



National Poverty Center Working Paper Series

#06-45

December, 2006

**Mixing Qualitative and Quantitative Research in
Developmental Science: Uses and Methodological Choices**

**Hirokazu Yoshikawa, Harvard University
Thomas S. Weisner, University of California, Los Angeles
Ariel Kalil, University of Chicago
Niobe Way, New York University**

This paper is available online at the National Poverty Center Working Paper Series index at:
http://www.npc.umich.edu/publications/working_papers/

Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Poverty Center or any sponsoring agency.

Mixing Qualitative and Quantitative Research in Developmental Science:
Uses and Methodological Choices

Hirokazu Yoshikawa

Thomas S. Weisner

Ariel Kalil

Niobe Way

Author Note

Hirokazu Yoshikawa, Harvard Graduate School of Education; Thomas S. Weisner, University of California, Los Angeles; Ariel Kalil, University of Chicago; Niobe Way, New York University.

This article was partially based on a conference, “Mixed Methods Research on Economic Conditions, Public Policy, and Child and Family Well-Being” conducted at the National Poverty Center, University of Michigan, in June of 2005. That conference was supported by grants from the American Psychological Association and the National Institute of Child Health and Human Development to Kalil and Yoshikawa. Work on this article by Yoshikawa and Way was also supported by National Science Foundation BCS Grant #021589 to the New York University Center for Research on Culture, Development, and Education. Work on the article by Yoshikawa was also supported by a Scholars grant from the William T. Grant Foundation.

Correspondence concerning this article should be addressed to Hirokazu Yoshikawa at

hiro_yoshikawa@harvard.edu.

Mixing Qualitative and Quantitative Research in Developmental Science:

Uses and Methodological Choices

Abstract

Multiple methods are vital to understanding development conceptualized as a dynamic, transactional process. This article focuses on the ways in which quantitative and qualitative methodologies can be combined to enrich developmental science and the study of human development, focusing on the practical questions of “when” and “how”. In particular, we highlight research situations that may be especially suited to mixing qualitative and quantitative approaches. We also discuss some of the critical choices confronting mixed quantitative / qualitative approaches in the phases of study design, sampling, construction of measures or interview protocols, and data analysis.

Mixing Qualitative and Quantitative Research in Developmental Science: Uses and Methodological Choices

How does knowledge gleaned from words complement knowledge gleaned from numbers, and vice versa? How and when does the combination of quantitative and qualitative methods enrich developmental science? Our science increasingly relies on multi-method approaches to examining developmental processes (Garcia Coll, 2005; Society for Research in Child Development, 2005; Weisner, 2005). As a consequence, developmental scholars have broken new ground over the past decade in understanding the cognitive, linguistic, social, cultural, and biological processes related to human development and family life. This article focuses on the many productive ways in which quantitative and qualitative methodologies can be combined to study human development.

Several summaries and handbooks focusing on integrating qualitative and quantitative methods in the social sciences have recently been published (Bernard, 1995, 1998; Creswell & Plano Clark, in press; Greene & Caracelli, 1997; Tashakkori & Teddlie, 1998, 2003). In this paper, we focus specifically on the uses of mixed methods for developmental science. We answer practical questions of when and how: When might mixing qualitative and quantitative approaches be useful in a developmental study? What are the methodological choices involved in qualitative and quantitative inquiry in studies of human development?

By quantitative research, we mean methods of inquiry that analyze numeric representations of the data. Survey and questionnaire data as well as observational, biological or physiological data are analyzed in quantitative units. Inquiry that relies on qualitative methods aims typically to represent the quality of an experience by analyzing words, texts, narratives,

written descriptions, and/or observational data. The epistemological assumption underlying our discussion of mixed methods is that the world can be represented through both numbers and words and that both numbers and words should be given equal status in developmental science. Developmental science is thus a holistic enterprise, including the social, neurological, and biological sciences. Although disciplines may focus on particular methods, this is no reason to limit a particular program of research in developmental science to a single method.

Before turning to our primary questions, we begin with three general beliefs that guide our discussion of mixing qualitative / quantitative studies in studies of human development. First, integrating quantitative and qualitative methods can bring us closer to understanding a developmental process than either set of methods can on its own. This belief goes beyond the commonly stated value of triangulation across methods, a strategy that focuses on convergence across methods on a particular finding, or separating out methods variance. Rather, our belief is that the combination of words and numbers can bring us closer to the complexity of developmental change by providing divergent as well as convergent data. Diverging data across methods can spur further inquiry and refinement of theory, rather than simply representing disconfirming information..

Our second belief is that the particular puzzle at hand concerning developmental processes should determine whether and how qualitative and quantitative methods should be combined. As with other forms of research, methods should follow the research question rather than vice versa. We will describe certain common types of research questions that we think might lend themselves to the process of mixing methods.

Our third assumption is that the distinction between qualitative and quantitative research is to some degree artificial. For example, whenever a qualitative study includes a count of the

prevalence of a particular theme, or uses comparative terms like “more” or “less”, words and numbers are being mixed. Conversely, many studies include interpretations of quantitative findings that call up or rely on qualitative evidence. It is also useful to divide methods in other ways that cross-cut the qualitative/quantitative distinction. Anthropologists have described methods as experience-near (representing the voice, intentions, meanings, and local rationality of parents and children in local settings) and experience-distant (representing the world of groups, institutions, and social address categories). Methods can be particularistic, capturing a part of some phenomenon, or holistic, attempting to capture the whole context or situation (Weisner, 1996). In this article, we define mixed qualitative / quantitative research broadly, with most of the examples from programs of research where both qualitative and quantitative research were conducted across all major phases of a study or across a program of research.

Research Circumstances in Developmental Science that Call for Mixing Qualitative and Quantitative Methods

In line with our view that the choice of methods should follow the research questions rather than vice versa, we do not think that all developmental research studies should necessarily combine the collection and analyses of words and numbers. This section presents research situations that may be particularly suited to mixing qualitative and quantitative approaches.

To assess developmental or contextual constructs that are difficult to measure using either set of methods alone. Human development occurs through the reciprocal exchanges between individual growth and change in social contexts (Bronfenbrenner & Morris, 1998; Thelen & Smith, 2006). However, some aspects of individual behavior or contextual characteristics can be difficult to understand using only quantitative or only qualitative methods. For example, recent work focused on single mothers’ economic strategies and household

budgeting by Kathryn Edin and Laura Lein (1997) established patterns of household expenditure that have been difficult to measure using traditional quantitative methods due to the sensitive nature of this information. Their assessment of spending relied first on meeting mothers in person and gaining their trust and then interviewing them over several months until a typical month's budget was fully accounted for. The questions posed by these researchers required collecting and analyzing quantitative and qualitative data.

Another example of research requiring both quantitative and qualitative information concerns studies of diurnal and nocturnal stress processes in human development. Physiological measures, such as those representing stress processes, provide information about the effects of stress on human development that cannot be reported by individuals (Gunnar & Vasquez, 2001). However, these types of data should be combined with self-report data that provide information on individuals' perceptions of and responses to daily stressful events (Adam, Hawkley, Kudielka, & Cacioppo, 2006), thus allowing researchers to track how individual behavior, at both the psychological and physiological levels, corresponds to individual perceptions and meaning-making. McKenna and McDade (2005) review evidence on perceived norms regarding co-sleeping between mothers and infants, as well as evidence for contingent psychobiological attunement that occurs in these dyads as they sleep together. To understand sleep patterns between mothers and infants, qualitative and quantitative data are necessary. Quantitative data are necessary to monitor physiological patterns of parents and infants while asleep. Interviews and ethnographic evidence about who sleeps with whom and why are equally important to understand the cultural models and scripts for sleeping together or apart, and parents' developmental beliefs regarding why such practices are important for children's development.

To integrate the study of beliefs, goals, and practices in socialization and development.

Shweder et al. (2006) note that the study of culture in human development benefits from the integration of symbolic (e.g., beliefs, goals, rules) and behavioral (e.g., customs, behaviors) aspects of cultural communities. In this view, the shared meanings that are passed on from one generation to the next and constitute culture have both symbolic and behavioral dimensions. Similarly, Super and Harkness's concept of the developmental niche of child rearing integrates attention to the physical setting, behavioral customs, and caregivers' psychology (Super & Harkness, 1986). In order to conduct integrated studies of beliefs and practices in human development, it is necessary to conduct close observation of behaviors and activities in natural settings, as well as explore the beliefs, intentions, meanings, and goals of children, their caregivers, and others over time (Weisner, 2002). Examining both behavior and belief systems requires both quantitative and qualitative approaches to research: quantitative methods to understand the prevalence of particular practices, behaviors, and beliefs, and qualitative methods to understand the meanings and intentions lying behind them.

Parenting and development include a direction and purpose along a life path, or a cultural career (Goldschmidt, 1992), which organizes both symbolic and behavioral aspects. LeVine (2003) calls for the blending of the study of universals in development, with local variations in both the goals and specific practices of socialization and parenting around the world. Should normatively "healthy" relationships require a balance between opposed dimensions of autonomy and intimacy, which is the dominant cultural relational schema underlying successful development in the United States (Tamis-LeMonda et al., in press; Weisner, 2001), rather than "symbiotic harmony" as found in Japan (Rothbaum, Pott, Azuma, Miyake, & Weisz, 2000), or "socially distributed" caretaking and support, as found in many Latin American, African, and

Asian countries (LeVine, Miller, & West, 1988; Serpell, 1993; Weisner, 1987)? Classic cross-cultural studies of children's development have fully integrated qualitative and quantitative methods to examine both beliefs and behaviors of children and their caregivers, resulting in a useful blend of local and universal knowledge (LeVine et al., 1994; Whiting & Whiting, 1975; Whiting & Edwards, 1988).

To estimate and understand developmental change at multiple time scales.

Developmental growth over time in populations is best discerned by estimating trajectories of changing competencies and skills. Such work is conducted most often using quantitative methods (Collins & Sayer, 2001; Singer & Willett, 2003). However, events of developmental importance can occur at a multitude of time scales and at intervals that are difficult to predict.

Developmental change occurs in part as a result of the cumulative impact of innumerable interactions with parents, caregivers, teachers, siblings, and peers in the settings and at the time scale of the daily routine. Such interactions can be assessed using methods that quantify the data (e.g., structured tasks; time diaries; time allocation methods), and with methods (e.g., observations, interviews) that aim to understand the quality of those interactions. The "spot observation" technique, in which random occurrences of behavior are sampled and described in detail, has been used in ethnographic research in the tradition of the Whitings', and Super's work investigating child rearing and family life in cultures around the world Super, 1976; Whiting & Whiting, 1973). For example, analysis of hundreds of sampled events resulting from systematic participant observation indicated that the balance of sleep, arousal, and restraint among infants in different cultures varied greatly, and was associated with patterns of infant motor development (Super, 1976).

Mixing quantitative and qualitative evidence can also shed light on developmental changes that occur within and across entire developmental stages. In a longitudinal study of families with children with disabilities, quantitative measures showed that the frequency of family accommodations remains relatively stable across early to middle childhood, while the intensity of such accommodations declines. Qualitative evidence showed which kinds of family accommodations (meal time, services, transportation, caretaking, etc.) changed and why parents changed them. Quantitative measures also showed that cognitive assessments of the children did not predict sustainable accommodations, whereas assessments of socio-emotional functioning did (Gallimore, Coots, Weisner, Garnier, & Guthrie, 1996; Weisner, Matheson, Coots, & Bernheimer, 2005).

In a longitudinal study of social and emotional development among urban, low-income adolescents, quantitative measures of friendships indicated that whereas adolescent girls were more likely to report higher levels of perceived support from their friends in early adolescence, by late adolescence girls and boys were reporting equal levels of friendship support. These quantitative findings suggested that commonly held assumptions about gender differences in perceptions of friendship support during adolescence is only evident during early adolescence. However, qualitative findings indicated that whereas boys and girls reported equal levels of friendship support by their senior years in high school, the ways in which they were close and the meaning of their close friendships were dramatically different across gender (Way & Greene, 2006; Way, Becker, & Greene, 2006).

To examine reciprocal relationships between contextual and individual-level factors.

Transactional theories of development posit that individual and contextual characteristics influence each other in reciprocal causal processes across time (Gottlieb, 1997; Ford & Lerner,

1992). In recent years, quantitative methods to model such reciprocal influences have grown, such that studies modeling reciprocal associations between individuals and their family, peer, and other contexts have become relatively commonplace (e.g., Eisenberg et al., 2005). The strengths of the quantitative approach include the ability to estimate how the strength of reciprocal causal associations changes over time. For example, quantitative data can estimate how the influence of child characteristics on parenting changes between the periods of early and middle childhood.

Mixing qualitative and quantitative methods can give a richer picture of such reciprocal associations by uncovering in detail the processes by which individuals select their own (or others') environments. A quantitative study on a national data set examined the factors that predicted parents' choice of center-based care; mothers with higher levels of education, lower levels of social support (e.g., from a co-resident grandparent), and those providing higher levels of cognitive stimulation in the home were more likely to select center-based care (Fuller, Holloway, & Liang, 1996). A complementary qualitative study found that parents valued safety and trust in their providers more than other structural or process indicators of quality (Mensing, French, Fuller, & Kagan, 2000). Importantly, these findings suggest that most quantitative studies of child care quality are overlooking factors that parents value the most – i.e., aspects of the caregiver-parent relationship.

To explore causal associations and their mechanisms. Both words and numbers can shed light on causality. However, the contributions of qualitative and quantitative methods are different, and the combination can provide a richer picture of a causal association than either alone. Quantitative methods are suited to estimating the direction and magnitude of a causal effect. Whether using classic, random-assignment experimental methods, or a quasi-

experimental approach, the goal is an unbiased estimate of the effect of a predictor (in developmental science, often an effect on some aspect of developmental competence or dysfunction; Foster, 2002; Rubin, 1974; Shadish, Cook, & Campbell, 2002).

Qualitative approaches to causal analysis, on the other hand, are most suited to uncovering mechanisms of cause and effect (what some have called “process analysis”; Brady & Collier, 2004). Many quantitative analyses that aim to understand causal impacts of a treatment or phenomenon have as their goal the elimination of selection effects; in contrast, qualitative analysis is often aimed at describing in detail these same processes, taking into account human agency. In addition, quantitative approaches, testing particular hypotheses about a delimited number of mediating mechanisms, may not discern the full range of explanatory processes that hold in any particular cause-effect relationship. Qualitative methods can help uncover such mechanisms. For example, a qualitative analysis using data from the Moving to Opportunity residential-mobility experiment explored why the offer of a move from a low-income to a high-income neighborhood had more positive effects on the academic performance and social behavior of girls than boys. The qualitative sub-study found that boys of parents who took up the offer to move from high- to low-poverty neighborhoods had more difficulty adjusting to new neighborhoods. Girls adapted more quickly to the new settings, developing school-based friendship networks that were less likely to be involved with risky behaviors. Girls felt more harassed in their old neighborhoods and experienced less fear in the new ones. These were experiences that had not been anticipated in the survey, but emerged from in-depth qualitative interviews (Clampet-Lundquist, Kling, Edin, & Duncan, 2006).

Another common situation in which quantitative and qualitative data are integrated is in the evaluation of the implementation quality of programs for children and youth. Implementation

is partly a matter of what was offered in a program and partly a consequence of perceptions by families about a program that determine whether they make use of it or not. Both can explain or moderate the causal effects of an intervention on children. This mix of examining “what was offered?” and “how was it perceived?” is well-suited to combining quantitative and qualitative methods. Datta (2005), for example, reviewed evidence from quantitative experimental evaluations of the Comer approach to whole-school reform. Quantitative data seemed to indicate that the program did not achieve the intended results; merging the qualitative and quantitative data indicated that the Comer principles were effective, but only when the approach was appropriately implemented (Datta, 2005, p. 66).

Another example of a puzzling causal association addressed by the integration of quantitative and qualitative research emerged from a 6-year longitudinal study of adolescent mothers and their children (Way & Leadbeater, 1999). In this study, the survey data indicated that mothers who reported lower levels of emotional support from their own mothers at the time of the birth achieved higher levels of educational attainment after 6 years than their counterparts who reported more emotional support. The qualitative, in-depth interviews with these young mothers indicated that those mothers who reported the least amount of emotional support from their own mothers at birth had mothers who had the highest expectations for their daughters. Thus, the low amount of emotional support received by their own mothers at the birth of their child was due, in part, to the anger and disappointment that their own mothers felt about the fact that their daughters had become pregnant at such a young age. The mothers, however, who were perceived to be the most emotionally supportive of their daughters at the birth of the daughter’s child had few educational expectations for their daughters; thus, the arrival of a grandchild was not frowned upon. The qualitative analysis indicated that the predictors of educational attainment

may have had more to do with the expectations the mothers had for their daughters than the level of emotional support they provided. These findings underscore the ways in which quantitative and qualitative methods can be mixed to produce a clearer understanding of an association uncovered using quantitative methods.

To integrate the study of developmental phenomena that occur with high prevalence with those that occur in isolated cases. The distinction between quantitative and qualitative research has occasionally been described as variable- vs. individual-centered, or nomothetic and idiographic. However, this distinction is not accurate, in that both qualitative and quantitative research can be conducted at either the population or individual level of analysis. However, a strength of qualitative research is its ability to identify isolated cases that may uncover an entirely new area of inquiry (Turner, 2004). For example, many quantitative methods used in developmental science summarize information about groups of individuals, rather than identify and explore unusual cases in depth. The ability to identify and then conduct follow-up detailed exploration of atypical cases may be a particular strength of qualitative approaches. This can occur in two ways. First, a qualitative analysis can uncover a new developmental phenomenon. This can open up the opportunity to explore its prevalence, predictors, and sequelae in quantitative studies. For example, the *Sturm und drang* theory of adolescent development as a process of individuation requiring conflict with parents was developed largely through data and theorizing from case studies in psychoanalytic scholarship. This theory was then tested in numerous developmental studies of adolescence, most of which employed quantitative methods, to the point where it was discounted as a phenomenon that was a necessary feature of successful adolescent development in middle-class U.S. cultures. Theories of adolescent research were enriched through this process.

Second, a quantitative analysis could uncover an unusual developmental phenomenon, with qualitative research employed to investigate it in more depth. An “outlier” or set of outliers in a quantitative analysis, for example, could be followed up with qualitative inquiry. For example, a recent study of a hospital-recruited birth cohort of children born to low-income immigrant parents in New York City uncovered an extraordinarily high prevalence – eighty percent -- of infants under 6 months old being sent back to China (specifically, to Fujian province). Among the immigrant groups studied, the rate of sending babies back in the first year among the Chinese was many times that among Mexicans or Dominicans. This finding, uncovered using quantitative methods, is being followed up by intensive ethnographic work in both New York and Fujian province to examine the immigration, household economic, and parenting factors that comprise the experience of these “transnational babies” and their far-flung families (Gaytan, Xue, Yoshikawa, & Tamis-LeMonda, 2006). A variant on these notions is the use of cross-cultural and cross-national samples to test findings from work done in a single community or nation. In this instance, the “isolated case” is usually the U.S., when it is known that the U.S. is an outlier compared to the world of children and parents to which we hope to generalize. Often qualitative and quantitative evidence helps to put our own isolated U.S. case into perspective. The *Sturm und Drang* hypothesis, for example, required major modifications when it was compared to studies concerning the quantitative patterning as well as qualitative meaning of adolescent-parent relationships in other cultures (Brown, Larsen, & Saraswathi, 2002; Larson & Verma, 1999; Schlegel & Barry, 1991).

Methodological Choices in Mixing Qualitative and Quantitative Approaches

Methodological choices are determined by the particular research question at hand. Here we discuss some of the critical choices when designing studies, sampling, constructing measures or interview protocols, and analyzing data using a mixed quantitative / qualitative approach.

Research design and data collection modality. The productive mixing of qualitative and quantitative methods can occur within a variety of research designs, including non-experimental and experimental studies and prospective longitudinal as well as cross-sectional or retrospective studies. The choice of design should ideally be made *a priori*, with attention to the particular strengths of each design within the context of the research topic (causal inference, e.g., for experimental studies; the ability to model change for longitudinal studies). Using integrated methods throughout the stages of a study, as an iterative, cumulative approach to inquiry, is likely to result in richer data and theory than employing a new set of methods after the research design for the other part of the study has already been finalized. Goldenberg, Gallimore, and Reese (2005) illustrate this in their 15-year longitudinal research program of studies of Latino children's literacy development, in which an interest in the contexts that mattered for these children's school success led to the use of ethnography in homes and schools; qualitative interviews with parents, teachers, and children; questionnaires; school records; and developmental assessments. The research team used interventions, experimental designs, and naturalistic longitudinal designs and samples. For example, their quantitative findings indicated that parental personal and educational backgrounds significantly influenced the literacy beliefs and home literacy practices of parents and children and also their children's early school achievement. These findings led the researchers back to Mexico and more qualitative research in the cities, small towns, and rural villages of origin of the parents to figure out why these associations held.

Much has been written about the choice of qualitative methods (e.g., Bernard, 1998; Creswell, 1998; Denzin & Lincoln, 1998) as well as data collection modality (e.g., in-depth interview; structured open-ended questions; focus group). In the context of a mixed qualitative / quantitative study, the match between the quantitative and qualitative methods should be considered in addition to the usual match of method to research question. One method might be chosen specifically to fill in gaps or shortcomings of another. For example, a survey study that examines parenting practices and child development without much attention to the physical context of the home or the community may benefit from participant observation that obtains detailed, in-depth descriptions of these social contexts of parenting. As another example, if group process and discourse are important elements of a construct (e.g., peer perceptions) but have not been a focus of research using one set of methods, a data collection method that provides group dynamics data, such as sociometric ratings or focus groups, could be chosen for the next phase in the research.

If the two sets of methods are to be used with the same or overlapping samples, an issue to consider is how the relationship between researcher and participant changes across the methods. This change in relationship quality may have consequences for data quality. For example, conducting qualitative interviews first may enable a level of rapport that is crucial for collecting certain kinds of data. On the other hand, some quantitative methods may be more likely to provide confidentiality or anonymity (e.g., computer-assisted survey administration). The use of nested designs and pilot samples all provide ways to do qualitative research that is complementary to quantitative study when such issues arise.

Sampling. Mixing qualitative and quantitative approaches brings up vexing trade-offs regarding how to sample. Typically, qualitative samples are smaller than quantitative samples

due to the time demanding nature of qualitative data collection and analysis. However, this need not be the case. Some studies (e.g., Edin & Lein, 1997; Way & Pahl, 2001, Way, Gingold, Rotenberg, & Kuriakose, 2005) conduct both quantitative and qualitative work with entire samples of hundreds of participants. If that is not possible, embedding or nesting a qualitative sample within a larger quantitative sample is generally preferable to assembling a qualitative sample not linked to the quantitative data. This is preferable for two reasons. First, one can examine the quantitative (e.g., survey) data of the qualitative sample. Subgroups of the qualitative sample, for example, could be drawn based on responses obtained from the survey (e.g., above and below the median on a particular continuous measure). Second, one can more easily generalize from one sample to the other if they are nested. Random sub-sampling can be especially useful in this regard.

An embedded qualitative sample can be drawn based on particular criteria, such as family structure, risk level, or developmental status. For example, a recent qualitative investigation drew a sub-sample from a larger quantitative study of welfare recipients based on women's entry into marriage over the five-year time frame of the larger study (Jayakody & Seefeldt, 2005). Another ethnographic sub-sample was drawn randomly from both conditions of an experimentally evaluated intervention (the New Hope antipoverty experiment) (Duncan, Huston, & Weisner, 2006; Gibson-Davis & Duncan, 2005). In this case, the researchers argued strongly for incorporating both experimental and control-group members in the qualitative sub-study in order to gain more powerful insights into the causal effects of the intervention.

Network-based sampling (e.g., "snowball sampling," in which respondents refer the researcher to other respondents) is quite common in qualitative research. By carefully selecting a range of starting cases and engaging in several stages of referrals from those cases, snowball

samples can represent a relatively wide range of variation on demographic characteristics in a particular population (Heckathorn, 1997). The choice between network-based sampling and population-based sampling should be informed by the type of population as well as the response rate obtained. For example, a “hidden” or stigmatized population may be better sampled using network-based sampling than using population-based sampling, while the reverse may be true for a population from which one can obtain a higher response rate (Small, 2005).

The systematic sampling of particular contexts to highlight variation in qualitative cases is a common approach when the topic of study is development within that context. This task becomes more complicated when it is conducted in combination with sampling in a quantitative study. For example, a qualitative study of child or youth development in neighborhood contexts that is conducted within a larger quantitative study may need to sample a smaller number of communities than those represented in the larger sample. Neighborhoods may be selected based on particular dimensions that are of interest in the study; the number of dimensions across which neighborhoods are chosen, however, will be more constrained in the qualitative study in this case. Decisions of how many interviews or participants to sample per neighborhood depend, in turn, on the individual-level characteristics across which one would like to ensure variation. This is a topic that is not well understood and would benefit from new research. In the New Hope experiment (Gibson-Davis & Duncan, 2005), 44 ethnographic cases were randomly sampled from some 550 in a larger survey sample (i.e., a qualitative subsample of about 8%). This was largely a decision based on time, money, and intuition about what would constitute enough families and children. Forty-four cases could detect a program impact of about 0.6 of a standard deviation with a 95% confidence interval. However, it turned out that there were no program impacts found using the full quantitative data that were as large as 0.6. The variance and other

features of the quantitative data also affect decisions about how and how many to select in a subset – features that often cannot be predicted before doing the study. Factors to consider when making decisions about relative sample size of quantitative vs. qualitative samples include: Insuring representation of the full range of the target population or allowing for variation in the variable/topic of interest; ensuring that fieldworkers have the time and resources to capture rich, complex and nuanced developmental processes, regardless of statistical generalization; and estimating statistical power *a priori* for key associations . These are methodological dilemmas specific to mixed-methods work, for which no established guidelines are as yet available, and for which experience is therefore often the best guide.

Measure development. The development of assessment and measurement tools in one set of methods can occur based on evidence from the other. Perhaps most common is the situation where qualitative evidence is used to develop quantitative instruments. Pendleton, Poloma, and Garland (1980), for example, utilized interviews with 53 dual-earner couples to develop quantitative scales tapping aspects of work and family such as domestic responsibility, satisfaction, self-image, and career salience.

Qualitative evidence can also be used to improve upon the limitations of measures that historically have been implemented in quantitative survey instruments. Lugo-Gil and Yoshikawa (2006), for example, analyzed qualitative interviews on expenditures on children conducted with immigrant and ethnically diverse parents. These interviews suggested multiple ways that the standard U.S. survey approach to expenditure measurement – the Consumer Expenditures Survey – could be revised to better measure expenditures on children in diverse families. Revisions were made to time frames, definitions of household, and phrasing of questions, while categories particularly relevant to consumption in these families, such as informal contributions

from others and remittances, were added. The survey measure based on the qualitative findings was then administered to estimate investments in children in a larger survey sample.

Qualitative protocols also can be developed from quantitative data. For example, participants can be asked how two domains of experience are related, based on quantitative study of the two domains in association with one another (e.g., asking adolescents how experiences of discrimination in their daily lives might relate to their well-being and their school engagement, a question that is best asked after extensive probing of each of these topics separately). Similarly, the constructs of “time” and “money” have long been studied as key components of family life and child development. In quantitative studies, these constructs are usually assessed separately with time diaries and expenditure grids. A recent qualitative study of unemployed middle-class fathers, however, asked parents about the trade-offs they perceived in having time versus money as key parenting “investments” in their school-age children. The findings suggested a more nuanced portrait of the conditions under which the merits of increased time for children as a result of parents’ job loss outweighed the loss of income from employment. For example, for unemployed fathers who had sufficient savings or other financial resources and were therefore experiencing relatively little economic stress, the unexpected chance to rekindle or strengthen relationships with children through spending more time together was viewed as a welcome opportunity that would have long-lasting positive consequences. In contrast, for those fathers whose financial obligations weighed more heavily upon them, the increased time they were spending at home served only as a frustrating reminder of their unemployment status. These qualitative findings suggest in turn a revising of quantitative measures to assign “weights” to these important inputs in light of a particular family’s circumstance (Kalil, Spindel, & Hart, 2006).

Data analysis. Quantitative and qualitative data analysis from a mixed-methods study can be sequenced in a variety of ways. As the examples throughout this article illustrate, there is no “best” way for the two kinds of analyses to inform each other. Studies can, for example, range from two-stage models in which the qualitative analyses follow the quantitative, or vice versa, to quite complex iterations where at different stages qualitative and quantitative analysis accomplish different purposes. For example, Odom et al. (2006) conducted a study of the experiences of preschool children with disabilities in inclusive classrooms. They conducted survey, observational, participant observation, and in-depth interviews concerning children’s experiences in inclusive classrooms. In their analyses, they first identified children at extremes of social acceptance and rejection using quantitative methods, then analyzed these two groups’ experiences holistically using a range of qualitative methods. They then conducted a quantitative cluster analysis to identify patterns of peer sociometric perceptions that were associated with acceptance or rejection, and validated those clusters using their participant observation methods. This complex set of analyses provides a rich picture of the experience of acceptance and rejection of children with disabilities in an educational setting.

Divergent findings quantitative and qualitative methods do not necessarily represent a “problem” with the data. Miller, Khamarko, and Beard (2005) reported, for example, conflicting results from a mixed-methods evaluation of an HIV prevention program for adolescents. They found that although the program did not achieve substantial impacts from quantitative assessments of risk behavior, the community organizations involved felt that the program was extremely important in bringing attention to a neglected health issue and catalyzing community efforts to prevent HIV/AIDS infection. Thus, the divergence of evidence provided useful data

that challenged the program's established theory of change, as well as revealing the plurality of values among stakeholders involved.

One all-too-common way that qualitative and quantitative methods are mixed within a research project is to have separate analysts engage with data, each focused on one set of methods. This division of labor is, in our view, not the best choice from both scientific and training perspectives. It is preferable to integrate the two perspectives throughout the analysis phase of a research project (through all phases, if possible), and have each analyst conduct both quantitative and qualitative data analysis. This can lead to rich integration across methods and analyses. However, this approach also requires training across both sets of methods, a difficult task given the extensive traditions of training within each set of methods. If experts in quantitative methods partner with experts in qualitative methods and jointly explore common developmental questions, new findings as well as new skills can be learned by all. It is not necessary for each individual to be equally expert in all methods. Joint training in qualitative and quantitative methods can be accomplished productively by embedding training opportunities in mixed qualitative / quantitative studies. In a recent book detailing effects of low-wage work dynamics on family processes and child development, each member of a team of 15 analysts engaged in both quantitative and qualitative analyses. Many members of the team were at the doctoral or post-doctoral level, and were lead analysts on studies focusing on particular aspects of low-wage work and child development (Yoshikawa, Weisner, & Lowe, 2006). The whole team engaged in a core set of coding and analysis tasks using the ethnographic data, as well as a core quantitative analysis of work and income trajectories. Each chapter author then expanded on these core analyses, using both quantitative and qualitative methods to examine a particular aspect of low-wage work and its effects on parents and children. This approach served

simultaneously as an efficient way to conduct mixed-methods analyses and a rich training opportunity across both sets of methods.

Conclusions

We have aimed in this article to outline the ways in which mixing qualitative with quantitative methods can enrich developmental science, and the range of methodological choices involved in this mixing. Developmental theory is enriched through the expanded lens that mixing methods can provide on developmental phenomena. This work is just beginning with regard to mixing the study of words and numbers. For example, research in gene-environment interaction, contextual influences on physiological processes, and the effects of public policies on children's development will all be enriched through the more extensive use of both qualitative and quantitative methods. We believe that in future years, as the productive mixing of these methods continues to grow, our understanding of human development will be greatly enhanced.

References

- Adam, E., Hawkley, L., Kudielka, B., & Cacioppo, J. (2006). Day-to-day dynamics of experience-cortisol associations in a population-based sample of older adults. *Proceedings of the National Academy of Sciences*. Published on-line October 30 and available at: <http://www.pnas.org/cgi/reprint/0605053103v1>
- Bernard, H. R. (1995). *Research methods in anthropology: Qualitative and quantitative approaches*. Walnut Creek, CA: Alta Mira Press.
- Bernard, H. R. (1998). Introduction: On method and methods in anthropology. In H. R. Bernard (Ed.), *Handbook of methods in cultural anthropology* (pp. 9-36). Walnut Creek, CA: AltaMira Press.
- Brady, H.E., & Collier, D. (2004). (Eds.). *Rethinking social inquiry: Diverse tools, shared standards*. New York: Rowman and Littlefield.
- Bronfenbrenner, U., & Morris, P.A. (1998). The ecology of developmental process. In W.R. Damon & R.M. Lerner (Eds.), *Handbook of child psychology (5th edition): Volume I. Theoretical models of human development* (pp. 993-1028). New York: Wiley.
- Brown, B. B., Larson, R. W., & Saraswathi, T. S. (2002). *The World's Youth: Adolescence in Eight Regions of the Globe*. Cambridge: Cambridge University Press.
- Chell, E. (2004). Critical incident technique. In M.S. Lewis-Beck, A.E. Bryman, & F. Liao (Eds.), *The Sage Encyclopedia of Social Science Research Methods* (pp. 218-219). Thousand Oaks, CA: Sage.

- Clampet-Lundquist, S., Edin, K., Kling, J., & Duncan, G. (2006) *Moving at-risk teenagers out of high-risk neighborhoods: Why girls fare better than boys*. Princeton IRS Working Paper 509. Princeton, NJ: Industrial Relations Section, Princeton University.
- Collins, L.M., & Sayer, A.G. (2001). (Eds.). *New methods for the analysis of change*. Washington, DC: APA Books.
- Creswell, J.W. (1998). *Qualitative inquiry and research design: Choosing among five alternatives*. Thousand Oaks, CA: Sage Publications.
- Creswell, J.W., & Plano Clark, V.L. (in press). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications.
- Datta, L.(2005). Mixed methods, more justified conclusions: The case of the Abt evaluation of the Comer program in Detroit. In Weisner, T.S. (2005). (Ed.). *Discovering successful pathways in children's development: Mixed methods in the study of childhood and family life* (pp. 65-83). Chicago: University of Chicago Press.
- Denzin, N.K., & Lincoln, Y.S. (1998). (Eds.). *Strategies of qualitative inquiry*. Thousand Oaks, CA: Sage Publications.
- Duncan, G.J., Huston, A.C., & Weisner, T.S. (2006). *Higher ground: New hope for the working poor and their children*. New York: Russell Sage Foundation.
- Edin, K., & Lein, L. (1997). *Making Ends Meet: How Single Mothers Survive Welfare and Low-Wage Work*. New York: Russel Sage Foundation.
- Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R.A., & Liew, J. (2005). Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Development*, 76, 1055–1071.
- Flanagan, E. (1954). The critical incident technique. *Psychological Bulletin*, 51, 327-358.

- Ford, D.H., & Lerner, R.M. (1992). *Developmental systems theory: An integrative approach*. Thousand Oaks, CA: Sage.
- Foster, E.M. (2002). How economists think about family resources and child development. *Child Development*, 73, 1904-1914.
- Fuller, B., Holloway, S.D., & Liang, X. (1996). Family selection of child-care centers: The influence of household support, ethnicity, and parental practices. *Child Development*, 67, 3320-3337.
- Gallimore, R., Coots, J. J., Weisner, T. S., Garnier, H. E., & Guthrie, D. (1996). Family responses to children with early developmental delays II: Accommodation intensity and activity in early and middle childhood. *American Journal on Mental Retardation*, 101, 215-232.
- Gallimore, R., Keogh, B.K., and Bernheimer, L.P. (1999). The nature and long-term implications of early developmental delays: A summary of evidence from two longitudinal studies. In L.M. Glidden (Ed.), *International review of research in mental retardation* (pp. 105-135). New York: Academic Press.
- Garcia Coll, C. (2005). Editorial. *Developmental Psychology*, 41, 299-300.
- Gaytan, F.X., Xue, Q., Yoshikawa, H., & Tamis-LeMonda, C.S. (2006). "Transnational babies:" *Patterns and Predictors of Early Childhood Travel to Immigrant Mothers' Native Countries*. Paper presented at the National Head Start Research Conference, Washington, DC, June.
- Gibson-Davis, C., & Duncan, G. J. (2005). Qualitative/ Quantitative synergies in a random-assignment program evaluation. In T. S. Weisner (Ed.), *Discovering Successful Pathways*

- in Children's Development: New methods in the study of childhood and family life* (pp. 283-303). Chicago: University of Chicago Press.
- Goldenberg, C., Gallimore, R.G., & Reese, L. 2005. Using mixed methods to explore Latino children's literacy development. In Weisner, T.S. (Ed.), *Discovering successful pathways in children's development: Mixed methods in the study of childhood and family life* (pp. 21-46). Chicago: University of Chicago Press.
- Goldschmidt, W. (1992). *The Human Career. The Self in the Symbolic World*. Cambridge, MA: Blackwells.
- Gottlieb, A. (2004). *The Afterlife is Where We Come From: The Culture of Infancy in West Africa*. Chicago: University of Chicago Press.
- Gottlieb, G. (1997). *Synthesizing nature-nurture: Prenatal roots of instinctive behavior*. Mahwah, NJ: Lawrence Erlbaum.
- Greene, J.C., & Caracelli, V.J. (1997). (Eds.). *Advances in mixed-method evaluation: The challenges and benefits of integrating diverse paradigms*. Thousand Oaks, CA: Sage Publications.
- Greene, M., Way, N., & Pahl, K. (2006). Trajectories of perceived discrimination among Black, Latino, and Asian American adolescents: Patterns, predictors, and psychological consequences. *Developmental Psychology*, 42, 218-238.
- Gunnar, M. R. & Vazquez, D. M. (2001). Low cortisol and a flattening of the expected daytime rhythm: Potential indices of risk in human development. *Development and Psychopathology*, 13, 516-538.
- Harkness, S., & Super, C. M., (Ed.). (1996). *Parents' cultural belief systems*. New York: Guilford Press.

- Heckathorn, D.D. (1997). Respondent-driven sampling: A new approach to the study of hidden populations. *Social Problems*, 44, 174-199.
- Jayakody, R., & Seefeldt, K. (2005). *We got married, now what? Family dynamics after union formation*. Paper presented at the annual meeting of the Population Association of America, April.
- Kalil, A., Spindel, L., & Hart, C. (2006). *Downsized dads: How white-collar fathers negotiate family life after job loss*. Unpublished manuscript, University of Chicago.
- Larson, R. W., & Verma, S. (1999). How children and adolescents spend time across the world: Work, play, and developmental opportunities. *Psychological Bulletin*, 125, 701-736.
- LeVine, R.A. (2003). *Childhood socialization: Comparative studies of parenting, learning, and educational change* (CERC Studies in Comparative Education, 12). Hong Kong: University of Hong Kong Press.
- LeVine, R.A., Miller, P.M., & West, M.M. (1988). (Eds.). *Parental behavior in diverse societies*. San Francisco: Jossey-Bass.
- LeVine, R. A., Dixon, S., LeVine, S., Richman, A., Leiderman, P. H., Keefer, C. H., & Brazelton, T. B. (1994). (Eds.). *Child care and culture: Lessons from Africa*. Cambridge, UK: Cambridge University Press.
- Lugo-Gil, J., & Yoshikawa, H. (2006). *Measuring expenditures on children in immigrant and ethnically diverse families*. National Poverty Center Working Paper 06-017. Ann Arbor, MI: National Poverty Center.
- McKenna, J.J., & McDade, T. (2005). Why babies should never sleep alone: a review of the co-sleeping controversy in relation to SIDS, bedsharing and breast feeding. *Pediatric Respiratory Reviews*, 6, 134-152.

- Mensing, J.F., French, D., Fuller, B., & Kagan, S.L. (2000). Child care selection under welfare reform: How mothers balance work requirements and parenting. *Early Education and Development, 11*, 573-595.
- Miller, R., Khamarko, K., & Beard, S. (2005). *Two tales of an intervention: Sorting through conflicting evidence from a mixed-methods evaluation*. Paper presented at the biennial meeting of the Society for Community Research and Action, Urbana-Champaign, IL.
- Munroe, R.H., & Munroe, R.L. (1971). Household density and infant care in an East African society. *Journal of Social Psychology, 83*, 3-13.
- Odom, S.L., Zerher, C., Li, S., Marquart, J.M., Sandall, S., & Brown, W.H. (2006). Social acceptance and rejection of preschool children with disabilities: A mixed-method analysis. *Journal of Educational Psychology, 98*, 807-823.
- Pendleton, B.F., Poloma, M.M., & Garland, T.N. (1980). Scales for investigation of dual-earner couples. *Journal of Marriage and the Family, 42*, 269-276.
- Rothbaum, F., Pott, M., Azuma, H., Miyake, K., & Weisz, J. (2000). The development of close relationships in Japan and the United States: Paths of symbiotic harmony and generative tension. *Child Development, 71*, 1121-1142.
- Rubin, D. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology, 66*, 688-701.
- Schlegel, A., & Barry, H. (1991). *Adolescence: An anthropological inquiry*. New York: The Free Press.
- Serpell, R. (1993). *The Significance of schooling. Life journeys in an African society*. Cambridge: Cambridge University Press.

- Shadish, W.R., Cook, T.D., & Campbell, D.T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. New York: Houghton Mifflin.
- Shweder, R. A. (Ed.). (1998). *Welcome to Middle Age!* Chicago: University of Chicago Press.
- Shweder, R. A., Balle-Jensen, L., & Goldstein, W. (1995). Who sleeps by whom revisited: A method for extracting the moral goods implicit in practice. In J. J. Goodnow, P. J. Miller & F. Kessel (Eds.), *Cultural practices as contexts for development*. San Francisco: Jossey-Bass.
- Shweder, R.A., Goodnow, J.J., Hatano, G., LeVine, R.A., Markus, H.R., & Miller, P.J. (2006). The cultural psychology of development: One mind, many mentalities. In W. Damon & R.M. Lerner (Eds.), *Handbook of child development: Volume 1. Theoretical models of human development*. New York: Wiley.
- Singer, J.D., & Willett, J.B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.
- Small, M. F. (2001). *Kids: How Biology and Culture Shape the Way We raise Our Children*. New York: Doubleday.
- Small, M.L. (2005). *Lost in translation: How not to make qualitative research more scientific*. Paper presented at the National Science Foundation Workshop on Interdisciplinary Standards for Rigorous Qualitative Research, Washington, DC, May 19-20.
- Society for Research in Child Development (2005). SRCD strategic plan. Downloaded from the web, December 3, 2006: <http://www.srcd.org/documents/miscellaneous/strategicplan.pdf>.
- Super, C. (1976). Environmental effects on motor development: The case of African infant precocity. *Developmental Medical Child Neurology*, 18, 561-567.

- Super, C., & Harkness, S. (1986). The developmental niche: A conceptualization at the interface of child and culture. *International Journal of Behavioral Development*, 9, 545-569.
- Tamis-LeMonda, C.S., Way, N., Hughes, D., Yoshikawa, H., Kahana-Kalman, R., & Niwa, E. (in press). Parents' goals for children: The dynamic coexistence of collectivism and individualism. *Social Development*.
- Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: Sage Publications.
- Tashakkori, A., & Teddlie, C. (2003). (Eds.). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage Publications.
- Thelen, E., & Smith, L. (2006). Dynamic systems theories. In W. Damon & R. Lerner (Eds.), *Handbook of child development: Volume 1. Theoretical models of human development* (pp. 258-311). New York: Wiley.
- Turner, M. (2004). *A study of mental events in cognitive science and social science*. Paper presented at the National Science Foundation Workshop on Qualitative Methods in the Behavioral Sciences, Washington, DC, May.
- Way, N., Becker, B., & Greene, M. (2006). Friendships among African American, Latino, and Chinese American adolescents in an urban context. In C. Tamis-LeMonda & L. Balter (Eds.). *Child Psychology: A Handbook of Contemporary Issues: Second Edition*. New York: Psychology Press.
- Way, N., Gingold, R., Rotenberg, M., & Kuriakose, G. (2005). The development of friendships among African American, Latino, and Chinese American youth: A qualitative account. In N. Way & J. Hamm (Eds.). *Close friendships among adolescents. New Directions For Child Development*. San Francisco: Jossey Bass.

- Way, N. & Greene, M. (2006) Changes in perceived friendship quality from early to late adolescence: Using growth curve analysis to examine the patterns and contextual predictors. *Journal of Research on Adolescence*. 16, 293-320.
- Way, N. & Leadbeater, B. (1999). Pathways toward educational achievement among African American and Puerto Rican adolescent mothers: Examining the role of family support. *Development and Psychopathology*, 8, 123-139.
- Way, N., & Pahl, K. (2001). Individual and contextual predictors of perceived friendship quality among ethnic minority, low-income adolescents. *Journal of Research on Adolescence*, 11, 325-349.
- Weisner, T. S. (1987). Socialization for parenthood in sibling caretaking societies. In J. Lancaster, A. Rossi, J. Altmann & L. Sherrod (Eds.), *Parenting across the life span* (pp. 237-270). New York: Aldine Press.
- Weisner, T.S. (1996). Why ethnography should be the most important method in the study of human development. In R. Jessor, A. Colby, & R. Shweder (Eds.), *Ethnography and Human Development. Context and Meaning in Social Inquiry*. (pp. 305-324). Chicago, IL: University of Chicago Press.
- Weisner, T. S. (2001). The American dependency conflict: Continuities and discontinuities in behavior and values of countercultural parents and their children. *Ethos*, 29(3), 271-295.
- Weisner, T.S. (2005). (Ed.). *Discovering successful pathways in children's development: Mixed methods in the study of childhood and family life*. Chicago: University of Chicago Press.
- Weisner, T.S. (2002). Ecocultural understanding of children's developmental pathways. *Human Development*, 45, 275-281.

- Weisner, T. S., Matheson, C., Coots, J, and Bernheimer, L. 2005. Sustainability of daily routines as a family outcome. In Ashley Maynard and Mary Martini, Eds. *The Psychology of Learning in Cultural Context*. New York: Kluwer/Plenum. Pp. 41 – 73.
- Whiting, B.B., & Edwards, C.P. (1988). *Children of different worlds: The formation of social behavior*. Cambridge, MA: Harvard University Press.
- Whiting, B.B., & Whiting, J.W.M. (1975). *Children of six cultures; A psycho-cultural analysis*. Cambridge, MA: Harvard University Press.
- Yoshikawa, H., Weisner, T.S., & Lowe, E. (2006). (Eds.). *Making it work: Low-wage employment, family life, and child development*. New York: Russell Sage Foundation.