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Sampling in developmental science: Situations, shortcomings, solutions, and standards ☆

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A R T I C L E   I N F O

A B S T R A C T

Sampling is a key feature of every study in developmental science. Although sampling has far-reaching implications, too little attention is paid to sampling. Here, we describe, discuss, and evaluate four prominent sampling strategies in developmental science: population-based probability sampling, convenience sampling, quota sampling, and homogeneous sampling. We then judge these sampling strategies by five criteria: whether they yield representative and generalizable estimates of a study's target population, whether they yield representative and generalizable estimates of subsamples within a study's target population, the recruitment efforts and costs they entail, whether they yield sufficient power to detect subsample differences, and whether they introduce "noise" related to variation in subsamples and whether that "noise" can be accounted for statistically. We use sample composition of gender, ethnicity, and socioeconomic status to illustrate and assess the four sampling strategies. Finally, we tally the use of the four sampling strategies in five prominent developmental science journals and make recommendations about best practices for sample selection and reporting.

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Introduction

When we undertake to study some phenomenon, we wish to know something about that phenomenon in a population, but in practice we study the phenomenon in a group of individuals who purportedly represent the target or reference population to whom we wish our results to generalize. That is, we *sample* the population. We sample because we normally do not command the resources (time, money, or personnel) to assess the entire population of interest. Sampling is therefore a key feature of every study in developmental science, and sampling has far-reaching implications in all studies. This article is concerned with sampling in developmental science. As we point out, different sampling strategies exist, and each has its implications. Employing sub-optimal sampling strategies is far too common in developmental research, compromises the validity and utility of the research, renders replication and cross-study comparisons difficult, and most generally impedes progress in the field of developmental science.

In this article, we briefly describe and illustrate four prominent strategies that answer the sampling challenge, and we evaluate each in terms of some fundamental, meaningful, and practical criteria. The four strategies include (a) population-based probability sampling as well as nonprobability sampling strategies such as (b) convenience sampling, (c) quota sampling, and (d) homogeneous sampling. The five criteria by which we appraise these sampling strategies include (a) whether they yield representative and generalizable estimates of a study's target population (e.g., estimates of intelligence among the population when all sociodemographic groups are collapsed), (b) whether they yield representative and generalizable estimates of sociodemographic group differences within a study's target population (e.g., how estimates of intelligence vary across a population's ethnic groups), (c) the recruitment efforts and costs they entail, (d) whether they provide sufficient power to detect sociodemographic group differences, and (e) whether they introduce noise related to variation in sociodemographic factors and whether that noise can be accounted for statistically. After overviewing the four sampling strategies, we examine how the sociodemographic composition of a sample in terms of gender, ethnicity, and SES can compromise a study's findings – regardless of the study goals. We then recount the use of each prominent sampling strategy in five high-profile journals in contemporary developmental science. On these bases, we arrive at conclusions and recommendations about best practices and practical considerations, including ethical issues, and discuss the importance of weighing the research question when considering the merits of various sampling strategies.

This article is not comprehensive, and we have not assumed some related burdens. By now demographers, sociologists, and others in many disciplines have weighed the pros and cons of different sampling strategies (Davis-Kean & Jager, 2011; Henry, 1990; Onwuegbuzie & Collins, 2007; Sue, 1999; Watters & Biernacki, 1989). This article does not provide a tutorial on sampling (see http://stat-trek.com/statistics/data-collection-methods.aspx?Tutorial=Stat). We also eschew technical details in favor of highlighting "big picture" issues of design and practicality in an accessible way. Although our examples and arguments are applicable to any single sociodemographic factor or set of sociodemographic factors, here we limit our focus to gender, ethnicity, and SES. Also, although we fully recognize that gender, ethnicity, and SES are non-independent (ethnicity and SES in particular) but interact in myriad complex ways, when discussing the implications of these three sociodemographic factors we

Table 1
Ethnicity distribution in the United States in 2010.

Ethnicity	Percentage (%)
White (European American)[a]	63.75
Hispanic (Latin American)	16.35
Black (African American)[a]	12.21
Asian (Asian American)[a]	4.69
American Indian/Alaskan Native[a]	0.73
Hawaiian/Other Pacific Islander[a]	0.16

Note: Adapted from Table 1 in Humes, Jones, and Ramirez (2011).
[a] Non hispanic.