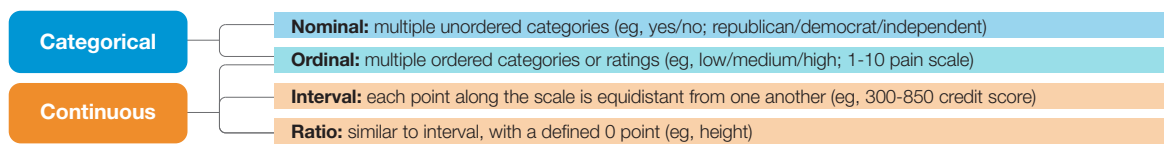


Family medicine residents and faculty need to fulfill Accreditation Council for Graduate Medical Education (ACGME) requirements for scholarly activity, and many implement surveys as a low-cost option to generate data. Here are some best practices for de novo survey development with a decision framework for analysis.

## Instrument Development

1. Determine what respondent characteristics are needed to describe the sample and make inferences about representativeness and/or generalizability.
2. Consider the measurement properties of various response options:<sup>1</sup>
  - a. Forced-choice (Figure 1)
  - b. Open-ended (see qualitative frameworks, beyond the scope of this infographic)

Figure 1. Taxonomy of measurement



3. Follow best practices for survey design:
  - Be intentional about item order.<sup>2</sup> A common approach is to implement a funnel sequence starting with broad, overarching questions before narrowing to specific topics of interest.
  - List demographic items at the end.
  - When possible, use questions instead of statements.<sup>4</sup>
  - Avoid double-barreled item stems (eg, “rate your satisfaction with EHR updates *and* user support”) and double negatives (eg, “...the system downtime was not unreasonable”).<sup>3,4</sup>
  - Avoid mixing positively and negatively worded items in the same response set (eg, “the EHR is difficult to navigate” followed by “the EHR is easy to use”).<sup>5</sup>
  - Ensure adequate variance and discrimination to avoid straight line scoring (eg, selecting the same response option for an entire matrix of responses) and fence sitters (those who answer neutral or no opinion despite having an opinion). When using Likert scales, include 5 or more response anchors.<sup>4</sup>
  - Avoid leading or unbalanced response anchors (eg, an uneven number of positive and negative response anchors).<sup>3</sup>
  - Make response options mutually exclusive outside of the check-all-that-apply format. A common mistake is overlapping age ranges (eg, 1-10, 10-20, 20-30).
  - Be mindful of social desirability bias, the tendency to distort responses to appear in a more positive light (eg, underreporting alcohol consumption or overestimating physical activity), when drafting questions.
  - Avoid acronyms and jargon.
  - Solicit expert feedback on survey length, readability, item clarity, operational definitions, and other aspects of the survey instrument.<sup>6</sup>

## Sampling Design

4. Determine the appropriate sampling method:
  - a. Probability sampling (eg, simple random sampling, cluster sampling)
  - b. Nonprobability sampling (eg, convenience sampling, snowball sampling)

## Analysis Plan

5. Calculate a response rate, if applicable.
6. Describe the sample and sampling frame using descriptive statistics (eg, frequency counts, cross-tabulations, means, and standard deviations).
7. Conduct hypothesis testing using inferential statistics, if applicable (Table 1).

Table 1. General framework for quantitative data analysis

Dependent Variable	Independent Variables	Statistical Tests
Continuous	1 categorical variable with 2 levels	t test
Continuous	1 categorical variable with more than 2 levels or multiple categorical variables	Analysis of variance
Continuous	Continuous	Linear regression
Continuous	Continuous and categorical	Analysis of covariance
Categorical	Categorical	$\chi^2$ tests, logistic regression, or log linear regression
Categorical	Continuous, or continuous and categorical	Logistic regression or other generalized linear model

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