DEWEY DEFEATS TRUMAN and Cancer Statistics

DEWEY DEFEATS TRUMAN was a famous headline in a 1948 issue of the Chicago Daily Tribune (1). Truman’s 4.4-percentage point victory contrasted with pre-election polls predicting Dewey by 5–15 percentage points. Several prominent pollsters including Gallup used quota sampling (asking until one gets a certain number of respondents from certain groups) instead of probability sampling (asking people who are randomly chosen from some list). The polling was done by telephone. In 1948, Dewey Republicans were more likely to have a telephone than generally less affluent Truman Democrats. Although quota samples favored Dewey, a probability sample predicted Truman’s win. Thus, it is important to be sure that the techniques and methods used to create a sample from a population actually provide an accurate proportional representation of the population parameter under study.

Similarly, deviations from chance selection of a sample can weight the results in favor of cancer survivors or people without cancer when estimating cancer risks in carriers of cancer-related gene mutations. Cancer patients are more likely than people without cancer to die and to be lost to follow-up. This loss may bias the sample even though the sample is large. For example, BRCA1 and BRCA2 mutations increase the risk for early-onset ovarian cancer. According to Surveillance, Epidemiology, and End Results data for the general population, 62% of ovarian cancers are diagnosed after metastasis has occurred and survival is only 28.2% (2). Early deaths from ovarian cancer in mutation carriers may appear to lower cancer incidence if records from these early deaths are overlooked.

A loss in representation or loss to follow-up can also lower risk estimates for primary cancers at other anatomical sites, such as the pancreas. At least one large study (3) should be commended for including documentation that the people who were excluded or lost to follow-up had more than twice the incidence of cancer as people who were included in the analysis. Some studies report relative risks for cancers at various sites that are well below 1.0, implying that an inherited mutation actually protects against cancers in some organs. Other studies more clearly select for survival or for people who do not get cancer, such as by only studying families that have data from three generations available.

BRCA1 and BRCA2 mutations are widely reported at comparatively high frequency in Ashkenazi Jews. Incorporating random sampling in surveys of cancer incidence in Ashkenazi Jews is especially difficult because the Holocaust left few survivors. Entire family trees or branches were lost. In such cases, nonprobability or availability sampling is the best that can be done. But then the limitations should be clearly discussed.

Ideally, the sample includes carriers of a pathogenic mutation in a particular gene selected at random from carriers who have all been identified or at least estimated in some defined population. In practice, the sample must satisfy additional nonrandom study inclusion criteria that may include being healthy enough or surviving long enough for adequate follow-up; having a striking family history of cancers; voluntarily sharing an accurate knowledge of family cancers with an interviewer; having access to genetic testing, specialized clinics, and high-quality treatment; and not being denied this access because they are too sick, too poor, uninsured, or a minority.

Large random samples are almost always close to reality and have low variability in subsequent trials. It is essential that there be some effort to ensure that random sampling is a basic building block in study design so that cancer risk estimates come from an unbiased sample of some population of mutation carriers.

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References

Notes
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