- "Are you in favor of creating a government-funded 'Citizen Volunteer Corps' that would pay young people to do work now being done by churches and charities, earning Corps Members the same pay and benefits given to military veterans?"

The questions above are worded in a way that is intended to bias the response by encouraging a negative response.

Volunteer Bias People who volunteer to participate constitute a voluntary response sample, and they typically have different characteristics when compared to participants who are selected by those conducting the survey. Volunteers typically have more interest in the topic being studied and are typically not representative of the population. Volunteer bias can be easily exploited to generate data that support a desired position.

The effects of volunteer bias have been extensively studied using the topic of human sexuality. "Volunteer Bias in Sexuality Research," by D. S. Strassberg et al., Department of Psychology, University of Utah, found that compared to nonvolunteers, volunteers reported a more positive attitude toward sexuality, less sexual guilt, and more sexual experience.

II. Analysis

Research study findings are often distorted by improper analysis. Even though the sample data may be inconclusive, insufficient, or supportive of an undesirable outcome, many researchers have succumbed to pressures and temptation to report significant or "conclusive" results through negligent and unethical analysis.

Falsified Data Several surveys have attempted to determine the incidence of data falsification or fabrication among scientists. "How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data," by D. Fanelli, *PLoS ONE,* Vol. 4, No. 5, found that nearly 2% of scientists admitted to have fabricated, falsified, or modified data or results at least once. This is likely to be a conservative estimate, given the sensitivity of the topic and potential for sampling bias.

One notable example of data falsification is found in the original study suggesting a link between childhood vaccines and autism. Andrew Wakefield published a 1998 study claiming that the families of eight out of twelve children attending a routine hospital clinic had blamed the MMR vaccine for their autism and problems that appeared just two days after receiving the vaccine. This study was the catalyst for an international antivaccine movement. Following this study, United Kingdom inoculation rates fell from 92% to less than 80%, and in 2009 there were 1348 confirmed cases of measles in England and Wales, compared to just 56 such cases in 1998.

In 2010, the *British Medical Journal* provided evidence that Wakefield's study relied on falsified data. *The Lancet*, which published the original study in 1998, retracted the study. Wakefield's medical license was revoked. While some autism activists still defend his actions, the scientific community has condemned his research as unethical.

Inappropriate Statistical Methods The inappropriate use of statistical methods may lead to incorrect findings and distorted results even if the data are sound. Whether unintentional or intentional, studies on this topic have shown that errors in statistical analysis are widespread.

"Statistical Errors in Manuscripts Submitted to *Biochemia Medica* Journal," by Šimundić et al., *Biochemia Medica*, Volume 19, Number 2, examined 55 manuscripts that were submitted for publication and found that 48 (87%) contained at least one statistical error; 34 (62%) had an incorrect choice of the statistical test; 22% had incorrect interpretation of a *P*-value; and 75% included incorrect use of a statistical test for comparing three or more groups. Peer review is a primary defense against the use