

## Case study

### Data quality in citizen science

SOURCE: Resnik, D. B., Elliott, K. C., & Miller, A. K. (2015). A framework for addressing ethical issues in citizen science. *Environmental Science & Policy*, 54, 475-481.

(The original study: Macey, G. P., Breech, R., Chernaik, M., Cox, C., Larson, D., Thomas, D., & Carpenter, D. O. (2014). Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. *Environmental Health*, 13(1), 1-18.)

"A study of the air quality near oil and gas hydraulic fracturing sites in Arkansas, Colorado, Pennsylvania, and Wyoming published in 2014 used community-based citizen scientists to obtain air samples. Most of the sites were chosen because members of the community had experienced symptoms, such as headaches, dizziness, or respiratory irritation when breathing air at those sites. Community volunteers received extensive training on procedures for taking and storing air samples and keeping research records, including quality assurance (QA) and quality control (QC) methods. Samples that did not meet QA/QC criteria were excluded from the final dataset. The study found that atmospheric concentrations of eight volatile organic compounds (VOCs), including benzene, formaldehyde, and hydrogen sulphide, exceeded federal guidelines.

The journal requires authors and reviewers to disclose competing interests, but it does not define competing in interests. The authors of the study disclosed that they had no competing financial interests; however, four of the authors disclosed that they receive funding from non-profit organizations whose mission is to reduce exposures to toxic chemicals. The authors also acknowledged that over a dozen non-profit environmental groups known to be opposed to hydraulic fracturing had made contributions to their research. Some industry-sponsored studies have reached the opposite conclusion concerning the impact of hydraulic fracturing on air quality.

Citizens and environmental groups opposed to the use of hydraulic fracturing ("fracking") to extract natural gas from the ground have collected water quality data for the Shale Network, a project funded by the National Science Foundation (NSF) to provide information on the impact of shale gas exploration on water sources. Although the NSF did not fund the project with an explicit political goal in mind, some citizens regard their involvement in data collection as an opportunity to help gather evidence on the harmful effects of fracking."

### Questions for discussion:

1. It is widely believed that when researchers publish the results of their research, they should disclose their financial conflicts of interests. However, this case suggests that this might be a too narrow way how a conflict of interests should be understood in contemporary research and in the context of citizen science. If so, what other possible conflict of interests should be disclosed?
2. Do potential conflicts of interest in citizen science differ from potential conflicts of interest in science in general? If yes, what is the difference?
3. What factors might threaten the data quality in citizen science? Develop a list of recommendations that the researchers should implement in this case and in citizen science / open science in general to ensure data quality (use the table below for this task)!

Challenges for ensuring data quality (in this case and in open sciences in general)	Recommendations



Training Materials for Responsible Open Science


