Michael Giffin

# Hard, Soft, and Problematic Science

A "replication crisis" was discovered in the early 2010s, when a large proportion of studies published in peer-reviewed science journals were found impossible to replicate. The inability to replicate findings was thought to undermine their credibility, which led to calls for closer scrutiny of the methods used to obtain them, more scrutiny of their statistical power, and the possibility of selective reporting and publication bias.

This was thought to be important, because the scientific method is often said to rest on the twin pillars of Replication and Falsifiability. Replication ensures findings are reliable and reproducible, which builds confidence in them. Falsifiability ensures the findings are testable, capable of being proven wrong. Failure to replicate by empirical observation or experiment undermines the findings and—by inference—the theory/ontology on which the findings are based.

It all depends—however—on the scientific method used. In the hard sciences like chemistry and physics, the focus is on studying phenomena *objectively* by controlled experiments, precise modelling, and high replicability. In the soft sciences like sociology and psychology, the focus is on studying human behaviour and social systems *subjectively*, using qualitative data—surveys of attitudes—which makes findings variable because attitudes reflect cultural biases and ideological prejudices.

The distinction between hard and soft in the sciences has become increasingly opaque with the cultural/ideological rejection of objective truth and biological reality. When the Anglosphere elevated constructivism above positivism, it placed a paradigm of objective reality discoverable through empirical observation (quantitative research) below a paradigm where reality is subjective, created by individual interpretation and experience (qualitative research). Positivists seek to predict and generalise; constructivists seek to know context and meaning.

While the two methods are complementary—qualitative findings can strengthen quantitative findings; for example, as part of a larger mixed-method study—stand-alone qualitative research is hard to do well, as measuring attitudes scientifically is difficult. Whether quantitative or qualitative, however, the structure of a peer-reviewed scientific article is the same. There are sections for Background, Methods, Results, Discussion (including Limitations), and Conclusion, as well as established conventions for what each section should contain.

Reviewers of submissions to health journals are noticing an increasing number of qualitative studies which seek to present themselves as quantitative. This problem—if it is a problem—is an artefact of how the definition of science has changed. Many researchers in the soft sciences—with their cultural biases and ideological prejudices—are using their recently acquired institutional power, seeking to present soft science as hard. If a soft-science psychologist believes human gender is fluid—a man can become (or believe he is) a woman and vice-versa—a hard-science pharmacist knows men and women are biologically different, so sex-specific medication should not be dispensed to both. That there is conflict over this distinction between hard and soft in the sciences—whether the distinction is rational or irrational, ethical or unethical—is symptomatic of our cultural moment.

The Background section is where the survey rationale is stated and its theory/ontology—the concepts and categories framing it, their properties, and the relations between them—is given. In quantitative surveys this is open and objective. Numerical data are collected from a sufficiently large sample to enable statistical analysis and identify trends, patterns, and relationships. In such surveys, structured or closed questions are asked, with multiple-choice answers or rating/Likert scales, to create objective, measurable, and generalisable insights.

In qualitative surveys, however, open-ended questions are asked to collect data on experiences,

opinions, feelings, and motives. The Background section of a qualitative survey report must describe how its theory/ontology is scientific, its subjectivity is whole and complete in its soft-science way. The above example of gender fluidity—whether a man can become (or believe he is) a woman and vice-versa—is a good example, because the soft sciences operate in research settings where the subjectivist paradigm of constructivism has become hegemonic and often self-serving. In these settings, replication and falsifiability are less important, because the truth of the theory/ontology—for example, that biological sex is fluid and a man/woman can redefine what being a man/woman is—is self-evident, taken for granted (and does not require a hard-science explanation).

In qualitative survey articles, the Background section often has an all-purpose quality about it, as if written by a publications officer whose job it is to place as many articles in peer-reviewed journals as they can on behalf of their soft-science setting. The tendency here is not to relate the concepts and categories of the theory/ontology—their properties and the relations between them—to a survey, specifically, but simply to create a generic context for the survey report. Because the theory/ontology of gender fluidity has become hegemonic in the soft sciences—where it is now a business model—authors do not feel the need to justify it scientifically.

The Methods section is where authors explain what they did, how they did it, and why. If the peer reviewer finds this section inadequate, the survey method is either flawed or just poorly described. This applies to quantitative and qualitative surveys alike. In the former, a Randomised Control Trial is the gold standard, with its convention of a CONSORT flow chart to describe the progress of the randomised and control groups through the trial (enrolment, intervention allocation, follow-up, data analysis). In the latter, while a qualitative survey may not need to be as replicable and falsifiable as a quantitative one, the authors must still explain what they did, how they did it, and why.

Here there are many failures. Most serious is the failure to fully describe the sampling procedure—how the sample was obtained, what it represents, how it is representative. This can happen through naivety, or from not wanting to draw attention to the cultural/ideological biases of a soft science. Again, the example of gender fluidity is useful here, because there are now qualitative researchers trying to obtain survey samples of LGBT+ people. This is difficult because—scientifically—there is no such thing as an LGBT+ person or a community of such persons. The initialism was invented for ideological purposes which seek to be scientific but are not.

Having obtained their sample—occasionally but not often representative—qualitative researchers can go in one of two directions: they can attempt to appear as quantitative as they can, or they can conduct a qualitative survey properly. Both choices are hard to do well. Those who want to appear quantitative administer a range of short, validated tools with rating scales, and model the results, on the novel presumption that modelling magically creates meaning. Those who want to conduct a qualitative survey properly will take an inductive approach which develops theories/ontologies from the data collected rather than testing pre-existing hypotheses that are often ideological rather than scientific.

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In popular culture, calling something "scientific" is a way of investing it with an authority it would not otherwise have. This is why objective truth and the scientific method matter. But if hard science has proven inflexible, in some ways, soft science operates with a range of assumptions which are also inflexible. Here the divide over gender fluidity continues to be relevant, for the soft sciences flourished throughout the twentieth century, obtaining vast amounts of institutional power on the strength of their "scientific" claims. Freudianism is a good example, as a failed attempt to bridge the gap between mind philosophy and brain science, with terrible consequences like Repressed Memory Syndrome. Freud ultimately failed because what was scientific to him is now deemed unscientific (mythopoeic).

In the twenty-first century, anything can be rendered "scientific", depending on the definition of science used in the rendering. This is why the "replication crisis" matters, and why submissions to "scientific" journals must be crystal clear about what they did, how they did it, and why.

*Michael Giffin is a retired Anglican priest in the Diocese of Sydney and a retired managing editor in NSW Health. He continues to review submissions for clinical journals and has conducted workshops in scientific writing for population health professionals.*