

A response to: “Causal analysis of existing databases: no power calculations required.
Responses to Campbell, Morris and Mansournia, et al”

Hernán writes: Campbell et al. were not swayed by my arguments against statistical power as a criterion to decide which causal analyses are worth pursuing with existing databases [1]. Their letter repeatedly refers to power, as in “a study [...] would have a statistical power of 37%”. Because “a power of 37%” is shorthand for “a power of 37% to detect a non-null effect”, Campbell et al. effectively disagree with a key point of my commentary: the primary goal of causal analyses is not to *detect* a non-null causal effect but to *quantify* it as unbiasedly and precisely as possible. Not surprisingly, Campbell et al. prefer talking about underpowered studies rather than about studies with imprecise estimates.

The primary goal of a causal analyses will no doubt depend on the specific context and research question. However, we do agree that a reasonable goal in many situations is to quantify the causal effect “as unbiasedly and precisely as possible”. We consider “underpowered studies” and “studies with imprecise estimates” and “small sample size studies” to be quasi-synonymous terms (at least pragmatically).

Hernán: It is tempting to argue that this fundamental disagreement about the goals of scientific research underlies Campbell et al.’s reaction to my proposal. However, this disagreement doesn’t fully explain how their rejection of my proposal fits with their concern (which I share) about small studies being “a cause of distrust in science because their results are selectively reported.” My proposal—publishing all effect estimates regardless of sample size—is precisely a way to fight selective reporting by ensuring that all evidence becomes accessible.

*We fully support the proposal to **publish** “all effect estimates regardless of sample size.” Where we might disagree is with the proposal to **pursue** “all studies regardless of sample size.” If one can guarantee that a proposed small sample study will be published regardless of the outcome obtained, pursuing the study might be justifiable. Our concern is that frequently (and often, despite a researcher’s best intentions), small observational studies are selectively published. The second bullet-point in our list of a “few things to consider when deciding whether or not to conduct underpowered observational research” notes that researchers who wish to conduct an underpowered study should make a “commitment to publish, or at the very least make public, the results of the (pre-specified) analyses regardless of the outcome obtained.”*

Hernán: Campbell et al. also say that the hypothetical example used in my commentary is too simplistic. I agree: I designed an admittedly extreme example to quickly convey a conceptual point while adhering to strict editorial constraints on word count. A less extreme example would have conveyed the same concept in a more nuanced way, but it would have required more journal space.

The “extreme” example does indeed succinctly convey the important point that when imprecise estimates are combined together in a meta-analysis, they can provide a more precise pooled effect estimate. In our letter, we thought it important to consider a less extreme example so as to provide a little nuance. Specifically, readers should appreciate the fact that the number of imprecise estimates needed in order to obtain a relatively precise pooled meta-analytic estimate can be quite large. There are both costs and benefits to pursuing underpowered studies. The trade-off may indeed tilt towards the benefits if the analysis question is sufficiently important; much like driving through a red-light onroute to the hospital might be advisable in a medical emergency, but is otherwise undesirable. In the latter situation, risks can be mitigated with a trained ambulance driver at the wheel and a wailing siren. When it comes to pursuing underpowered studies, there are also ways to minimize risks. For example, by committing to publish one’s results regardless of the outcome, by pre-specifying all of one’s analyses, and by making the data publicly available, one can minimize the study’s potential contribution to furthering distrust in science, a concern which we both share.