significant hurdle: only 54% and 61% of articles had data-manipulation code or estimation code, respectively, that did not require major modifications.

Our results align with previous findings in the literature[2]. A study of the articles published in the *Journal of Money, Credit and Banking* found that only 35.7% of articles met data-archive requirements, and only 20% of studies could be replicated using the information available in the archive[7]. Another study attempted to replicate 67 papers published in 13 well-regarded general-interest and macroeconomics journals, and could replicate only 29 (ref. 8). This problem goes beyond economics. In 2013, only 18 of 120 political-science journals had replication policies[9], and a 2016 study found that only 58% of the articles in top political-science journals publish their data and code[10].

However, some progress is being made. Notably, a few political-science journals verify that posted data and code produce the results in a publication. A handful of journals in statistics and information sciences have appointed 'reproducibility editors' to ensure that analyses can be replicated. The American Economic Association appointed a data editor last year to oversee reproducibility in its journals.

"Usually the code called for data or variables that had not been supplied."

CREDIBLE THREAT

We think that the way forward is for more journals to take on this kind of responsibility, using data editors to help implement the following replication policy.

Journals could oversee the replication exercise after conditional acceptance of a manuscript but before publication. Journals would then verify that all raw data used in the paper and code (that is, sample and variable construction, as well as estimation code) are included and executable. They would then commission academic experts, advanced graduate students or their own staff to verify that the code reproduces the tables and figures in the article. If not, editors could ask authors to correct their errors and, if necessary, have papers reviewed again.

In addition, for a random sample of papers, journals should attempt to reconstruct the code from scratch or search the executable code for errors. In this way, all papers would have some positive probability of being fully replicable.

This simple procedure has the winning combination of four desirable characteristics. First, it is unbiased: editors would have no incentive to overturn results. Second, it creates a credible expectation in authors that their work will be replicated, motivating them to be careful and to put effort into constructing their code and not report false results. Third, data and code would be easily available to outside researchers to explore the robustness of the original results using alternative specifications, measurements and methods of identification and estimation. Fourth, there is little cost associated with getting a research associate to perform replication exercises, especially because authors have strong incentives to cooperate with journals at the pre-publication stage. Although we are writing from our experience as economists, we think that similar practices could be adopted in other disciplines, particularly the social sciences.

Initially, these steps might slow down the time from acceptance to publication for some papers. However, authors will eventually internalize them and submit accurate, error-free materials so that the study replication will be done efficiently. This will help to restore confidence in the credibility of science. ■

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Supplementary information and funding details accompany this article online; see go.nature.com/2gejxbd.

CORRECTION

The Comment article 'Join the disruptors of health science' (*Nature* **551,** 23–26; 2017) should have disclosed that *Nature*'s Editor-in-chief, Philip Campbell, serves on an unpaid basis as a member of the science advisory board for the start-up firm Mindstrong Health.