

How Many Psychologists Use Questionable Research Practices? Estimating the Population  
Size of Current QRP Users

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## Abstract

Here is where the abstract text goes. We are currently collaborating on Google Sheets on the final text. But when it is finished, the abstract part of it will go in this very spot! In the abstract, we'll reference our estimates. We estimate up to 24.4% of American psychologists have recently used at least one questionable research practice. The in line r code works! woo! Donec et sodales nunc. Nunc cursus ultricies purus, sit amet varius ante vestibulum eget. Pellentesque ornare feugiat neque. Aliquam auctor diam tempor diam consectetur rhoncus. Morbi malesuada sodales mi, eu pellentesque velit finibus vitae. Vivamus iaculis sapien id ante accumsan auctor. In ultrices rhoncus massa. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Integer porttitor dui eget massa vehicula pulvinar. Pellentesque id venenatis elit. Praesent condimentum quis nibh eget pretium. Pellentesque interdum risus velit, pulvinar viverra lorem vulputate vel. Vivamus vel tincidunt lorem. Duis pellentesque lacus velit, fermentum laoreet orci condimentum sit amet. Nulla fermentum, erat non rhoncus tincidunt, turpis tellus efficitur ante, ac convallis orci elit ac risus. Aliquam eget ultrices ex, ut lobortis augue.

*Keywords:* Questionable Research Practices, QRPs, Social Networks

Word count: 2750

## How Many Psychologists Use Questionable Research Practices? Estimating the Population Size of Current QRP Users

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## METHOD

The work detailed in this manuscript was preregistered on May 15th, 2017. The preregistration can be found at DOI 10.17605/OSF.IO/XU25N and [www.osf.io/xu25n](http://www.osf.io/xu25n).

### Sample

The frame population was tenured or tenure-track psychologists associated with a PhD-granting institution in the United States. The population contained 7101 individuals as of June 2017. All 7101 members of this population were contacted via email and asked to participate. Of the 7101 email invitations sent, 214 emails bounced (3.01%). We collected 613 full responses (8.63% full response rate), and 296 partial responses. Only full responses are used in the following estimations. Additionally, 26 participant responses were removed for either being marked complete erroneously or due to breaking estimate-specific criteria. There was no compensation offered for participation, and participants had 7 days to complete the survey after starting. 299 (48.78%) participants identified as female, and 279 (45.51%) identified as male, and 19 (3.10%) choosing not to identify their gender. 131 (21.37%) participants identified as an Assistant Professor, 141 (23.00%) as Associate Professor, and 208 (33.93%) as Full Professor. 113 participants identified as tenure or tenure-track, but did not disclose their tenure level.

## Procedures

### Data Sources

Data was collected using three surveys (as opposed to the two proposed in the preregistration), designed and distributed using Qualtrics survey software (CITATION). Each survey asked questions designed to estimate the total social network size of the

participant, as well as demographic questions. Surveys 1 and 2 each contained questions appropriate for the UCT. Survey 3 contained our direct estimate measure and questions used to determine transmission of QRP-identity information within an individual’s social network.

All surveys included the definition of “Questionable Research Practices (QRPs)”. This definition included the list of behaviors previously defined in the literature as QRPs (see Table), but omitting “fabricating data” for reasons addressed earlier. The definition of QRP was made available on each relevant question with a mouse rollover that was first demonstrated with the initial definition.

Additionally, QRP use is temporally isolated to “in the past 12 months”. Although some have found instances of underreporting when using a 12 month recall (Connelly & Brown, 1995; Landen & Hendricks, 1995), this time frame is used frequently to measure current behavior in major national data collection surveys such as the National Health Interview Survey (NHIS) (United States Census Bureau, 2018) and the National Survey on Drug Use and Health (Ahrnsbrak, Bose, Hedden, Lipari, & Park-Lee, 2017).

As data was collected between September 2017 and December 2017, questions framed using “in the past 12 months” constrains actual QRP use between September 2016 and December 2017, a time frame of 15 months. Therefore, estimates of current QRP use are based on the number of psychologists who have used at least one QRP in this time frame.

## Measures

### Direct Estimate

For comparison to the generalized network scale-up (GNSUM) and unmatched count technique (UCT) estimates, we estimated the number of QRP users by direct estimation. This involved asking members of the target population whether they have used at least one QRP in the past 12 months, and is calculated as follows:

$$\rho = \frac{c}{n} \tag{1}$$

where  $\rho$  is the proportion estimate of people who have used at least one QRP in the past 12 months,  $c$  is the number of participants indicating they have used a QRP in the past 12 months, and  $n$  is the total number of participant responses.

### Unmatched Count Technique

The unmatched count technique is an indirect way of measuring the base rates of concealable and potentially stigmatized identities (Gervais & Najle, 2017; Wolter & Laier, 2014). In this estimate, two groups of participants are given a list of innocuous items that could apply to them (e.g., I own a dishwasher; I exercise regularly). The list of items for both groups is the same except for one additional item that one group receives and the other does not. This extra item asks about the concealable identity (e.g., I own a dishwasher; I exercise regularly; I smoke crack cocaine [examples from (Gervais & Najle, 2017)]). See Table~?? for the full list of items used. Participants are asked to count and report the number of items in the list that apply to them. At no point does a participant identify themselves with any particular list item, only the total number of applicable items. The proportion of participants that identify with the stigmatized identity is calculated as:

$$\rho = \frac{\sum x_y^s}{n^s} - \frac{\sum x_y^i}{n^i} \quad (2)$$

where  $\rho$  is the proportion estimate of people who have used at least one QRP in the past 12 months,  $x_y^s$  is the number of reported items for participant  $y$  in the stigma list group  $s$ ,  $n^s$  is the total number of participant responses in group  $s$ ,  $x_y^i$  is the number of reported items for participant  $y$  in the innocuous list group  $i$ , and  $n^i$  is the total number of participants in group  $i$ .

### Network Scale-Up and Generalized Network Scale-Up Methods

Network scale-up methods estimate population sizes using information about the personal networks (i.e., ego networks) of respondents, based on the assumption that personal

networks are, on average, representative of the population (M. J. Salganik et al., 2011). Participants were asked about how many people they “know” in the frame population. In this study, “know” was defined as: they know you by face or by name, you know them by face or by name, you could contact the person if you wanted to, and you’ve been in contact in the past two years (Bernard et al., 2010). Participants were then asked a series of questions to estimate the total size of their social network, and the number of people they know who have used at least one QRP in the past 12 months. Together, the network scale-up can be used to estimate the proportion of QRP users, and was calculated as follows:

$$\rho = \frac{\sum y_i}{\sum d_i} \quad (3)$$

where  $\rho$  is the proportion estimate of people who have used at least one QRP in the past 12 months,  $y_i$  is the number of people known in the target group  $y$  by participant  $i$ , and  $d_i$  is the estimated total number of people known  $d$  by participant  $i$  within the frame population.

Equation 3 makes two assumptions: that members of the general frame population know all identity information about all members of their ego networks, and that QRP users have the same size social networks as the general frame population. Since QRP use is concealable and potentially stigmatizing, these assumptions may not hold. For that reason, data was collected from self-identifying QRP users to estimate how QRP-use identity information transmits through ego networks (tau,  $\tau$ , also called the transmission rate). This data was collected using the game of contacts method (Salganik et al., 2012). A popularity ratio (delta,  $\delta$ ) was calculated by dividing the average network size of QRP users by the average network size of the general frame population.

Together,  $\tau$  and  $\delta$  adjust the network scale-up estimate in equation 3 into the generalized network scale-up as follows:

$$\rho = \frac{\sum y_i}{\sum d_i} * \frac{1}{\tau} * \frac{1}{\delta} \quad (4)$$

where  $\rho$  is the proportion estimate of people who have used at least one QRP in the past 12 months,  $\sum \frac{y_i}{d_i}$  is the network scale-up estimate (equation 3),  $\tau$  is the transmission rate, and  $\delta$  is the popularity ratio. All network scale-up results are calculated using Equation 4, incorporating  $\tau$  and  $\delta$ .

### Game of Contacts

To estimate the QRP identity transmission rate,  $\tau$ , we performed the game of contacts with participants who self-identified as using at least one QRP in the past 12 months. For a full description of the game of contacts, see Salganik et al. (2012). Briefly, this method has participants (called egos in network terminology) answer a set of questions about what they know about the QRP use of several others (called alters) in their social network, and what those alters know about the participant's QRP use. The questions are semi-graphical and responses are recorded on a digital 2x2 grid, representing the four possible ways information can flow through a given ego-alter relationship. The transmission rate is then calculated as:

$$\tau = \frac{\sum w_i}{\sum x_i} \quad (5)$$

where  $w_i$  is the number of alters that know the ego is a member of the target population, and  $x_i$  is the total number of alters generated by the ego. This produced a value between 0 and 1.

This study utilized a digital distribution of the game of contacts. This method is typically performed in a face-to-face interview setting with the participant (M. J. Salganik et al., 2012). Due to the distributed nature of our frame population, this was not feasible. Instead, participants were presented with the game of contacts via Qualtrics. These questions were pretested with several academics not within the frame population. A comparison between an in-person and digital game of contacts has been pre-registered by the authors (GET PREREG LINK) for future study.



## Results

The three estimates of recent QRP use in the frame population of American tenured or tenure-track faculty are summarized in Figure 1, and described in detail below.

### Direct Estimate

To ensure the highest number of participants in our game of contacts, half of the total population were asked to participate in Survey 3, which contained our direct estimate question. Thus, psychologists were solicited, and we received responses to Survey 3 able to be analyzed. Of the participants, indicated they had used at least one QRP in the past 12 months. Using Equation 1, we calculated QRP prevalence to be 18.18% (bootstrapped 95% confidence interval [13.96%, 22.40%]). This corresponds to an estimated 1291 American psychologists currently using QRPs.

It is possible this estimate is underestimating the true number of psychologists using QRPs. For one, social desirability may influence QRP users to conceal their identity when asked directly. In that case, our estimate is only generated by those participants willing to reveal their identity. Given the somewhat critical social environment for QRP users (Fiske, 2016), it is reasonable to believe some participants withheld their identity when we asked directly. The following indirect estimation methods sought to mitigate this social desirability bias.

### Unmatched Count Technique

The remaining psychologists contacted were asked to participate in our unmatched count estimate with randomized into the innocuous list condition, and randomized into the sensitive list condition.

The average number of list items corresponding to participants in the innocuous list condition was . The average number of list items corresponding to participants in the sensitive list condition was . Using Equation 2, we calculated QRP user prevalence to be

10.46% [-20.19%, 22.40%]. This corresponds to an estimated 743 American psychologists currently using QRPs.

It was unexpected that an UCT estimate lower than our direct estimate would be calculated. Typically, due to reducing response bias, UCT estimates tend to be larger than direct estimates when the behavior or identity in question is stigmatized (???; Gervais & Najle, 2017; Wolter & Laier, 2014). The fact that the bootstrapped confidence interval crosses zero indicates instability in the sensitive list being consistently larger than the control list. It is likely our relatively low number of participants in our UCT estimate () led this calculation to be overly sensitive to individual responses. This is not the first time the UCT has provided smaller estimates than a direct estimate (???), though given the high variability, we do not have confidence that this UCT estimate is a valid estimate of current QRP use.

### **Generalized Network Scale-Up Estimate**

All participants who were randomized into the UCT estimate were also asked to answer questions about their social networks, and to estimate how many researchers they know who have used at least one QRP in the past 12 months. Participants who were randomized into the direct estimate and who self-identified as a QRP user in that estimate were also asked to answer questions about their social network and to participate in the game of contacts method. Participants in the direct estimate who did not self-identify as a QRP user were asked questions about their social network as well, but were not asked how many researchers they know who have used at least one QRP in the past 12 months. Therefore, we collected social network responses from participants from the general frame population (to be used in estimating  $\delta$ ), responses from participants who self-identified as QRP users who also completed the game of contacts (to be used in estimating  $\tau$ ), and responses from participants who estimated the number of researchers they know who have used at least one QRP in the past 12 months.

These identified QRP users, and know a collective researchers. Given the total frame

population is 7101, we are fairly confident all members were identified at least once by our participants. Using the network scale-up in Equation 3, this generates an estimate of 1.42% [0.85%, 2.14%]. This estimate serves as the base starting point for Equation 4, the Generalized Network Scale-Up Estimator, detailed below.

Equation 4 relaxes the assumptions of equal network size and total information transmission by incorporating  $\tau$  and  $\delta$ . Using the responses from the general population, plus the responses from the participants who indicated using a QRP in the past 12 months, we estimate  $\delta$  as 0.97. Using the game of contacts, we estimate  $\tau$  as 0.06. Using Equation 4, we estimate QRP user prevalence to be 24.40% [10.93%, 58.74%]. This corresponds to an estimated 1733 American psychologists currently using QRPs.

To assess the accuracy of participants in estimating the size of this unknown group (QRP users), we asked questions about 24 populations of known size (number of researchers named David, named Janet, etc). The 24 names were gender balanced and represented common, uncommon, and rare names that exist within the census of the frame population. The size estimates of these populations of known size can be seen in Figure 2. These estimates seem reasonable and closely mirror the actual prevalence of these groups. The fact that the same estimator in the same group of participants can generate reasonable estimates for populations of known size is encouraging evidence of the accuracy of our estimate of the number of recent QRP users utilizing the generalized network scale-up estimate.

## DISCUSSION

To the best of our knowledge, this is the first report of the prevalence of QRPs in a proximal timespan. As such, it is difficult to draw conclusions about the magnitude of our estimates when compared to previous estimates. Compared to John, Loewenstein, and Prelec (2012) and Agnoli, Wicherts, Veldkamp, Albiero, and Cubelli (2017), we estimate lower rates of questionable research practices. Compared to Fiedler and Schwarz (2016), however, we estimate higher rates of these practices. Our definition of “questionable research

practices” were the same ones used in John et al. (2012) and Agnoli et al. (2017), but was restricted to a timespan of only 15 months, so it is reasonable that our estimates would be lower than those with an unrestricted time of QRP use. Since we used those same QRP definitions, is also reasonable that our estimates would be higher than those described by Fiedler and Schwarz (2016), who changed the definition of each QRP. We also measured true “prevalence”, that is, the commonality of a behavior within a designated time frame, which was a point of difference between John et al. (2012) and Fiedler and Schwarz (2016).

This is also the first report to use the network scale-up and generalized network-scale up estimators to investigate the ongoing reproducibility issues in psychology. Re-framing QRP prevalence away from the individual behavior and towards the user state brings our field-wide problems more into scope with existing literature on stigma and concealable identities. For example, much work has been done focusing on how increasing stigma inadvertently locks individuals into detrimental behaviors (Stuber2009), and how revealing a concealed identity can increase well-being by reducing the stress of being exposed (Chaudoir & Quinn, 2010). Framing QRP use in terms of the individual may help the field reduce QRP use by increasing awareness of the effects of stigma and support.

## Implications

These estimates serve as a baseline to measure the effectiveness of current initiatives, as well as a foundation for new ones. While much work is being done to grow support for interventions such as pre-registration (CITATION) and Registered Reports (CITATION), it is currently unknown what quantitative effect these are having on curbing behaviors associated with inflated Type I error such as QRPs. By performing follow-up estimates, the field can use these baseline estimates to measure the effectiveness of these programs and make informed decisions on their effectiveness.

## Limitations & Future Directions

Our unmatched count estimate produced a value with a confidence interval that crossed zero, meaning there was sufficient variance to destabilize the group difference we observed. As mentioned previously, the relatively low number of participants for the unmatched count estimate ( ) contributed to this high variability. Future work using the unmatched count technique would benefit from larger sample sizes (as demonstrated in Gervais and Najle (2017), which used 2000 participants).

These estimates were limited to American psychologists, though we know that these issues are not contained solely in the United States (Stapel CITATION). Future studies estimating the prevalence of QRPs in other countries will be an important next step. Some of this work has already started through the Horizon 2020 framework in the European Union (PRINTEGER CITATION), though more innovative work will be required to better understand the scope of the problems faced by our field.

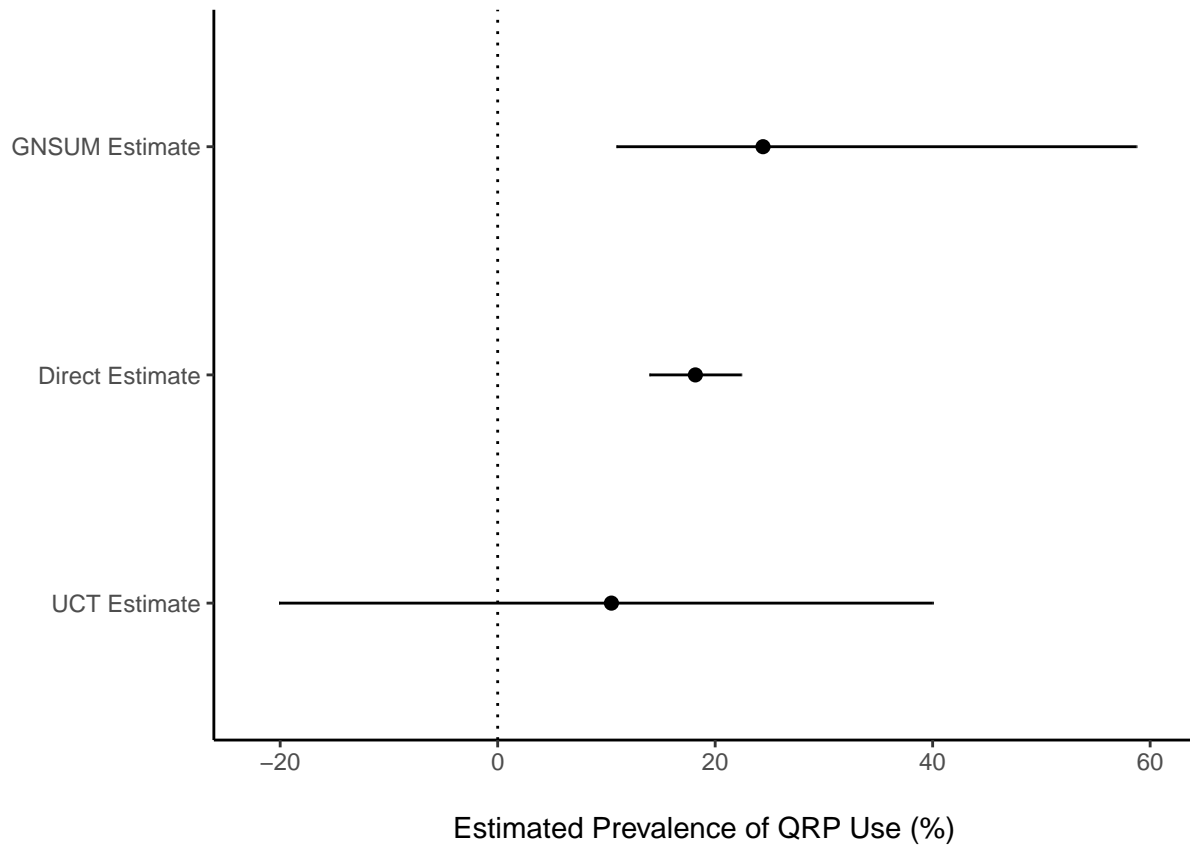
## Conclusion

By directly asking participants about their use of QRPs, we estimate 18.18% have used at least one QRP in the past 12 months, and the generalized network scale up estimate is 24.40%, which corresponds to between 1291 and 101 American psychologists. While some argue the narrative of the “replication crisis” is overblown (Fanelli, 2018), the current work illustrates how common these behaviors that inflate false-positive findings are. Although many have called for changes in statistical inference practices to mitigate false-positive findings [Lakens et al. (2018); Benjamin2017], it is important that we as a field continue to focus on disincentivizing the use of questionable research practices (and other behavioral degrees of freedom) among our peers and coworkers for the betterment of our science.

## References

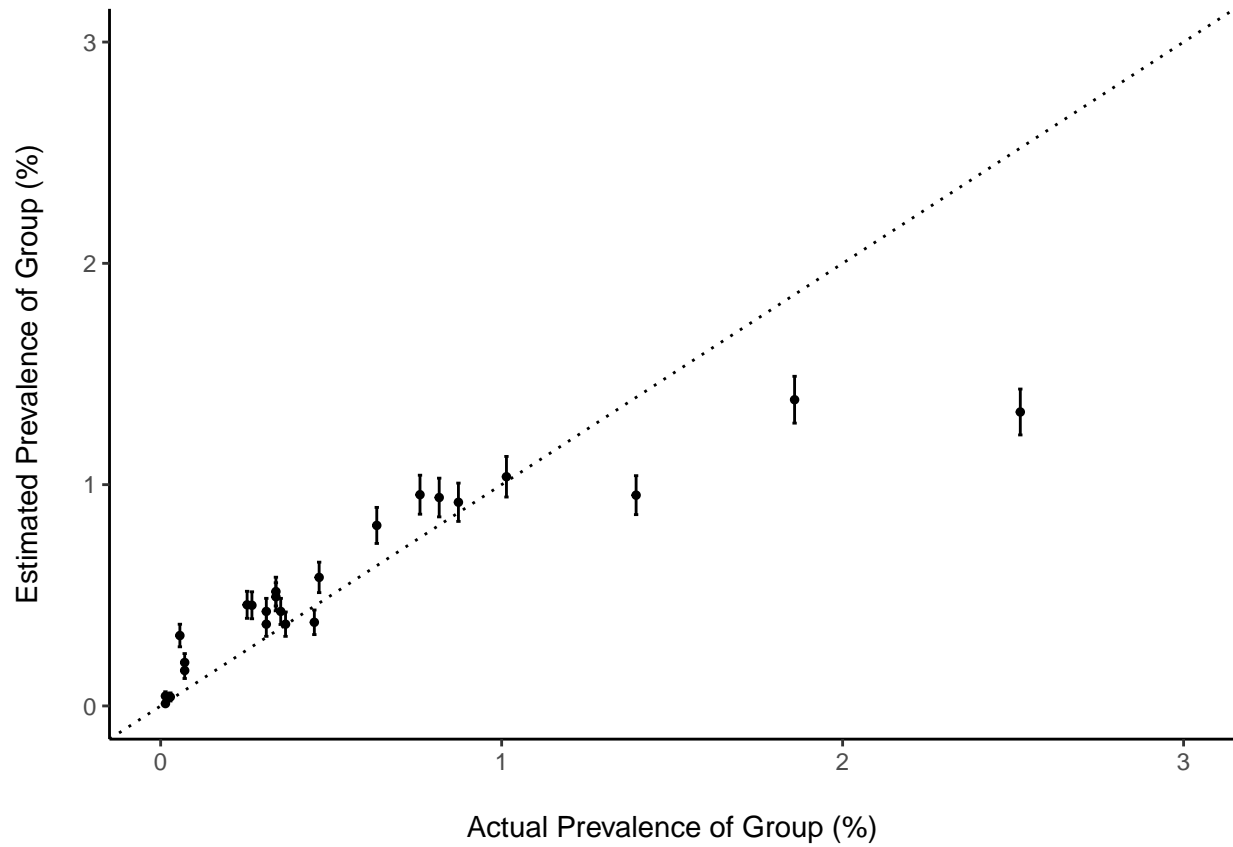
- Agnoli, F., Wicherts, J. M., Veldkamp, C. L. S., Albiero, P., & Cubelli, R. (2017). Questionable research practices among Italian research psychologists. *PLoS ONE*, *12*(3), 1–17. doi:[10.1371/journal.pone.0172792](https://doi.org/10.1371/journal.pone.0172792)
- Ahrnsbrak, R., Bose, J., Hedden, S., Lipari, R., & Park-Lee, E. (2017). Key Substance Use and Mental Health Indicators in the United States: Results from the 2016 National Survey on Drug Use and Health. *Substance Abuse and Mental Health Services Administration*, *7*(1), 877–726. doi:[10.1016/j.drugalcdep.2016.10.042](https://doi.org/10.1016/j.drugalcdep.2016.10.042)
- Bernard, H. R., Hallett, T., Iovita, A., Johnsen, E. C., Lyerla, R., McCarty, C., . . . Stroup, D. F. (2010). Counting hard-to-count populations: the network scale-up method for public health. *Sexually Transmitted Infections*, *86 Suppl 2*, ii11–5. doi:[10.1136/sti.2010.044446](https://doi.org/10.1136/sti.2010.044446)
- Chaudoir, S. R., & Quinn, D. M. (2010). Revealing Concealable Stigmatized Identities: The Impact of Disclosure Motivations and Positive First-Disclosure Experiences on Fear of Disclosure and Well-Being. *Journal of Social Issues*, *66*(3), 570–584. doi:[10.1111/j.1540-4560.2010.01663.x](https://doi.org/10.1111/j.1540-4560.2010.01663.x)
- Connelly, N. A., & Brown, T. L. (1995). Use of Angler Diaries to Examine Biases Associated with 12-Month Recall on Mail Questionnaires. *Transactions of the American Fisheries Society*, *124*(3), 413–422. doi:[10.1577/1548-8659\(1995\)124<0413:uoadte>2.3.co;2](https://doi.org/10.1577/1548-8659(1995)124<0413:uoadte>2.3.co;2)
- Fanelli, D. (2018). Is science really facing a reproducibility crisis, and do we need it to? *Proceedings of the National Academy of Sciences of the United States of America*, *in press*, 1–4. doi:[10.1073/pnas.1708272114](https://doi.org/10.1073/pnas.1708272114)
- Fiedler, K., & Schwarz, N. (2016). Questionable Research Practices Revisited. *Social Psychological and Personality Science*, *7*(1), 45–52. doi:[10.1177/1948550615612150](https://doi.org/10.1177/1948550615612150)
- Fiske, S. T. (2016). Mob Rule or Wisdom of Crowds. *APS Observer*.
- Gervais, W. M., & Najle, M. B. (2017). How many atheists are there? *Social Psychological*

- and Personality Science*, 1948550617707015.
- John, L. K., Loewenstein, G., & Prelec, D. (2012). Measuring the Prevalence of Questionable Research Practices With Incentives for Truth Telling. *Psychological Science*, 23(5), 524–532. doi:[10.1177/0956797611430953](https://doi.org/10.1177/0956797611430953)
- Lakens, D., Adolphi, F. G., Albers, C. J., Anvari, F., J Apps, M. A., Argamon, S. E., . . . Lino de Oliveira, C. (2018). Justify Your Alpha: A Response to “Redefine Statistical Significance”. *Nature Human Behavior*, 2, 168–171.
- Landen, D. D., & Hendricks, S. (1995). Effect of recall on reporting of at-work injuries. *Public Health Reports (Washington, D.C. : 1974)*, 110(3), 350–4. doi:[10.1016/s0022-4375\(97\)90342-x](https://doi.org/10.1016/s0022-4375(97)90342-x)
- Salganik, M. J., Fazito, D., Bertoni, N., Abdo, A. H., Mello, M. B., & Bastos, F. I. (2011). Assessing network scale-up estimates for groups most at risk of HIV/AIDS: Evidence from a multiple-method study of heavy drug users in Curitiba, Brazil. *American Journal of Epidemiology*, 174(10), 1190–1196. doi:[10.1093/aje/kwr246](https://doi.org/10.1093/aje/kwr246)
- Salganik, M. J., Mello, M. B., Abdo, A. H., Bertoni, N., Fazito, D., & Bastos, F. I. (2012). The Game of Contacts: Estimating the Social Visibility of Groups. *Networks*, 33(1), 70–78. doi:[10.1016/j.socnet.2010.10.006](https://doi.org/10.1016/j.socnet.2010.10.006)
- Salganik, M. J., Mello, M., Abdo, A., Bertoni, N., Fazito, D., & Bastos, F. (2012). The Game of Contacts: Estimating the Social Visibility of Groups, 100(2), 130–134. doi:[10.1016/j.pestbp.2011.02.012](https://doi.org/10.1016/j.pestbp.2011.02.012)
- United States Census Bureau. (2018). *National health Interview Survey: CAPI Manual for NHIS Field Representative* (No. January). Retrieved from [ftp://ftp.cdc.gov/pub/health/\\_statistics/nchs/Survey/\\_Questionnaires/NHIS/2006/frmanual.p](ftp://ftp.cdc.gov/pub/health/_statistics/nchs/Survey/_Questionnaires/NHIS/2006/frmanual.p)
- Wolter, F., & Laier, B. (2014). The Effectiveness of the Item Count Technique in Eliciting Valid Answers to Sensitive Questions. An Evaluation in the Context of Self-Reported Delinquency. *Survey Research Methods*, 8(3), 153–168.



*Figure 1.* Estimates of the current prevalence of users of questionable research practices using three different estimators; the Generalized Network Scale-Up Method (GNSUM), the Direct Estimate, and the Unmatched Count Technique (UCT). Point estimates with 95% bootstrapped confidence intervals.





*Figure 2.* Validation of Network Scale-Up Estimates using 24 groups of known size. Each point represents one group, with 95% confidence intervals. Dotted line represents when estimated group size equals actual group size.