

The Dangers of Small Samples and Insufficient Methodological Detail

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This brief commentary is to speak concerns about the presentation of data in figure 1 in the editorial written by Collins and colleagues¹ titled “The Role of Disability Benefits as an Environmental Factor Contributing to Negative Symptoms”. These data were secondary analyses from two previously published studies (the previous publications did not focus on the role of disability), each of which contained very small sample sizes (Ns of 6 and 22 in the data taken from Luther et al²; Ns of 12 and 14 in the data take from Strauss et al³) and which were non-randomized designs, one of which was cross-sectional. One might wonder about the importance of raising concerns about these small sample analyses from this editorial, as it could be argued that there is little harm in presenting small sample non-peer reviewed data when such data could be seen as consistent with the larger literature. However, there are multiple reasons as to why it is critical not to present such data in a published forum that implies that such data are on par with typical empirical reports that go through the normal peer review process. First, these data were not presented with sufficient methodological detail to allow any evaluation of the scientific rigor of the methods or the justifiability of any conclusions. This includes concerns about potential baseline differences in who does or does not receive disability benefits and how that might be influencing group differences, something that cannot be judged from the material presented. Second, these data were not peer reviewed and thus have not gone through the process our field expects before empirical data are added to the body of work that can be cited by others. Third, the sample sizes are too small to allow conclusions. The field now knows far too well the dangers of small sample size studies, both in terms of their low likelihood of replication and high likelihood of overestimation of effect sizes.^{4,5} Even if the existing literature were clear and consistent, and the presented small sample data were generally consistent with that literature, it is still dangerous to present data that

does not confer strong independent evidence and interpretability. In this case, the danger is augmented, as the existing literature is by no means clear on the complex issue of the relationship between disability benefits and outcomes and symptoms among individuals with serious mental illness. As such, one could also argue that the title of the commentary, which could be read as implying that the literature is fully consistent on the point of whether disability benefits *contribute* to negative symptoms, is overly assertive and would benefit from revision or addition, such as: “*Mixed findings and complex issues*”. All of the points made above about the sample size and the need to present sufficient methodological detail for evaluation are true regardless of the topic of the work. However, when the topic is one that has potentially major implications for welfare of a vulnerable population, we must use an even higher level of caution in what we put into the citable literature, as this literature, including editorials, is available to influence the positions of policy makers who may themselves not be fully aware of the challenges and caveats in interpreting small sample size studies. In short, I would argue, given the topic area, that the field truly needs the most rigorous designs, capable of drawing strong inferences in a nuanced manner that aids interpretation for both the academic community and importantly the lay public. The authors of the commentary make many useful and important points about this existing literature and raise many of the key issues with the current literature in terms of the challenges of interpreting findings from the various studies. All of these important points can be made without recourse to the data presented in figure 1 and the discussion (which does not depend on the data and should not use the small sample non-peer reviewed data for support) is hugely important to the field and should be rich fodder for theoretical and empirical development and provides important guidance for future rigorous work on this topic.

References

1. Collins DE, Luther L, Raugh IM, Condray R, Allen DN, Strauss GP. The role of disability benefits as an environmental factor contributing to negative symptoms. *Schizophr Bull.* 2022. This issue.
2. Luther L, Fischer MW, Johnson-Kwochka AV, *et al.* Mobile enhancement of motivation in schizophrenia: a pilot randomized controlled trial of a personalized text message intervention for motivation deficits. *J Consult Clin Psychol.* 2020;88(10):923–936.
3. Strauss GP, Macdonald KI, Ruiz I, Raugh IM, Bartolomeo LA, James SH. The impact of the COVID-19 pandemic on negative symptoms in individuals at clinical high-risk for psychosis and outpatients with chronic schizophrenia. *Eur Arch Psychiatry Clin Neurosci.* 2022;272(1):17–27.
4. Button KS, Ioannidis JP, Mokrysz C, *et al.* Power failure: why small sample size undermines the reliability of neuroscience. *Nat Rev Neurosci.* 2013;14(5):365–376.
5. Szucs D, Ioannidis JP. Empirical assessment of published effect sizes and power in the recent cognitive neuroscience and psychology literature. *PLoS Biol.* 2017;15(3):e2000797.