

Correspondence

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Reply to: 'To the editor: how statistics killed the cat' – E. F. Torrey, R. H Yolken

Torrey and Yolken raise two concerns about our study (Solmi *et al.* 2017). The first relates to the use of psychotic experiences, as opposed to diagnosed schizophrenia, as the outcome for our analyses. They suggested that this approach could be over-inclusive and result in a dilution of the association between the exposure and the outcome. We agree with Torrey and Yolken that psychotic experiences and schizophrenia are different outcomes and we acknowledged this issue in our study as a potential limitation. Adolescents who report psychotic experiences are, nevertheless, at increased risk of developing psychosis and other psychopathology later in life (Fisher *et al.* 2013). In this cohort, they have also been shown to share a number of features and risk factors that are typically observed in individuals with schizophrenia [e.g. lower IQ (Horwood *et al.* 2008); impaired social cognition (Sullivan *et al.* 2017); higher residential mobility (Singh *et al.* 2014) and neighbourhood deprivation (Solmi *et al.* *in press*)]. We therefore hypothesised that, if a link between cat ownership and schizophrenia existed, we would have found this association with broadly-defined phenotypical presentations of psychosis, as we do with these other risk factors.

The second concern related to our choice of confounders. Torrey and Yolken argue that the statistically significant association which we reported between cat ownership in childhood and psychotic experiences at age 13 years in univariable analyses was artificially removed by inappropriate adjustment for variables (i.e. indicators of socioeconomic status) which lie on the causal pathway between our exposure (cat ownership) and our outcome (psychotic experiences). Adjustment for confounding is necessary to take account of alternative potential explanations for an observed association. We do not believe socioeconomic status lies on the causal pathway between cat ownership and psychotic experiences, since that would imply that owning a cat leads to lower socioeconomic status, which, in turn, causes psychotic experiences. Different socioeconomic backgrounds might, however, be associated with different patterns of cat ownership, and are also known to be associated with psychosis [with higher rates of the latter in more deprived settings (Morgan *et al.* 2008)], thus providing theoretical support for our use of socioeconomic status as a confounder (our full causal

model is presented in online Supplementary Figs S1 and S2). Torrey and Yolken's proposal that low socioeconomic status might lead to increased exposure to *Toxoplasma gondii* in faeces compared with those of higher socioeconomic status implies effect modification. We thank Torrey and Yolken for their interest in our paper, and hope that our reply clarifies these issues.

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F. SOLMI*, J. F. HAYES, G. LEWIS AND J. B. KIRKBRIDE
Division of Psychiatry, University College London, London, UK

*Address for correspondence: F. Solmi, Ph.D., Division of Psychiatry, University College London, 6th Floor, Wing B, Maple House, 149 Tottenham Court Road, London W1T 7NF, UK.
(Email: francesca.solmi@ucl.ac.uk)