

## Correspondence

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### Letter to the Editor

#### Smoking and mental health in young women – challenges in interpretation

In their recently published study, Leung *et al.* (2012) reported a bi-directional association between smoking status and mental health in a sample of young women. We congratulate the authors for highlighting the importance of tobacco use and mental health in young women. This paper is one of the few to investigate the bi-directionality of smoking and mental health specifically in this population. However, we have some concerns on the generalizability, interpretation and presentation of the study findings.

First, from the initial baseline sample of 14 247 participants, only 2191 (15%) remained by wave 5. This low rate of follow-up was partly due to the fact that the study excluded ever-pregnant participants as a way to adjust for the confounding effect of pregnancy (up to 73% of the study sample at wave 5). However, this exclusion may have impeded on the generalizability of findings, as focusing on never-pregnant responders may not be representative of young women. Methods other than exclusion exist to adjust for confounding, such as including pregnancy status as a time-varying variable in the model. The authors might have also conducted sensitivity analyses to check the robustness of findings despite this exclusion criterion. Women without information on smoking or mental health status were also excluded, but no information was available on these excluded cases, making it difficult to assess the potential for bias.

Second, we found some difficulties in interpreting results. The study defined smoking status as an ordinal variable, but treated smoking as an interval variable in correlation analyses and structural equation modelling. This approach makes a strong assumption that the differences between smoking statuses are equal. For example, it assumes that the difference between never-smoking and former-smoking is the same as the difference between moderate smoking and heavy smoking. This assumption may be hard to defend in this context and the interpretation of the longitudinal reciprocal effects in the structural equation model is not clear. A categorical ordinal definition of smoker types would have been warranted. The paper also attempts to estimate the impact of prior

mental health problems (exposure) on the risk of being a former smoker (outcome). The temporality of this relationship is challenging to untangle, as the time of smoking cessation could have occurred before or after the mental health problem.

Third, we were surprised that some of the odds ratios reported in Table 2 reached a value above 10. Given the confidence intervals, we suspect these may be misprints, and encourage the journal to correct these misprints.

### Declaration of Interest

None.

### References

Leung J, Gartner C, Hall W, Lucke J, Dobson A (2012).

A longitudinal study of the bi-directional relationship between tobacco smoking and psychological distress in a community sample of young Australian women.

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#### Smoking and mental health in young women – challenges in interpretation: a reply

We welcome the opportunity to discuss the concerns raised by Gariépy *et al.* (2012) on the interpretation of our data on the relationships between smoking and mental health in young women. Gariépy *et al.* suggest that by excluding women who have ever been pregnant in our analysis, we limited the generalizability of our findings. The results were much the same when we re-ran the analyses on the full sample of women. It was still the case that young women who smoked at earlier waves had significantly higher odds of poor

mental health at later waves (see Appendix 1), and young women with poor mental health at previous waves had significantly higher odds of smoking at later waves (see Appendix 2). As in our previous analyses, the strength of the association increased with the number of cigarettes smoked per day (CPD).

Second, Gariépy *et al.* argued that it was difficult to assess the potential for bias in our study because we did not provide data on the women with missing data on smoking or mental health status. Only a very small number of women had this missing data (Leung *et al.* 2012, Fig. 1) and their exclusion is unlikely to have had a substantial impact on our results. These excluded women were more likely to have lower education, to have been born in a non-English-speaking country, and to have more difficulties managing their income (Young *et al.* 2006). These variables have previously been shown to be associated with both smoking and poor mental health. In addition, the women with missing data were more likely to be smokers and have poor mental health. Therefore, as we argued in our discussion, any missing data are more likely to have biased our findings in the direction of underestimating the strength of the association between smoking and poor mental health.

Third, Gariépy *et al.* questioned our treatment of an ordinal measure of smoking as an interval variable in the structural equation models. They suggested that a categorical ordinal definition of smoker types would have been better. We can confirm that smoker type was analysed as an ordinal categorical variable in our structural equation models. Using Amos 17.0 software, we coded the smoking status variables as an ordered-categorical variable and fitted the model using Bayesian estimation. In addition, we presented the results from the generalized estimated equation models to show that the relationship between smoking and poor mental health increased with increasing level of smoking. When all paths were entered simultaneously in a single model, smoking was associated

with poor mental health, and poor mental health was associated with smoking.

Fourth, Gariépy *et al.* also commented on the challenges in untangling the temporal order of the relationship between prior mental health problems and the risk of being a former smoker. We concur with the comment that this is a limitation of our data. We have attempted to address this issue in model 4 in each of Tables 2 and 3. The findings support our interpretation that the association is bi-directional.

Last, Gariépy *et al.* correctly identified several misprints in Table 2, where some odds ratios appeared incorrectly and the reference value was 10.00 instead of 1.00. It appears that in the first eight rows, '1.\*\*' has been misprinted as '10.\*\*'. For example, the odds ratio for poor mental health (according to the Mental Health Index from the SF-36) for ex-smokers should be 1.21 (not 10.21). None of the odds ratios presented in Table 2 should be over 10.00. Please see Appendix 3 for the corrected values.

**Appendix 1.** Longitudinal analysis of smoking status predicting subsequent mental health status using generalized estimated equation analysis for all young women participating in the Australian Longitudinal Study on Women’s Health with and without any experience of pregnancy

Smoking status (predictor) at waves 1, 2, 3, 4 (never as reference)	Poor mental health (outcome) at waves 2, 3, 4, 5 (good as reference)	
	OR	95% CI
Never	1.00	
Ex-smoker	1.19	1.09–1.30
Smoke <10 CPD	1.25	1.13–1.39
Smoke 10–19 CPD	1.54	1.37–1.73
Smoke ≥20 CPD	1.97	1.70–2.27

OR, Odds ratio; CI, confidence interval; CPD, cigarettes per day.

Mental health status was measured by the SF-36 Mental Health Index, ≤52 as poor.

**Appendix 2.** Longitudinal analysis of mental health status predicting subsequent smoking status using generalized estimated equation analysis for all young women participating in the Australian Longitudinal Study on Women’s Health with and without any experience of pregnancy

Poor mental health status at waves 1, 2, 3, 4	Smoking status (outcome) at waves 2, 3, 4, 5 (never smoker as reference)							
	Ex-smoker		Smoke <10 CPD		Smoke 10–19 CPD		Smoke ≥20 CPD	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Poor MHI status (≤52)	1.07	1.03–1.12	1.22	1.16–1.28	1.26	1.20–1.32	1.55	1.45–1.67

OR, Odds ratio; CI, confidence intervals; CPD, cigarettes per day.

Mental health status was measured by the SF-36 Mental Health Index (MHI), ≤52 as poor.

**Appendix 3.** Longitudinal analysis of smoking status predicting subsequent mental health status using generalized estimated equation models

Smoking status (predictor) at waves 1, 2, 3, 4 (never as reference)	Poor mental health (outcome) at waves 2, 3, 4, 5 (good as reference)			
	MHI $\leq$ 52		CES-D $\geq$ 10	
	OR	(95% CI)	OR	(95% CI)
<b>Model 1: Unadjusted</b>				
Never	1.00		1.00	
Ex-smoker	1.21	(1.06–1.39)	1.25	(1.11–1.41)
Smoke < 10 CPD	1.23	(1.07–1.41)	1.21	(1.07–1.37)
Smoke 10–19 CPD	1.29	(1.05–1.58)	1.35	(1.12–1.61)
Smoke $\geq$ 20 CPD	1.62	(1.24–2.11)	1.59	(1.26–2.00)
<b>Model 2: Adjusted for covariates</b>				
Never	1.00		1.00	
Ex-smoker	1.26	(0.94–1.70)	1.20	(0.91–1.60)
Smoke < 10 CPD	1.28	(0.98–1.68)	1.33	(1.04–1.71)
Smoke 10–19 CPD	1.29	(0.99–1.69)	1.26	(0.99–1.61)
Smoke $\geq$ 20 CPD	1.55	(1.20–1.99)	1.58	(1.25–1.99)
<b>Model 3: Adjusted for mental health status at waves 1, 2, 3, 4</b>				
Never	1.00		1.00	
Ex-smoker	1.21	(1.06–1.38)	1.10	(0.94–1.29)
Smoke < 10 CPD	1.16	(1.01–1.33)	1.06	(0.89–1.26)
Smoke 10–19 CPD	1.20	(0.99–1.47)	1.05	(0.82–1.35)
Smoke $\geq$ 20 CPD	1.45	(1.12–1.88)	1.16	(0.85–1.59)
<b>Model 4: Including only participants with good mental health status at baseline wave</b>				
Never	1.00		1.00	
Ex-smoker	1.23	(1.04–1.47)	1.31	(1.14–1.52)
Smoke < 10 CPD	1.15	(0.96–1.38)	1.22	(1.05–1.42)
Smoke 10–19 CPD	1.24	(0.95–1.61)	1.33	(1.06–1.67)
Smoke $\geq$ 20 CPD	1.67	(1.17–2.39)	1.54	(1.14–2.08)

MHI, Mental Health Index; CESD, Center for Epidemiologic Studies Depression Scale; OR, Odds ratio; CI, confidence intervals; CPD, cigarettes per day.

Covariates included marital status, education level, and employment status.

**Declaration of Interest**

None.

Young A, Powers J, Bell SL (2006). Attrition in longitudinal studies: who do you lose? *Australian & New Zealand Journal of Public Health* 30, 353–361.

**References**

Garipey G, Smith KJ, Clyde M, Schmitz N (2012). Smoking and mental health in young women – challenges in interpretation. *Psychological Medicine*. doi:10.1017/S003329172001778.

Leung J, Gartner C, Hall W, Lucke J, Dobson A (2012). A longitudinal study of the bidirectional relationship between tobacco smoking and psychological distress in a community sample of young Australian women. *Psychological Medicine* 42, 1273–1282.

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