

Anxiety and depressive disorders are associated with delusional-like experiences: a replication study based on a National Survey of Mental Health and Wellbeing

Sukanta Saha,¹ James Scott,^{1,2,3,4} Daniel Varghese,⁵ John McGrath^{1,4,6}

To cite: Saha S, Scott J, Varghese D, *et al.* Anxiety and depressive disorders are associated with delusional-like experiences: a replication study based on a National Survey of Mental Health and Wellbeing. *BMJ Open* 2012;**2**:e001001. doi:10.1136/bmjopen-2012-001001

► Prepublication history and additional appendix for this paper is available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2012-001001>).

Received 8 February 2012
Accepted 26 April 2012

This final article is available for use under the terms of the Creative Commons Attribution Non-Commercial 2.0 Licence; see <http://bmjopen.bmj.com>

For numbered affiliations see end of article.

Correspondence to

Dr Sukanta Saha;
sukanta_saha@qcmhr.uq.edu.au

ABSTRACT

Objectives: There is growing evidence that delusional-like experiences (DLE) are associated with common mental disorders. In particular, a National Mental Health Survey conducted in Australia during 2007 reported an association between DLE and both anxiety disorder and major depressive disorder (MDD). However, the previous study did not examine this association with respect to subtypes of anxiety disorder nor with severity of MDD. The aim of this study was to examine the associations between DLE and both anxiety disorder and MDD in more detail based on an independent population sample.

Design: Cross-sectional study.

Setting: Subjects were drawn from the Australian Survey of Mental Health and Wellbeing 1997 using a stratified multistage area sampling of persons living in private dwellings in all States and Territories of Australia.

Participants: Approximately 13 600 private dwellings were initially selected with one person aged 18 years or older from each dwelling invited to participate. In total, 10 641 individuals participated in the survey.

Primary and secondary outcome measures: The Composite International Diagnostic Interview was used to identify individuals with DLE and Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition (DSM IV) lifetime diagnoses of anxiety disorders and MDD. The influence of various anxiety disorders and MDD on DLE was assessed with logistic regression.

Results: Having a lifetime diagnosis of either any anxiety disorder or MDD was significantly associated with the endorsement of DLE. The association was found for each of the main anxiety disorders when examined separately. There was a dose–response relationship between increasing severity of MDD and higher odds of DLE endorsement.

Conclusions: DLE are associated with a wide range of anxiety disorders and are more prevalent in those with MDD. Understanding the relationship between DLE, anxiety disorders and depression may provide insights

ARTICLE SUMMARY

Article focus

- The study was undertaken in order (1) to examine the association between DLE and (a) broadly defined anxiety disorders and (b) MDDs; (2) to explore the association between DLE and a range of specific anxiety disorders and (3) to examine if severity of MDD influenced the risk of endorsement of DLE.

Key message

- Having a lifetime diagnosis of either any anxiety disorder or MDDs was significantly associated with the endorsement of DLE.
- The association was found for each of the main anxiety disorders when examined separately.
- There was a dose–response relationship between increasing severity of MDD and higher odds of DLE endorsement.

Strengths and limitations of this study

- The data were drawn from the nationally representative sample from the Australia general population.
- Cross-sectional study.

into shared pathways that underpin both psychotic disorders and common mental disorders.

INTRODUCTION

There is now robust evidence indicating that hallucinations and delusional-like experiences (DLE) are common in the general population. In recent years, the field has focused on the demographic and clinical correlates of hallucinations and DLE.^{1–10} Of particular interest, there is a growing body of evidence reporting an association between DLE endorsement and common mental disorders, such as anxiety disorders and major depressive disorder (MDD). For

example, panic attacks during adolescence were significantly associated with increased levels of DLE among young adults.¹¹ In the NEMESIS study, subjects with obsessive–compulsive symptoms were more likely to develop incident psychotic symptoms 3 years later.¹² Conversely, a Swiss-based cohort reported that young adults with psychotic-like experiences were significantly more likely to later develop common mental disorders, such as anxiety disorders and MDD.¹³ A German community-based study found an association between social phobia, social anxiety and DLE,¹⁴ while a US primary-care-based sample reported that those who reported psychotic-like experiences were more likely to have generalised anxiety disorders and panic disorders.¹⁵

Trauma exposure with or without post-traumatic stress disorder has been associated with DLE.⁷ Several Australian studies^{10–16} have found significant associations between DLE and broadly defined anxiety disorders; however, to date, these studies did not report on subtypes of anxiety disorders. In light of the evidence linking DLE with a wide range of different types of anxiety disorders, the evidence suggests that DLE are non-specifically associated with anxiety disorders.

With respect to depression, several studies have found that individuals with depression are significantly more likely to endorse DLE.^{9–10, 16–17} Studies also show that DLE requiring clinical care were progressively more likely to occur with greater levels of affective dysregulation (depressive symptoms and hypomanic symptoms).¹⁸ Importantly, there was a significant association between severity of depressive symptoms and persistence of psychotic symptoms.

While longitudinal studies are required to explore the temporal sequence between depression, anxiety and DLE, we had the opportunity to replicate our previous findings with respect to the cross-sectional association between DLE and (1) broadly defined anxiety disorders and (2) MDD.¹⁰ Based on our previous studies, we predicted that those with anxiety disorder or major depression disorder would be more likely to endorse DLE. In addition, we were able to explore the association between DLE and a range of specific anxiety disorders. Furthermore, we were able to examine if severity of MDD influenced the risk of endorsement of DLE—we predicted that those with more severe MDD would be more likely to endorse DLE compared with those with milder forms of MDD.

METHODS

Participants

The data were drawn from the 1997 National Survey of Mental Health and Wellbeing conducted in Australia by the Australian Bureau of Statistics from a representative sample (random stratified multistage area sampling) of persons living in private dwellings in all States and Territories of Australia. Details of the survey methodology were published elsewhere.¹⁹ In brief, approximately 13 600 private dwellings were initially selected with one person

aged 18 years or older from each dwelling invited to participate. In total, 10 641 individuals participated in the survey, representing a response rate of 78%. Interviews were carried out by trained interviewers from the Australian Bureau of Statistics, a statutory body responsible for conducting such surveys using ethical protocols that include written informed consent.

Assessment of DLE and DSM-IV diagnoses

Mental disorders were assessed by a modified version of the Composite International Diagnostic Interview (CIDI),²⁰ which yielded diagnoses of Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition (DSM IV) disorders. Briefly, within the CIDI, there are three items related to identifying individuals who may be psychotic (*G Items*: ‘screening items’). For those who endorsed the screen item, a follow-up item was used to further explore the delusional-like nature of the experiences (‘probe items’). Full details of the screen and probe items are provided in online appendix 1. The items covered the following features of psychotic disorders: delusions of control, thought interference and passivity (question 1 and 1a); delusions of reference or persecution (question 2 and 2a) and grandiose delusions (question 3 and 3a). There was no item to assess hallucinations.

Based on CIDI-derived DSM-IV criteria, we identified subjects who had lifetime diagnoses of (1) an anxiety disorder and (2) MDD. Anxiety disorders included panic disorder with or without agoraphobia, social phobia, generalised anxiety disorder, obsessive–compulsive disorder and agoraphobia without panic disorder. For those with MDD, allocation to subtypes was based on the total number of particular ‘depressive’ symptoms with the duration of at least 2 weeks. Full details of the symptom list and related rules to deal with multiple episodes can be found in the full report.²¹ In brief, mild MDD was characterised by the presence of at least four symptoms, moderate MDD with at least six symptoms and severe MDD with at least eight symptoms. These subtypes of MDD were mutually exclusive.

To ascertain trauma exposure, the CIDI elicits responses from 10 questions pertaining to past exposure to traumatic events. Details of the trauma variables have been published previously by our group.^{7–8} In keeping with our previous analyses,^{1–10} individuals who screened positively for schizophrenia (ie, respondents who reported ‘Yes’ to the item ‘Had been told at any time by a psychiatrist that they had schizophrenia’) were excluded from the analyses (n=87), leaving a total of 10 554 subjects for this study.

Statistical analysis

To examine the association between DLE and both anxiety disorders and MDD, logistic models were fitted to the data while adjusting for various confounding factors. Because sex and age are associated with DLE,^{9–10, 22} we included these as covariates in the main analyses. In keeping with our previous studies, we included a range of CIDI-derived potential confounding

Table 1 Descriptive statistics of delusional-like experiences (screen items), anxiety disorder and major depressive disorder (n=10 554)

Exposure	Sample N (%)	Delusional-like experiences endorsement, n (%)	
		No	Yes
Total sample	10 554 (100.00)	9278 (88.44)	1276 (11.56)
Anxiety and depressive disorders			
No anxiety disorders	9974 (95.13)	8900 (85.16)	1074 (9.97)
Any anxiety disorders: lifetime*	580 (4.87)	378 (4.29)	202 (16.88)
No major depressive disorder	9903 (94.66)	8834 (84.76)	1069 (9.89)
Any major depressive disorder: lifetime†	651 (5.34)	444 (4.77)	207 (16.78)

*Anxiety disorders based on Composite International Diagnostic Interview (CIDI) DSM IV diagnosis.
 †Major depressive disorder based on CIDI DSM IV diagnosis.

variables in model 2. These include substance misuse,²³ marital status and migrant status,²⁴ educational status, employment status and family income, and trauma exposure.^{2 6–8} As comorbidity frequently occurs between anxiety disorders and MDD, we also adjusted for the presence of the other psychiatric diagnoses under investigation (ie, the association between MDD and DLE was adjusted for the presence of anxiety disorders, and the association between anxiety disorders and DLE was adjusted for the presence of MDD).

For secondary analyses (a sensitivity analysis), we repeated the main analyses excluding the second screen items (‘Have you ever had a feeling that people were too interested in you?’) because clinical experience suggests that this is a common experience in social anxiety.

The sample was weighted to adjust for differential probabilities of selection within households, over-sampling of population subgroups and non-response to match census population distribution on a number of geographic and socio-demographic variables. The initial weights were calibrated against known population estimates. Replicate weight variables were developed using the Jack-knife procedure of replication (ie, the analysis was repeated after one subject was dropped and then the SE was derived from the distribution of results from all ‘minus one’ resamples).²⁵ Analyses were performed using Proc *Surveylogistic*,²⁶ which is designed to analyse complex survey sample using SAS (V.9.3; SAS Institute). χ^2 Test-for-linear trend was used to assess

dose–response relationships between the exposure variables and DLE.

RESULTS

Of the 10 554 subjects surveyed, 11.6% (n=1276) positively endorsed one or more DLE items (table 1). There was a weak effect of women being more likely to endorse DLE than men (OR 1.05, 95% CI 1.04 to 1.05). The prevalence of lifetime diagnosis of any anxiety disorder was 4.9% (n=580), and the prevalence of lifetime depressive disorders was 5.3% (n=651).

As predicted, the main analyses showed that those with any anxiety disorder and participants who had lifetime diagnosis of MDD were significantly more likely to endorse DLE. Those with anxiety disorders were two to three times more likely to endorse both DLE screen and probe items (table 2), and those with a diagnosis of MDD were also two to three times more likely to endorse DLE screen and probe items.

Concerning the subtypes of anxiety disorders, each disorder was significantly associated with DLE screen items, and there were no marked differences in the effect sizes between the different disorders (table 3). There was a dose–response relationship between the severity of the MDD and DLE in which severe depression showed twice the odds of endorsement of DLE screen items compared with a diagnosis of mild MDD with a significant linear trend ($\chi^2=44.19$, $p<0.0001$). Broadly similar (but less precise) associations were also found for probe items.

Table 2 Association between delusional-like experiences, and anxiety disorders and major depressive disorder (n=10 554)

Disorders	Delusional-like experiences			
	Screen items		Probe items	
	Model 1* OR (95% CI)	Model 2† OR (95% CI)	Model 1* OR (95% CI)	Model 2† OR (95% CI)
Anxiety disorders: lifetime‡	3.88 (2.92 to 5.16)§	2.43 (1.91 to 3.09)§	3.36 (1.86 to 6.05)§	2.12 (1.27 to 3.54)§
Major depressive disorder: lifetime‡	3.63 (2.75 to 4.79)§	2.17 (1.65 to 2.86)§	2.91 (1.84 to 4.59)§	1.63 (1.10 to 2.42)§

*Model 1= adjusted for age and sex.
 †Model 2= adjusted for age, sex, marital status, migrant status, income, employment status, educational status, any alcohol use/dependence disorders, any drug use/dependence disorders and any traumatic life events (in model 2, anxiety disorders were adjusted for major depressive disorder and vice versa).
 ‡Anxiety and depressive disorders were based on Composite International Diagnostic Interview DSM IV diagnosis.
 §Significance: $p<0.001$.

Table 3 Association between delusional-like experiences, and different individual exposure to lifetime anxiety disorders and major depressive disorder (n=10 554)

	Number (% , SE*)	Delusional-like experiences			
		Screen items		Probe items	
		Model 1† OR (95% CI)	Model 2‡ OR (95% CI)	Model 1† OR (95% CI)	Model 2‡ OR (95% CI)
Anxiety disorders					
Panic disorder with/without agoraphobia	124 (1.02, 0.12)	4.56 (2.51 to 8.33)§	2.40 (1.03 to 5.63)§	2.55 (1.13 to 5.78)§	1.54 (0.77 to 3.08)
General anxiety	311 (2.57, 0.23)	3.69 (2.57 to 5.29)§	2.09 (1.50 to 2.93)§	3.05 (1.41 to 6.58)§	1.77 (0.89 to 3.51)
Obsessive-compulsive disorder	77 (0.69, 0.12)	5.19 (2.69 to 10.03)§	2.97 (1.50 to 5.88)§	4.60 (1.81 to 11.74)§	2.68 (1.05 to 6.84)§
Agoraphobia without panic disorder	60 (0.49, 0.06)	5.18 (2.72 to 9.85)§	3.49 (1.95 to 6.28)§	7.02 (3.73 to 13.19)§	4.65 (1.98 to 10.89)§
Social phobia	160 (1.35, 0.14)	4.14 (2.81 to 6.11)§	2.29 (1.63 to 3.24)§	4.15 (1.93 to 8.91)§	2.39 (1.06 to 5.43)§
Major depressive disorder					
Mild	297 (2.52, 0.20)	2.96 (1.82 to 4.82)§	1.97 (1.15 to 3.37)§	2.37 (1.39 to 4.04)§	1.49 (0.88 to 2.53)
Moderate	190 (1.52, 0.14)	3.29 (1.81 to 6.01)§	1.89 (0.98 to 3.70)	2.73 (1.27 to 5.84)§	1.53 (0.79 to 2.96)
Severe	164 (1.29, 0.12)	5.73 (3.96 to 8.30)§	3.03 (2.11 to 4.35)§	4.25 (2.01 to 8.99)§	1.99 (1.02 to 3.91)§
Trend		$\chi^2=111.83, p<0.0001$	$\chi^2=44.19, p<0.0001$	$\chi^2=21.19, p<0.0001$	$\chi^2=6.04, p<0.001$

*SE= SE of estimates.
 †Model 1= adjusted for age and sex.
 ‡Model 2= adjusted for age, sex, marital status, migrant status, income, employment status, educational status, any alcohol use/dependence disorders, any drug use/dependence disorders and any traumatic life events (in model 2, anxiety disorders were adjusted for major depressive disorder and vice versa).
 §Significance: p<0.001 (shown in bold).

In the secondary analysis, when we conducted the models using two DLE items (G1 and G3), the pattern of significant association for major anxiety and depressive disorders remained unchanged (data not shown).

DISCUSSION

Individuals with a lifetime diagnosis of MDD or an anxiety disorder were significantly more likely to report DLE compared with those without these disorders. We found that each subtype of anxiety disorder was associated with DLE, and there were no marked differences in the effect sizes for these associations (the CIs around these associations overlapped). Based on this same sample, we have previously demonstrated that trauma exposure without post-traumatic stress disorder was associated with DLE.⁷ Our new findings add additional weight to the conclusion that a range of disorders with prominent anxiety symptoms are associated with DLE.

As predicted, there was also a dose-response relationship between severity of MDD and DLE. All associations remained significant when adjusted for associated comorbidity with anxiety, alcohol and illicit substance misuse and any traumatic life events, indicating that the associations are independent of comorbid psychiatric illnesses and selected environmental and demographic risk factors.

The mechanisms linking DLE with anxiety disorder and MDD remain unclear. However, there is evidence to suggest that shared familial factors may contribute to these findings.⁹

In the current study, we were not able to examine the temporal sequence between the variables of interest—for example, we do not know if anxiety or depressive symptoms preceded the onset of DLE or vice versa. Unfortunately, the DLE have no information about age of onset nor presence during the past 12 months. Thus, while the CIDI has some information about the age of onset and the presence of the disorder in the past year, the lack of comparable data for the DLE compromises our ability to infer temporal sequence. Longitudinal studies will be required to explore this particular research question. The reliance on lifetime measures of both DLE and mental disorders is also problematic, as it is known that respondents tend to under-report true lifetime prevalence estimates.²⁷ While the interviewers were trained, the diagnoses of MDD and anxiety disorders were not validated by clinical assessment. However, the CIDI is generally regarded as having good psychometric properties for common mental disorders.²⁸ Comorbidity between anxiety disorders and MDD is common, and while we included adjustments in the models to attempt to account for this feature, the complex nature of the relationships between DLE, MDD and anxiety disorders could reduce the accuracy of the ORs.²⁹ We had a small number of screen and probe items to measure DLE, and there were no items for hallucinations. However, previous general population studies have found a strong association between the presence of DLE and hallucinations.^{24 30–32}

There is now robust and consistent evidence indicating that those with anxiety disorders and MDD have an increased risk of DLE. For example, clinicians involved in the care of those with primary diagnoses of anxiety disorder or depression may not routinely enquire about DLE. In light of the association between DLE and suicidal ideation/behaviour,³ the presence of these experiences may suggest that clinical care plans place greater emphasis on the detection and management of suicidal ideation. A recent study based on adolescents found that most individuals (57%–80% depending on age) who reported psychotic-like experiences (eg, hallucinations and/or DLE) had at least one diagnosable non-psychotic psychiatric disorder.³³ We agree with these authors, who note that psychotic symptoms appear to be important risk markers for a wide range of non-psychotic mental health disorders.

Author affiliations

¹Queensland Centre for Mental Health Research, The Park Centre for Mental Health, Queensland, Australia

²Metro North Mental Health, Royal Brisbane and Women's Hospital, Queensland, Australia

³The University of Queensland Centre for Clinical Research, Queensland, Australia

⁴Discipline of Psychiatry, University of Queensland, Queensland, Australia

⁵Princess Alexandra Hospital, Queensland, Australia

⁶Queensland Brain Institute, University of Queensland, Queensland, Australia

Contributors JM, SS and JS have directly participated in the planning and execution of the study. SS analysed the data. All authors have critically read and approved the final version submitted.

Funding This research received no specific grant from any funding agency in public, commercial or not-for-profit sectors.

Competing interests None.

Patient consent Obtained.

Ethics approval We obtained data from the Australian Bureau of Statistics (ABS), which is a government organisation. So, we are not aware about the exact approval authority. However, it is understood that the ABS has followed all the ethical standards to conduct this national survey.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The data are available from the Australian Bureau of Statistics.

REFERENCES

- Saha S, Scott J, Varghese D, *et al*. The association between physical health and delusional-like experiences: a general population study. *PLoS One* 2011;6:e18566.
- Saha S, Scott J, Varghese D, *et al*. The association between socioeconomic disadvantage and delusion-like experiences: a nationwide population-based study. *Eur Psychiatry*. Published Online First: 6 December 2011. doi:10.1016/j.eurpsy.2011.09.004
- Saha S, Scott JG, Johnston AK, *et al*. The association between delusional-like experiences and suicidal thoughts and behaviour. *Schizophr Res* 2011;132:197–202.
- Saha S, Scott JG, Varghese D, *et al*. The association between delusional-like experiences, and tobacco, alcohol or cannabis use: a nationwide population-based survey. *BMC Psychiatry* 2011;11:202.
- Saha S, Scott JG, Varghese D, *et al*. The association between general psychological distress and delusional-like experiences: a large population-based study. *Schizophr Res* 2011;127:246–51.
- Saha S, Varghese D, Slade T, *et al*. The association between trauma and delusional-like experiences. *Psychiatry Res* 2011;189:259–64.
- Scott J, Chant D, Andrews G, *et al*. Association between trauma exposure and delusional experiences in a large community-based sample. *Br J Psychiatry* 2007;190:339–43.
- Scott J, Chant D, Andrews G, *et al*. Psychotic-like experiences in the general community: the correlates of CIDI psychosis screen items in an Australian sample. *Psychol Med* 2006;36:231–8.
- Varghese D, Saha S, Scott JD, *et al*. The association between family history of mental disorder and delusional-like experiences: a general population study. *Am J Med Genet B Neuropsychiatr Genet* 2011;156B:478–83.
- Varghese D, Scott J, Welham J, *et al*. Psychotic-like experiences in major depression and anxiety disorders: a population-based survey in young adults. *Schizophr Bull* 2011;37:389–93.
- Goodwin RD, Fergusson DM, Horwood LJ. Panic attacks and psychoticism. *Am J Psychiatry* 2004;161:88–92.
- van Dael F, van Os J, de Graaf R, *et al*. Can obsessions drive you mad? Longitudinal evidence that obsessive-compulsive symptoms worsen the outcome of early psychotic experiences. *Acta Psychiatr Scand* 2011;123:136–46.
- Rosslar W, Hengartner MP, Ajdacic-Gross V, *et al*. Sub-clinical psychosis symptoms in young adults are risk factors for subsequent common mental disorders. *Schizophr Res* 2011;131:18–23.
- Schutters SI, Dominguez MD, Knappe S, *et al*. The association between social phobia, social anxiety cognitions and paranoid symptoms. *Acta Psychiatr Scand* 2012;125:213–27.
- Olfson M, Lewis-Fernandez R, Weissman MM, *et al*. Psychotic symptoms in an urban general medicine practice. *Am J Psychiatry* 2002;159:1412–19.
- Yung AR, Buckley JA, Cosgrave EM, *et al*. Association between psychotic experiences and depression in a clinical sample over 6 months. *Schizophr Res* 2007;91:246–53.
- Armando M, Nelson B, Yung AR, *et al*. Psychotic-like experiences and correlation with distress and depressive symptoms in a community sample of adolescents and young adults. *Schizophr Res* 2010;119:258–65.
- van Rossum I, Dominguez MG, Lieb R, *et al*. Affective dysregulation and reality distortion: a 10-year prospective study of their association and clinical relevance. *Schizophr Bull* 2011;37:561–71.
- Andrews G, Henderson S, Hall W. Prevalence, comorbidity, disability and service utilisation. Overview of the Australian National mental health survey. *Br J Psychiatry* 2001;178:145–53.
- WHO. *Composite International Diagnostic Interview- Version 1.1*: Geneva: World Health Organisation, 1993.
- Australian Bureau of Statistics. *National Survey of Mental Health and Wellbeing: Summary Of Results, 2007 (Explanatory Notes)*. Cat No. 4326.0. Canberra: Australian Bureau of Statistics, 2008.
- Varghese D, Scott J, McGrath J. Correlates of delusion-like experiences in a non-psychotic community sample. *Aust N Z J Psychiatry* 2008;42:505–8.
- Degenhardt L, Hall W. The association between psychosis and problematic drug use among Australian adults: findings from the National Survey of Mental Health and Well-Being. *Psychol Med* 2001;31:659–68.
- Scott J, Welham J, Martin G, *et al*. Demographic correlates of psychotic-like experiences in young Australian adults. *Acta Psychiatr Scand* 2008;118:230–7.
- Rust KF, Rao JN. Variance estimation for complex surveys using replication techniques. *Stat Methods Med Res* 1996;5:283–310.
- An AB Performing logistic regression on survey data with the new SURVEYLOGISTIC procedure. *Proceedings of the Twenty-Seven Annual SAS Users Group International Conference*. Paper 258. 2004. <http://www2.sas.com/proceedings/sugi27/p258-27.pdf>
- Moffitt TE, Caspi A, Taylor A, *et al*. How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychol Med* 2010;40:899–909.
- Andrews G, Peters L. The psychometric properties of the Composite International Diagnostic Interview. *Soc Psychiatry Psychiatr Epidemiol* 1998;33:80–8.
- Hernan MA, Hernandez-Diaz S, Werler MM, *et al*. Causal knowledge as a prerequisite for confounding evaluation: an application to birth defects epidemiology. *Am J Epidemiol* 2002;155:176–84.
- Hanssen MS, Bijl RV, Vollebergh W, *et al*. Self-reported psychotic experiences in the general population: a valid screening tool for DSM-III-R psychotic disorders? *Acta Psychiatr Scand* 2003;107:369–77.
- Lincoln TM, Peter N, Schafer M, *et al*. Impact of stress on paranoia: an experimental investigation of moderators and mediators. *Psychol Med* 2009;39:1129–39.
- Scott J, Martin G, Welham J, *et al*. Psychopathology during childhood and adolescence predicts delusional-like experiences in adults: a 21-year birth cohort study. *Am J Psychiatry* 2009;166:567–74.
- Kelleher I, Keeley H, Corcoran P, *et al*. Clinicopathological significance of psychotic experiences in non-psychotic young people: evidence from four population-based studies. *Br J Psychiatry*. Published Online First: 12 April 2012. doi:10.1192/bjp.bp.111.101543.