Social isolation and psychosis-like experiences: A UK general population analysis

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Abstract

**Background:** Social isolation is a complex construct characterised by both objective and perceived components and has been commonly identified as a risk factor for psychosis-like experiences (PLEs). Few studies, however, have modelled the association between social isolation and PLEs in the general population.

**Method:** Data from a UK general population survey (N = 7403) were analysed using latent class analysis to identify distinct groups of individuals characterised by the same profile of social isolation. Six objective and perceived indicators of social isolation (e.g. living alone; feeling socially isolated and lonely) were modelled. Associations between classes and PLEs were analysed using multivariate binary logistic regression analysis.

**Results:** Three classes were identified: an isolated and lonely class (Class 1), a no communication or close relationships class (Class 2) and a baseline class (Class 3). Compared to the baseline class, Class 1 was significantly more likely to endorse thought interference (OR = 2.0) and paranoia (OR = 3.3), while Class 2 was significantly more likely to endorse paranoia (OR = 8.6) and hallucinations (OR = 1.9).

**Conclusions:** Social isolation in the general population seems to vary between two distinct groups. PLEs, in turn, seem to vary depending on the nature of this isolation.

**Key words:** Epidemiology, hallucinations, delusions, social isolation, latent class analysis
Introduction

In recent years there has been a growing interest in the impact of social isolation on human health and wellbeing. Social isolation can be both objective and perceived, where perceived social isolation is characterised by feelings of loneliness rather than a lack of social relationships (Hawley & Cacioppo, 2010). Both objective and perceived social isolation (i.e. loneliness) have been associated with increased risk for early mortality (Holt-Lunstad, Smith, Baker, Harris & Stephenson, 2015), poorer self-reported health (Fiorillio & Sabatini, 2011; Stickley et al., 2015) and a range of mental health disorders (Cacioppo, Hawkley & Thisted, 2010; Meltzer et al., 2013; Smyth, Siriwardhana, Hotopf & Hatch, 2015). Objective and perceived social isolation however seem to be distinct concepts; findings indicate that only weak to moderate correlations exist between them (Cornwell & Waite, 2009).

Socialising and interpersonal difficulties are common among those who experience psychosis and are well documented in the research literature. For example, using a case-control design, Morgan et al. (2008) found that a number of social isolation indicators, including not having a confidant and never having been in a long-term relationship, were associated with increased risk of psychosis, after adjusting for sociodemographic variables. Similarly, low social contact outside of home, work or services and lack of a confidant appear to be common among those with a psychotic disorder (Giacco, Palumbo, Strappelli, Catapano & Priebe, 2016; Sündermann, Onwumere, Kane, Morgan & Kupiers, 2014). A systematic review concluded that first-episode psychosis patients and non-clinical samples reporting psychosis-like experiences (PLEs) had smaller social network sizes, less satisfaction with relationships and fewer close friends compared to controls. This review also suggested that social network deficiencies may precede the onset of a psychotic disorder (Gayer-Anderson & Morgan, 2013).
Based on research findings, social isolation and withdrawal often predate the emergence of psychosis symptomology. For example, Hoffman’s (2007; 2008) social deafferentation (SDA) hypothesis posited that high levels of social isolation in predisposed individuals could facilitate cognitive processes which in turn could result in psychotic experiences. According to this hypothesis, social isolation can lead to a lack of ‘information flow’ to the ‘social brain’. Resulting brain ‘reorganisation’, in the absence of such social stimulation, in turn therefore may produce socially meaningful ‘analogues’ via hallucinatory and delusional experiences.

The social deafferentation hypothesis has recently been explored in relation to known risk factors for psychosis. Murphy, Shevlin, Adamson and Houston (2013) for example found that associations between sexual trauma and psychosis were mediated by avoidance. According to these authors, sexual trauma may create an enduring vulnerability which is accompanied, facilitated and compounded by social withdrawal, disconnection and isolation and which, in turn, may induce spurious social meaning in the form of complex, emotionally compelling hallucinations and delusions.

Using data from a UK general population survey, Meltzer and colleagues found that those meeting the criteria for a psychosis diagnosis were almost 6 times more likely to feel lonely compared to those without a mental disorder. Statistical adjustment for social contact, involvement in social activities and social support made little difference to this odds ratio (Meltzer et al., 2013). Furthermore, in a study of social networks, social support and psychiatric symptoms among an adult sample from south east London, increased emotional support (characterised by having someone to talk to when lonely and having someone that makes you feel cared for) was associated with decreased odds of PLEs, while no significant association was found between social network indicators and PLEs (Smyth et al., 2015).
High prevalence of loneliness has also been reported among people living with psychosis. The second Australian National Survey of Psychosis ($N=1,825$) found that the vast majority of participants (80.1%) had experienced loneliness in the past 12 months (Stain et al., 2012), which was significantly higher than the general population (Badcock et al., 2015). Loneliness has also been found to mediate the relationship between traumatic experiences, such as intimate partner violence (Boyda, McFeeters & Shevlin, 2015) and childhood abuse, (Shevlin, McElroy & Murphy, 2015) and PLEs. However, not all people with psychosis experience loneliness. Among a sample of 30 patients with psychotic disorder, Giacco et al. (2016) found that 43% reported feeling ‘very’ or ‘extremely’ alone, but that 37% reported feeling ‘slightly’ or ‘not alone at all’.

While previous research therefore has identified associations between psychosis and social isolation, no known analysis has attempted to profile social isolation in a general population and in turn analyse its association with individual psychotic experiences. The current study therefore attempted to profile social isolation, using latent class analysis (LCA), in order to identify distinct groups of individuals in the population characterised by key indicators of living alone, never having been in a relationship, lack of communication, having no close friends or relatives and feeling socially isolated and lonely. It was expected that several classes would emerge and that they would differ qualitatively in relation to their profiles of objective and perceived isolation. It was also predicted that PLEs would be most strongly associated with latent classes characterised by greater endorsement of social isolation indicators. It was believed that the proposed analytic framework would provide an opportunity to explore the social contact context of psychotic experiences in the general population.
Method

Sample

The dataset for the current study was generated from the Adult Psychiatric Morbidity Survey (APMS) 2007. The sample was designed to be representative of the population living in private households in England. The main aim of the survey was to estimate prevalence and correlates of mental health problems among adults. Using the small users’ postcode address file, the National Centre for Social Research (NatCen) adopted a multistage stratified probability sampling design. One adult aged 16 years or over was selected for interview within each household. The survey consisted of a phase one and a phase two (clinical) interview. The mean age of the sample was 51.12 (SD=18.59) years. Interviews were successfully conducted with 7,403 adults (3,197 males and 4,206 females). Details of the survey method are available (McManus, Meltzer, Brugha, Bebbington, & Jenkins, 2009).

Measures

Social isolation

Social isolation was assessed using a range of variables from the APMS:

Living arrangements: Respondents were asked how many people resided in their household. Responses were recoded into a binary variable (1=lives alone; 0=cohabiting).

Relationship status: The domestic violence and abuse section of the survey enquired about previous partners. This information was used to determine whether the respondent had been in a relationship (coded 0) or never been in a relationship (coded 1).
Communication: Respondents were asked to state the number of adults that they had communicated with in the past week (friends that they did not live with, but would regard as a close). Responses were coded 1=no communication and 0=some communication.

Number of close friends: Respondents were asked how many friends or acquaintances they would describe as good or close friends (friends that they did not live with). Responses were coded 1=none and 0=at least one.

Close relatives: Respondents were asked how many relatives aged 16 or over they would describe as close (relatives they do not live with). Responses were coded 1=none and 0=at least one.

Loneliness: Loneliness was assessed using an item from the Social Functioning Questionnaire (Tyrer et al., 2005). Respondents were asked to what degree the statement “I feel lonely and isolated from other people” applied to them over the past 2 weeks. Responses were scored on a four-point Likert scale, ranging from “1=very much” to “4=not at all”. This was recoded into a binary variable where 1 = extreme isolation/loneliness, and 0 = low to no isolation/loneliness.

Psychosis

In the initial interview of the survey, the Psychosis Screening Questionnaire (PSQ, Bebbington & Nayani, 1995) was administered to assess psychotic symptoms within the past year. The PSQ consisted of five main questions inquiring about mania, thought insertion, paranoia, strange experiences, and hallucinations (P1 to P5), their subsidiary questions (a and b), and sections to record verbatim descriptions of the symptoms. The current analysis focussed specifically on PSQ items 2 through 5 due to the inflated endorsement of the mania probe (PSQ1=52% endorsement). This item was considered less reliable as an accurate
screen for psychosis given that over half of the sample endorsed the probe, whereas no more than 18% of the sample endorsed either of the remaining four probes.

Analysis of the current study was based solely on selected subsidiary questions to attempt to capture clinically relevant psychotic experiences within the sample, with the exception of the main hallucination question, which was deemed more suitable than its subsidiary question: (2a) Did it come about in a way that many people would find hard to believe, for instance, through telepathy? (3b) Have there been times when you felt that a group of people was plotting to cause you serious harm or injury? (4a) Was it so strange that other people would find it very hard to believe? (5) Have there been times when you heard or saw things that other people could not? Responses to each of the selected questions were coded 1=endorsed, 0=rejected. An ‘unsure’ response to any of the four items was recoded and treated as missing data.

Background variables

In addition to age and sex, a range of demographic and clinical variables, known to be associated with PLEs, were controlled for in the analysis:

Education: A variable assessing educational achievement identified respondents as either having attained an educational qualification (0) or not (1).

Ethnicity: Ethnic background was recoded into a dichotomous variable, which identified respondents as being of white ethnic origin (0) or non-white ethnic origin (1).

Common mental disorders: The Clinical Interview Schedule-Revised (CIS-R; Lewis, Pelosi, Araya & Dunn, 1992) was used to identify the presence of any ICD-10 neurotic disorder diagnosis. This variable was coded 1=present, 0=absent.

Cannabis use: An item from the ‘Drugs’ section of the questionnaire was used to assess
cannabis use. The questions were prefixed by “Have you ever taken any of the drugs listed below even if it was a long time ago?” The first option was “Cannabis (marijuana, grass, hash, ganja, blow, draw, skunk, weed and spliff)”. Answers to this question were coded as 1=yes, 0=no.

Alcohol problem: Presence of a drinking problem was indicated by a score of 8+ on the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders & Monteiro, 2001); considered to indicate harmful alcohol use. Responses were coded 0=no problem, 1=problem.

Traumatic event: Having experienced a major traumatic event over the course of one’s lifetime (1) or not (0) was assessed in the PTSD section of the questionnaire.

Institution: A variable assessing whether the respondent had spent time in any kind of institution up to age 16 was coded yes (1) or no (0).

Care: This variable identified respondents who had ever been in Local Authority Care (such as a children’s home or foster care) up to age 16 (1) or not (0).

Homeless: This variable indicated whether the respondent had ever been homeless (1) or not (0).

Analytic plan

First, a LCA was conducted, using the social isolation items to determine the correct number of classes. LCA is a statistical method used to identify homogeneous groups, or classes, from categorical multivariate data. The technique has been used previously to model psychiatric and clinical categorical variables (e.g. Freed, Tompson, Otto, Nierenberg & Henin, 2015; Mannarini, Balottin, Toldo & Gatta, 2016). The fit of six models was assessed. The models were estimated using robust maximum likelihood (Yuan & Bentler, 2000). To avoid solutions
based on local maxima, 500 random sets of starting values were used initially and 100 final stage optimisations. The relative fit of the models was compared by using three information theory-based fit statistics: the Akaike information criterion (AIC) (Akaike, 1987), the Bayesian information criterion (BIC) (Schwarz, 1978) and sample size-adjusted Bayesian information criterion (ssa-BIC) (Sclove, 1987). The model that produced the lowest values was judged to be the best fitting model. In addition, the Lo-Mendell-Rubin (Lo, Mendell & Rubin, 2001) adjusted likelihood ratio test (LRT) was used to compare models with increasing numbers of latent classes. When a non-significant value ($p > 0.05$) occurred, this suggested that the solution with one less class should be accepted. Higher log-likelihood values also reflected good model fit. The LCA was conducted using Mplus 7.4 (Muthén & Muthén, 1998-2012) with the appropriate weighting variable. Second, a multivariate binary logistic regression was conducted. The dependent variables were the four psychosis items, while the predictors included the latent class variables, generated from the LCA and the background variables.

**Results**

PLE, social isolation and background variable response frequencies are shown in Table 1.

[Table 1 near here]

The LCA fit statistics are presented in Table 2. The 3-class solution was considered the best fitting model. The BIC and ssaBIC fit indices was lower for the 3-class solution compared to the indices for the other solutions, therefore, this model was accepted on the basis of parsimony. The entropy value (0.78) indicated acceptable classification of participants in this model. While the AIC was lowest in the 4-class model and the LRT was significant for all models tested, the BIC is considered the most reliable of the fit indices.
Class 1 \((n=400, 5.4\%)\), labelled the ‘isolated and lonely’ class, was characterised by the highest probabilities of living alone, never having been in a relationship and reporting feeling very socially isolated and lonely. This class also had elevated probabilities of not having any close friends or relatives compared to the baseline class. Class 2 \((n=176, 2.4\%)\) labelled the ‘no communication and close relationships’ class, was smallest class and was characterised by extremely high endorsement of having no communication in the past week and having no close friends, as well as elevated probabilities of having no close relatives. This class had similar probabilities as the baseline class in relation to living alone, never having been in a relationship and did not substantially differ from the baseline class regarding being lonely. Finally, Class 3 was the largest class \((n=6,827, 92.2\%)\) and represented a baseline, non-isolated group.

Using multivariate binary logistic regression analysis, associations between the four PLEs and the latent classes were analysed (Table 3). Compared to the baseline class, Class 1 was significantly more likely to endorse thought interference \((\text{OR}=2.0)\) and paranoia \((\text{OR}=3.3)\) while Class 2 was significantly more likely to endorse paranoia \((\text{OR}=8.6)\) and hallucinations \((\text{OR}=1.9)\). Several background variables were also significantly associated with PLEs.

Discussion
The primary purpose of this study was to profile social isolation in a general population sample and to analyse its associations with individual PLEs. Firstly, it was hypothesised that distinct groups of individuals, characterised by different social isolation profiles, would emerge. The results of the LCA revealed 3 distinct groups in the population; an isolated and lonely group (5.4%), a no communication and close relationships group (2.4%), and a majority baseline group (92.2%). Secondly, the four PLE items were regressed on the latent classes and a series of demographic and PLE psychosocial risk factors. It was expected that PLEs would be most strongly associated with classes that were characterised by the greatest endorsement of social isolation indicators.

Class 1 was characterised by elevated probabilities of living alone, never having been in a relationship, feeling socially isolated and lonely and having no close relatives but near zero probabilities for no communication. This class was significantly associated with thought interference and paranoia. Class 2 was characterised by the highest endorsement probabilities for no communication, no close friends and no close relatives but had similar probabilities as the baseline class regarding living alone, relationship status and feeling lonely. This class was significantly associated with experiencing paranoia and hallucinations.

Given the associations identified between the social isolation classes and PLEs, the current findings seemed to be in line with the SDA hypothesis and the literature demonstrating associations between both objective and subjective social isolation and PLEs (e.g. Gayer-Anderson & Morgan, 2013; Meltzer et al., 2013; Stain et al., 2012; Sündermann et al., 2014). In the current analysis, the classes diverged in relation to their communication patterns and, to a lesser extent, number of close friends and living arrangements. Of the four PLEs, paranoia was most strongly associated with both classes. Class 2 was eight and a half times more likely to believe that people were plotting to seriously harm them compared to the
baseline class. Therefore, lack of communication and friends may be influential in the development and/or maintenance of paranoid thoughts.

This finding complements cognitive models of persecutory delusions which posit that biased cognitive processes, such as abnormal reasoning, can lead to the formation and maintenance of psychotic symptoms (Garety, Kupiers, Fowler, Freeman & Bebbington, 2001). Paranoid delusions in the form of threat beliefs may arise from “a search for meaning for internal or external experiences that are unusual, anomalous, or emotionally significant for the individual” (Freeman, Garety, Kupiers, Fowler & Bebbington, 2002, p.331). Lack of communication and interaction with others reduces opportunities to explore alternative explanations for these threat beliefs. This creates a vicious cycle, whereby a person with persecutory delusions is mistrusting and suspicious of others and therefore interacts in ways which are deemed unusual, fostering further isolation and potentially confirming their delusions (Freeman et al., 2002; Garety et al., 2001).

Most of the background variables were associated with at least one PLE. Both presence of a neurotic disorder and non-white ethnicity where the strongest of the risk variables. These results provide support for the social defeat hypothesis (Selten, van der Ven, Rutten & Cantor-Graae, 2013) which suggests that experiences characterised by outsider status and feelings of discrimination and subordination are risk factors for psychosis.

**Limitations**

Firstly, as this was a cross-sectional study, causal inferences cannot be drawn from the results obtained. Associations between social isolation, PLEs and the risk variables can be observed, however, temporal order cannot be established. Future research, using prospective analysis, is recommended to clarify the relationship between these variables. While the use of secondary
data allowed for a large, nationally representative sample, certain variables of interest, such as urbanicity could not be investigated as a risk factor.

Also, a single-item measure of loneliness was not ideal. The study could be improved by using a validated multiple-item measure which would allow for more clarity in regards to the chronicity of loneliness. However, the item used in this study has been used in previous loneliness-based research (Meltzer et al., 2013) and the categorisation of lonely respondents as only those who endorsed feeling lonely ‘very much’ may have assisted in the accuracy of the profiling of loneliness. Due to the inflated endorsement of the mania item, it was omitted from the analysis. The inclusion of a reliable and accurate measure of mania would have allowed for a broader range of psychosis symptomology to be investigated.

Clinical implications

The findings of this study may have important clinical implications. There is a lack of interventions targeting loneliness and social interaction difficulties for people with psychosis (Anderson, Laxhman & Priebe, 2015; Lim & Gleeson, 2014), despite it being a major difficulty in their lives (Stain et al., 2012). Psychotic disorder is characterised, not only, by recurrent episodes and symptoms but also by social adversity, isolation, poverty, homelessness, prejudice, stigma and social exclusion (Thornicroft, 2006). Therefore, in light of current findings it would seem that the importance of social interventions that strive to promote recovery (in terms of access to work, education, recreation, independent accommodation/housing, and reduced stigma, and improved access to meaningful activities) are all the more important. Finally, the risk profiles presented may aid clinicians in identifying those at risk of PLEs and highlight the importance of assessing for the presence of social isolation indicators in this group. In particular, clinicians should be aware that service
users lacking in communication with others and without close relationships may be particularly vulnerable to experiencing paranoia.

**Conclusion**

In conclusion, this was the first known study to model social isolation using LCA and analyse its associations with PLEs in a general population sample. Two socially isolated classes emerged which were distinct in relation to their living arrangements, number of close friends and, particularly, communication patterns. Consistent with the SDA hypothesis, these classes were associated with PLEs; primarily paranoia. The findings merit further investigation and suggest that the SDA hypothesis may indeed constitute an alternative and plausible model for interpreting experiences of psychosis. These results further emphasise the complexity of social isolation and its possible impact on the development of subclinical psychotic experiences. Further research, using a prospective data, is recommended in order to better understand the relationship between social isolation and psychosis/PLEs.
References


Table 1. Descriptive statistics for PLEs, social isolation items and background variables

<table>
<thead>
<tr>
<th>PSQ Items</th>
<th>Overall count (%)</th>
<th>Male count (%)</th>
<th>Female count (%)</th>
<th>$\chi^2$ (df), $p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thought interference/control: people find it hard to believe</td>
<td>77 (1.0)</td>
<td>37 (1.2)</td>
<td>40 (1.0)</td>
<td>0.75 (1), $p &gt; 0.05$</td>
</tr>
<tr>
<td>Paranoia: plotting – serious harm/injury</td>
<td>125 (1.7)</td>
<td>67 (2.1)</td>
<td>58 (1.4)</td>
<td>5.62 (1), $p &lt; 0.05$</td>
</tr>
<tr>
<td>Strange experiences: people find it hard to believe</td>
<td>239 (3.2)</td>
<td>109 (3.4)</td>
<td>130 (3.1)</td>
<td>0.59 (1), $p &gt; 0.05$</td>
</tr>
<tr>
<td>Auditory/visual hallucinations</td>
<td>323 (4.4)</td>
<td>131 (4.1)</td>
<td>192 (4.6)</td>
<td>0.95 (1), $p &gt; 0.05$</td>
</tr>
<tr>
<td>Social Isolation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living arrangements: living alone</td>
<td>2099 (28.4)</td>
<td>835 (26.1)</td>
<td>1264 (30.1)</td>
<td>13.84 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Relationship status: never been in a relationship</td>
<td>153 (2.1)</td>
<td>88 (2.8)</td>
<td>65 (1.6)</td>
<td>13.09 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Communication: no communication in past week</td>
<td>320 (4.3)</td>
<td>178 (5.7)</td>
<td>142 (3.4)</td>
<td>22.24 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>No close friends</td>
<td>503 (6.8)</td>
<td>238 (7.6)</td>
<td>265 (6.4)</td>
<td>4.02 (1), $p &lt; 0.05$</td>
</tr>
<tr>
<td>No close relatives</td>
<td>345 (4.7)</td>
<td>187 (5.9)</td>
<td>158 (3.8)</td>
<td>18.07 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Loneliness: very much</td>
<td>259 (3.5)</td>
<td>95 (3.0)</td>
<td>164 (3.9)</td>
<td>4.59 (1), $p &lt; 0.05$</td>
</tr>
<tr>
<td>Background Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (No qualifications)</td>
<td>2117 (28.6)</td>
<td>789 (24.9)</td>
<td>1328 (31.8)</td>
<td>41.86 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Ethnicity (Non-white)</td>
<td>546 (7.4)</td>
<td>258 (8.1)</td>
<td>288 (6.9)</td>
<td>4.10 (1), $p &lt; 0.05$</td>
</tr>
<tr>
<td>Neurotic disorder</td>
<td>1275 (17.2)</td>
<td>420 (13.1)</td>
<td>855 (20.3)</td>
<td>65.88 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Cannabis use</td>
<td>1437 (19.4)</td>
<td>752 (23.7)</td>
<td>685 (16.4)</td>
<td>61.28 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Alcohol problem</td>
<td>1603 (21.7)</td>
<td>1003 (31.4)</td>
<td>600 (14.3)</td>
<td>313.15 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Traumatic event</td>
<td>3086 (41.7)</td>
<td>1400 (45.0)</td>
<td>1686 (41.2)</td>
<td>10.78 (1), $p &lt; 0.001$</td>
</tr>
<tr>
<td>Institution</td>
<td>213 (2.9)</td>
<td>109 (3.4)</td>
<td>104 (2.5)</td>
<td>5.73 (1), $p &lt; 0.05$</td>
</tr>
<tr>
<td>Care</td>
<td>167 (2.3)</td>
<td>77 (2.4)</td>
<td>90 (2.2)</td>
<td>0.62 (1), $p &gt; 0.05$</td>
</tr>
<tr>
<td>Homeless</td>
<td>286 (3.9)</td>
<td>134 (4.2)</td>
<td>152 (3.6)</td>
<td>1.66 (1), $p &gt; 0.05$</td>
</tr>
</tbody>
</table>
Table 2. Fit statistics for LCA of social isolation items

<table>
<thead>
<tr>
<th>Classes</th>
<th>Log-likelihood</th>
<th>AIC</th>
<th>BIC</th>
<th>ssaBIC</th>
<th>Entropy</th>
<th>LRT, p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-9556.584</td>
<td>19125.167</td>
<td>19166.625</td>
<td>19147.559</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-9344.674</td>
<td>18715.348</td>
<td>18805.173</td>
<td>18763.862</td>
<td>0.51</td>
<td>417.131, p &gt; 0.05</td>
</tr>
<tr>
<td>3</td>
<td>-9294.489</td>
<td>18628.978</td>
<td>18767.171</td>
<td>18703.615</td>
<td>0.78</td>
<td>98.786, p &gt; 0.05</td>
</tr>
<tr>
<td>4</td>
<td>-9286.273</td>
<td>18626.546</td>
<td>18813.107</td>
<td>18727.306</td>
<td>0.87</td>
<td>16.172, p &gt; 0.05</td>
</tr>
<tr>
<td>5</td>
<td>-9279.297</td>
<td>18626.595</td>
<td>18861.523</td>
<td>18753.478</td>
<td>0.89</td>
<td>13.731, p &gt; 0.05</td>
</tr>
<tr>
<td>6</td>
<td>-9277.152</td>
<td>18636.304</td>
<td>18919.600</td>
<td>18789.310</td>
<td>0.90</td>
<td>4.223, p &gt; 0.05</td>
</tr>
</tbody>
</table>

AIC Akaike information criterion, BIC Bayesian information criterion, ssaBIC sample size-adjusted BIC, LRT Lo-Mendell-Rubin adjusted likelihood ratio test
Figure 1. LCA profile plot displaying class response probabilities to social isolation indicators
Table 3. Odds ratios for latent class and background risk variables predicting PSQ item endorsement

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Thought Interference</th>
<th>Paranoia</th>
<th>Strange Experiences</th>
<th>Hallucinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>0.79 (0.44-1.43)</td>
<td>0.74 (0.44-1.25)</td>
<td>1.05 (0.69-1.59)</td>
<td>1.08 (0.83-1.40)</td>
</tr>
<tr>
<td>Age</td>
<td>1.03** (1.01-1.06)</td>
<td>0.97** (0.96-0.99)</td>
<td>1.01* (1.00-1.03)</td>
<td>0.99** (0.98-1.00)</td>
</tr>
<tr>
<td>Neurotic Disorder</td>
<td>1.06 (0.58-1.92)</td>
<td>1.16 (0.71-1.91)</td>
<td>2.49*** (1.62-3.82)</td>
<td>2.86*** (2.10-3.88)</td>
</tr>
<tr>
<td>Cannabis Use</td>
<td>0.97 (0.46-2.05)</td>
<td>0.58 (0.33-1.01)</td>
<td>0.72 (0.44-1.18)</td>
<td>0.74 (0.52-1.04)</td>
</tr>
<tr>
<td>Drink Problem</td>
<td>1.18 (0.63-2.22)</td>
<td>1.25 (0.76-2.08)</td>
<td>1.18 (0.75-1.87)</td>
<td>1.47** (1.10-1.96)</td>
</tr>
<tr>
<td>Trauma</td>
<td>1.43 (0.77-2.66)</td>
<td>1.21 (0.69-2.13)</td>
<td>0.91 (0.59-1.39)</td>
<td>2.44*** (1.83-3.25)</td>
</tr>
<tr>
<td>Institution</td>
<td>1.46 (0.39-5.50)</td>
<td>2.42 (0.88-6.63)</td>
<td>1.25 (0.41-3.76)</td>
<td>2.38* (1.11-5.12)</td>
</tr>
<tr>
<td>Care</td>
<td>0.59 (0.12-2.96)</td>
<td>0.63 (0.20-1.99)</td>
<td>2.07 (0.61-7.03)</td>
<td>0.46 (0.18-1.21)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>3.98** (1.64-9.63)</td>
<td>2.63** (1.35-5.15)</td>
<td>0.96 (0.50-1.85)</td>
<td>0.73 (0.42-1.26)</td>
</tr>
<tr>
<td>Qualifications</td>
<td>1.96 (0.99-3.89)</td>
<td>0.79 (0.38-1.66)</td>
<td>1.98** (1.21-3.24)</td>
<td>1.17 (0.83-1.63)</td>
</tr>
<tr>
<td>Homeless</td>
<td>1.42 (0.60-3.37)</td>
<td>2.40** (1.25-4.59)</td>
<td>0.73 (0.38-1.40)</td>
<td>1.68* (1.04-2.72)</td>
</tr>
<tr>
<td>Class 1</td>
<td>1.99* (1.02-3.87)</td>
<td>3.30*** (1.79-6.09)</td>
<td>0.89 (0.47-1.69)</td>
<td>0.91 (0.55-1.50)</td>
</tr>
<tr>
<td>Class 2</td>
<td>0.70 (0.19-2.55)</td>
<td>8.61*** (3.08-24.09)</td>
<td>1.31 (0.53-3.23)</td>
<td>1.93* (1.15-3.23)</td>
</tr>
</tbody>
</table>

*OR* odds ratio; *p* < 0.05; **p* < 0.01; ***p* < 0.001