The impact of the first UK COVID-19 lockdown on presentations with psychosis to mental health services for older adults: An electronic health records study in South London

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Abstract

Objectives: Social distancing restrictions in the COVID-19 pandemic may have had adverse effects on older adults’ mental health. Whereby the impact on mood is well-described, less is known about psychotic symptoms. The aim of this study was to compare characteristics associated with psychotic symptoms during the first UK lockdown and a pre-pandemic comparison period.

Methods: In this retrospective observational study we analysed anonymised records from patients referred to mental health services for older adults in South London in the 16-week period of the UK lockdown starting in March 2020, and in the comparable pre-pandemic period in 2019. We used logistic regression models to compare the associations of different patient characteristics with increased odds of presenting with any psychotic symptom (defined as hallucinations and/or delusion), hallucinations, or delusions, during lockdown and the corresponding pre-pandemic period.

Results: 1991 referrals were identified. There were fewer referrals during lockdown but a higher proportion of presentations with any psychotic symptom (48.7% vs. 42.8%, p = 0.018), particularly hallucinations (41.0% vs. 27.8%, p < 0.001). Patients of non-White ethnicity (adjusted odds ratio (OR): 1.83; 95% confidence interval (CI): 1.13–2.99) and patients with dementia (adjusted OR: 3.09; 95% CI: 1.91–4.99) were more likely to be referred with psychotic symptoms during lockdown. While a weaker association between dementia and psychotic symptoms was found in the pre-COVID period (adjusted OR: 1.55; 95% CI: 1.19–2.03), interaction terms indicated higher odds of patients of non-White ethnicity or dementia to present with psychosis during the lockdown period.

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Conclusions: During lockdown, referrals to mental health services for adults decreased, but contained a higher proportion with psychotic symptoms. The stronger association with psychotic symptoms in non-White ethnic groups and patients with dementia during lockdown suggests that barriers in accessing care might have increased during the COVID-19 pandemic.

**KEYWORDS**
COVID-19, delusions, dementia, hallucinations, lockdown, non-white ethnicity, older adults, psychosis

**Key points**
- Referrals to mental health of older adult services during lockdown were a third of the pre-pandemic period, but the proportion with any psychotic symptom was higher.
- Non-White ethnicity was associated with any psychotic symptom during the lockdown, but not in the pre-COVID comparison period.
- A referral with a diagnosis of dementia was more likely to be associated with any psychotic symptom, predominantly hallucinations, during the lockdown period.
- Inequalities in access to care, already present before the pandemic, may have been exacerbated during lockdown, leading to fewer referrals and more severe presentations with psychosis.

1 | INTRODUCTION

Social distancing restrictions implemented by countries around the world to reduce the spread of coronavirus disease 2019 (COVID-19) have been found to be associated with deteriorating mental health of the general population. The effects might have an even higher impact on older people for a number of reasons, including fear related to higher morbidity and mortality, reduction in already restricted means of socialising (e.g., closed community centres or places of worship), and difficulties in accessing modern technologies to remain in contact with relatives.

Evidence has already emerged of an increase in affective symptoms in older adults during the pandemic, particularly in those living alone and therefore perhaps more vulnerable to the impact of social distancing measures. However, little is known about how lockdown affects psychotic symptoms in the older adult population.

A number of features of the lockdown may increase the risk of developing or exacerbating a psychotic illness. High perceived stress, as a result of fears generated during the pandemic, can be an important risk factor for both triggering and exacerbating psychotic symptoms. In addition, lockdown has been associated with social isolation and loneliness and several case reports have described new onset psychosis in older adults attributed to social isolation.

Given the complexities of diagnosing and treating late-life psychosis, understanding the impact of the pandemic on the older adult population is essential to inform care. Although for many countries social distancing measures have been stopped, for others, they remain a part of life. We sought to understand this subject further through analysing data on routine referrals to mental health of older adult services (MHOA) of a large mental health trust during the first UK lockdown and before the pandemic.

2 | METHODS

2.1 | Data source

We carried out a retrospective observational study using anonymised electronic healthcare records from the South London and Maudsley NHS Foundation Trust (SLaM). SLaM is one of the largest specialist mental healthcare providers in Europe, serving a population of approximately 1.36 million residents across four South London boroughs (Lambeth, Lewisham, Croydon, and Southwark). SLaM’s de-identified electronic health records can be accessed for research purposes via the Clinical Record Interactive Search (CRIS) platform. CRIS was developed in 2007–2008, has supported over 250 publications, and is approved by the Oxford Research Ethics Committee C (reference 18/SC/0372) as a database for secondary analysis. Data are extracted both from structured fields and from free text (e.g., clinical case notes, correspondence), the latter through natural language processing (NLP) algorithms developed using General Architecture for Text Engineering (GATE) software.

2.2 | Study sample

All accepted referrals to SLaM’s older adult community and general hospital liaison services were identified during the first UK COVID
lockdown (16/3/2020-5/7/2020, 16 weeks) and the equivalent period in the preceding year (18/03/2019-7/7/2019, 16 weeks). Date of referral was defined as index date for definition of patient characteristics.

2.3 | Outcomes: Psychotic symptoms

The primary outcome variable was the presence of psychotic symptoms around the index date (maximum of 6 months before or after) in the electronic health record. We ascertained whether patients presented with either hallucinations (regardless of whether patients also had delusions), delusions (regardless of whether patients also had hallucinations), or both (referred to as any psychotic symptom) using NLP to identify documentation of these symptoms from free text. The NLP algorithm has previously been evaluated and in a random sample of 100 health-care documents, whereby high accuracy in identifying delusions (pre-annotated documents: precision = 90%; un-annotated documents: precision = 93%, recall 85%) and hallucinations (pre-annotated documents: precision = 90%; un-annotated documents: precision = 84%, recall = 98%) was demonstrated.

2.4 | Factors potentially associated with psychosis

We additionally extracted data on a number of clinical and sociodemographic characteristics, including age at referral, gender, and ethnicity (dichotomised to White and non-White). We further characterised the presence of the following mental health diagnoses according to ICD-10 criteria closest to the index date: dementia (F00-F03), psychotic illness (F20-29), affective disorder (F30-F39), and delirium (F05).

The presence and severity of clinical symptoms related to the referral, including mental and physical health problems and functional difficulties, were estimated from the Health of the Nation Outcome Scales (HoNOS) which are routinely completed in SLaM patients. HoNOS items we included in our analysis were the mental health problems of agitated behaviour, non-accidental self-injury, problematic substance or alcohol use, cognitive difficulties, depressed mood, physical illness/disability, as well as functional impairment, reflected in difficulties with activities of daily living (ADL), problems with relationships (social impairment), problems with living condition, and problems with daytime activities. These subscales are rated from 0 (no problem) to 4 (severe or very severe problem). We dichotomised these scores to define binary variables: 0-1, ‘minor or no problems’ and 2-4, ‘mild to severe problems’.

Through established NLP algorithms we further identified whether patients were living alone, experiencing disturbed sleep and were prescribed psychotropic medications (antidepressants, antipsychotics, mood stabilisers or sedative medications) within a window from 6 months before or to 6 months after referral.

2.5 | Statistical analysis

All statistical analyses were carried out using STATA version 15 (StataCorp. 2017. Stata Statistical Software: Release 15. StataCorp LLC.). Initially, descriptive statistics were generated to compare those referred during lockdown and the corresponding pre-COVID period. Next, logistic regression models were assembled to investigate associations of sociodemographic characteristics, diagnosis (present vs. not present), mental or physical health problems, functional difficulties and pharmacotherapy as independent variables, and psychotic symptoms (any psychotic symptom, hallucinations, delusions) as the dependent variable, during lockdown and the corresponding pre-COVID period. For each time period we applied an unadjusted logistic regression model, and a model adjusted for age, gender, ethnicity, and diagnosis. Lastly, we calculated the interaction between the individual clinical characteristic and the presence of a lockdown in predicting the respective psychotic symptom. Because 36% of referrals had missing data on at least one covariate and we judged missingness to be at random, we generated 36 imputed datasets through replacing missing values with simulated values gathered from covariates and outcome values.

3 | RESULTS

We identified 1991 older adults with accepted referrals to the MHOA services within the first lockdown period (16/03/2020-05/07/2020) and comparable pre-COVID period (18/03/2019-07/07/2019) combined. Of these, 1455 (73%) occurred during the pre-COVID period and 536 (27%) during the lockdown period, indicating a significant drop in referrals in the early phase of the pandemic.

Table 1 summarises the demographic and clinical characteristics of the full sample and by each referral period. In the full sample the mean age (SD) at referral was 77.9 (±9.5) years and 56.9% of patients were female. While there were no significant differences in age and gender between the referral periods, the proportion from non-White ethnicity backgrounds, with dementia, and living alone were lower during the lockdown period. Patients referred during lockdown more frequently had a diagnosis of affective disorder or delirium. Agitated behaviour, non-accidental self-injury, disturbed sleep, physical health problems as well as impairments of social functioning were more common during lockdown, but no differences in problems with activities of daily living were found. Use of antipsychotics, antidepressants, mood stabilisers and sedative medications were all recorded in a significantly higher proportion of referrals during the lockdown period than the pre-COVID period.
In the full sample, any psychotic symptom was found in 44.4% of referrals. During the lockdown period there was a significantly higher percentage of referrals associated with any psychotic symptom (48.7%) than in the pre-COVID period (42.8%). There was no significant difference between the percentage of referrals with delusions in during the first UK lockdown compared with the pre-COVID period, but the proportion of referrals with hallucinations was about 50% higher in the lockdown compared to the pre-COVID period.

**TABLE 1** Sample characteristics of the full cohort, referrals during lockdown and the corresponding same period pre-COVID

| Characteristics                      | Full cohort (n = 1991) | Lockdown period (n = 536) | Pre-COVID period (n = 1455) | P-value*       |
|--------------------------------------|------------------------|---------------------------|-----------------------------|----------------|
| Socio-demographic status             |                        |                           |                             |                |
| Mean age at referral (SD)            | 77.9 (9.5)             | 78.4 (8.4)                | 77.7 (9.8)                  | 0.135          |
| Female gender (%)                    | 56.9                   | 54.9                      | 57.7                        | 0.261          |
| Non-White ethnicity (%)              | 28.4                   | 23.8                      | 30.0                        | 0.014          |
| Diagnosis                            |                        |                           |                             |                |
| Dementia (%)                         | 38.2                   | 31.2                      | 40.8                        | <0.001         |
| Psychotic illness (%)                | 6.5                    | 7.7                       | 6.1                         | 0.220          |
| Affective disorder (%)               | 15.3                   | 18.1                      | 14.3                        | 0.037          |
| Delirium (%)                         | 9.8                    | 14.9                      | 8.0                         | <0.001         |
| HoNOS symptoms/disorders             |                        |                           |                             |                |
| Agitated behaviour (%)               | 19.7                   | 26.3                      | 17.7                        | <0.001         |
| Non-accidental self-injury (%)       | 5.4                    | 9.0                       | 4.3                         | 0.001          |
| Problem-drinking or drug taking (%)  | 5.4                    | 7.0                       | 4.8                         | 0.108          |
| Cognitive problems (%)               | 56.1                   | 56.5                      | 56.0                        | 0.885          |
| Depressed mood (%)                   | 28.4                   | 31.8                      | 27.3                        | 0.096          |
| Physical illness or disability (%)   | 60.6                   | 65.8                      | 59.0                        | 0.022          |
| HoNOS functional problems            |                        |                           |                             |                |
| Activities of daily living (%)      | 52.0                   | 55.3                      | 50.9                        | 0.146          |
| Living conditions (%)                | 14.9                   | 22.0                      | 12.7                        | <0.001         |
| Daytime activities (%)               | 32.9                   | 39.4                      | 30.9                        | 0.003          |
| Social relationships (%)             | 21.0                   | 27.8                      | 18.8                        | <0.001         |
| Other contextual factors             |                        |                           |                             |                |
| Living alone (%)                     | 48.9                   | 41.6                      | 51.6                        | <0.001         |
| Disturbed sleep (%)                  | 53.3                   | 59.7                      | 50.9                        | 0.001          |
| Pharmacotherapy                      |                        |                           |                             |                |
| Antipsychotic (%)                    | 24.7                   | 35.5                      | 20.7                        | <0.001         |
| Antidepressant (%)                   | 45.8                   | 51.3                      | 43.7                        | 0.003          |
| Mood stabiliser (%)                  | 5.5                    | 7.8                       | 4.6                         | 0.005          |
| Sedative medication (%)              | 28.9                   | 39.6                      | 25.0                        | <0.001         |
| Psychotic symptoms                   |                        |                           |                             |                |
| Any psychotic symptom (%)            | 44.4                   | 48.7                      | 42.8                        | 0.018          |
| Hallucinations (%)                   | 31.4                   | 41.0                      | 27.8                        | <0.001         |
| Delusions (%)                        | 27.4                   | 30.2                      | 26.3                        | 0.083          |

* t-test or $\chi^2$ test.  
**At the time of referral.  
*In a 6 months’ window around referral date; Lockdown period is defined as 16/03/2020–05/07/2020; Pre-COVID period is defined as 18/03/2019–07/07/2019.
3.1 | Factors associated with any psychotic symptoms during the lockdown and pre-COVID periods

Table 2 shows regression models of patient characteristics associated with having any psychotic symptom (hallucinations, delusions, or both) in the lockdown and the comparable pre-COVID period, in unadjusted and adjusted logistic regression models.

In the adjusted model (adjusted for age, gender, ethnicity, and diagnosis), clinical characteristics associated with any psychotic symptom regardless of time period referred were: diagnosis of dementia, psychotic illness, affective disorder and delirium, the mental health symptoms of agitated behaviour and disturbed sleep, and the use of antipsychotic and sedative medication.

For three characteristics, interaction terms between lockdown and clinical characteristic were significant, indicating that associations with any psychotic symptom differed between the two time periods. Non-White ethnicity was only associated with any psychotic symptom during the lockdown, but not the pre-COVID period, and a referral with a diagnosis of dementia was more likely to be associated with any psychotic symptom during the lockdown than during the pre-COVID period. While antidepressant prescription was associated with any psychotic symptom during the pre-COVID period, this wasn’t the case during lockdown.

3.2 | Factors associated with hallucinations during the lockdown and pre-COVID periods

Table 3 shows patient characteristics associated with being referred to MHOA services with hallucinations. In summary, similar associations were observed to those with any psychotic symptom. Interaction terms with time period indicated that associations of hallucinations with non-White ethnic background and dementia diagnosis were stronger in the lockdown period, while those with affective disorder and antidepressant use were stronger in the pre-COVID period.

3.3 | Factors associated with delusions during the lockdown and pre-COVID periods

Table 4 shows patient characteristics associated with being referred with delusions specifically. In the adjusted model, the following factors were associated with delusions in both time periods: diagnoses of dementia and a psychotic illness, disturbed sleep, and the use of antipsychotic, mood stabilising and sedative medications. While affective disorders and delirium were associated with delusions only during the lockdown, but not the pre-COVID period, the interaction term was not significant. Significant interactions were found for ethnicity, living alone and disturbed sleep: stronger associations of non-White ethnicity and disturbed sleep with delusions during lockdown, but stronger associations of living alone with delusion pre-COVID.

4 | DISCUSSION

In this study we investigated characteristics associated with recorded psychotic symptoms in patients referred to South London older adult mental health services during the first COVID-19 lockdown, compared with the same period in the previous year. We found that the factors associated with any psychotic symptom in both the pre-pandemic and first lockdown period were a diagnosis of dementia, psychotic illness, affective disorder, delirium, agitated behaviour and disturbed sleep, as well as antipsychotic and sedative use. Certain patient characteristics were more likely to be associated with psychotic symptoms during lockdown than during the pre-COVID period. Non-White ethnicity showed a stronger association with any psychotic symptom, hallucinations and delusions during the lockdown period. A dementia diagnosis also showed a stronger association with any psychotic symptom and hallucinations during the lockdown period, and delusions were more strongly associated with disturbed sleep during this time. On the other hand, associations of hallucinations with affective disorders and antidepressant prescribing, and of delusions with living alone, were stronger in the pre-pandemic period.

Our finding that mental health services for older people had only 37% of the referrals during the first lockdown compared with the corresponding pre-pandemic period in 2019 is consistent with other studies showing a decrease in secondary mental health services referrals and in mental health presentations to primary care. While the drop in referrals to MHOA services led to a reduction in case-loads, the number of discharges remained stable during the first UK lockdown. This suggests that old age psychiatry services continued to support patients already under their care, but patients with new onset mental health difficulties could have been missed. Both the reduction in presentations with milder mental health problems to primary care and barriers to accessing mental health services for older people might have resulted in proportionally more presentations with psychosis, whereby the possible reasons for this are discussed in more detail below.

The observation that a larger proportion of referrals presented with psychosis, and in particular hallucinations, could have a number of reasons. Firstly, psychosis might be more likely to emerge in older adults during a pandemic and lockdown. Various causative factors for developing psychotic symptoms during this time have been proposed, including psychosocial stress, steroid use, viral exposure, and pre-existing vulnerabilities. Our finding of a 50% increase in hallucinations in referrals during lockdown is also consistent with reports that visual hallucinations have been one of the most common presentations to community teams for MHOA services during the COVID-19 pandemic. These visual hallucinations might be due to more rapidly advancing dementia in the context of a lockdown, due to less access to medical care and possibly untreated infections leading to delirium, or due to a reduction in cognitive stimulating activities such as meeting friends and family. Alternatively, hallucinations could have been caused by sensory deprivation resulting from the social isolation of lockdown. Moreover, psychotic
**TABLE 2**  Associations of demographics, mental and physical health problems, functioning, and pharmacotherapy with the presence of any psychotic symptom (hallucinations and/or delusions)

| Clinical characteristics | Unadjusted logistic regression models—Odds ratios (95% CI) | Adjusted logistic regression models—Odds ratios (95% CI) |
|--------------------------|---------------------------------------------------------|--------------------------------------------------------|
|                          | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) | Pre-COVID | Lockdown | Lockdown × characteristic interaction | P (interaction term) |
| Socio-demographic status* |           |          |                                          |                     |           |          |                                          |                     |
| Age above 78             | 1.03 (0.83–1.26) | 0.95 (0.68–1.34) | 0.93 (0.63–1.38) | 0.722       | 1.10 (0.88–1.38) | 0.89 (0.61–1.30) | 0.94 (0.62–1.41) | 0.762       |
| Female gender            | 0.93 (0.75–1.14) | 0.91 (0.65–1.28) | 0.98 (0.66–1.46) | 0.927       | 0.88 (0.71–1.09) | 0.96 (0.67–1.39) | 1.05 (0.69–1.59) | 0.818       |
| Non-White ethnicity      | 1.02 (0.79–1.31) | 2.00 (1.28–3.14) | 1.97 (1.18–3.26) | 0.009       | 0.89 (0.68–1.16) | 1.83 (1.13–2.99) | 2.13 (1.26–3.62) | 0.005       |
| Diagnosis                |            |          |                                          |                     |           |          |                                          |                     |
| Dementia                 | 1.02 (0.83–1.27) | 1.56 (1.08–2.25) | 1.52 (0.99–2.32) | 0.053       | 1.55 (1.19–2.03) | 3.09 (1.91–4.99) | 1.65 (1.07–2.54) | 0.024       |
| Psychotic illness        | 5.83 (3.44–9.90) | 11.19 (3.93–31.87) | 1.92 (0.59–6.20) | 0.276       | 8.23 (4.71–14.40) | 20.12 (6.73–60.17) | 1.90 (0.59–6.15) | 0.284       |
| Affective disorder       | 1.15 (0.86–1.54) | 0.89 (0.57–1.39) | 0.78 (0.46–1.32) | 0.353       | 1.56 (1.02–2.37) | 2.11 (1.23–3.62) | 0.80 (0.47–1.36) | 0.402       |
| Delirium                 | 1.06 (0.72–1.55) | 1.06 (0.66–1.71) | 1.01 (0.55–1.85) | 0.981       | 1.56 (0.27–1.64) | 2.44 (1.38–4.33) | 1.03 (0.56–1.90) | 0.931       |
| HoNOS symptoms/disorders* |           |          |                                          |                     |           |          |                                          |                     |
| Agitated behaviour       | 1.57 (1.16–2.12) | 1.92 (1.21–3.05) | 1.23 (0.72–2.10) | 0.453       | 1.46 (1.07–1.99) | 1.74 (1.05–2.88) | 1.25 (0.72–2.18) | 0.424       |
| Non-accidental self-injury | 1.00 (0.58–1.73) | 1.29 (0.63–2.65) | 1.28 (0.52–3.18) | 0.588       | 1.03 (0.59–1.82) | 1.71 (0.79–3.73) | 1.33 (0.53–3.29) | 0.543       |
| Problem-drinking or drug taking | 0.74 (0.42–1.29) | 0.70 (0.31–1.54) | 0.94 (0.38–2.36) | 0.900       | 0.64 (0.36–1.16) | 0.71 (0.29–1.73) | 1.06 (0.40–2.83) | 0.900       |
| Cognitive problems       | 0.91 (0.72–1.15) | 1.16 (0.79–1.71) | 1.28 (0.81–2.02) | 0.283       | 0.96 (0.73–1.27) | 1.02 (0.62–1.69) | 1.33 (0.83–2.13) | 0.242       |
| Depressed mood           | 0.94 (0.73–1.21) | 1.04 (0.68–1.60) | 1.10 (0.67–1.83) | 0.698       | 0.92 (0.69–1.23) | 1.29 (0.77–2.15) | 1.14 (0.68–1.92) | 0.625       |
| Physical illness or disability | 1.02 (0.81–1.28) | 1.15 (0.77–1.73) | 1.13 (0.71–1.80) | 0.596       | 1.03 (0.81–1.32) | 1.24 (0.79–1.94) | 1.16 (0.82–1.87) | 0.542       |
| HoNOS functional problems* |           |          |                                          |                     |           |          |                                          |                     |
| Activities of daily living | 1.21 (0.96–1.53) | 0.93 (0.61–1.40) | 0.77 (0.49–1.21) | 0.253       | 1.18 (0.92–1.51) | 0.90 (0.56–1.43) | 0.82 (0.51–1.31) | 0.404       |
| Living conditions        | 1.51 (1.08–2.12) | 1.24 (0.77–2.00) | 0.82 (0.46–1.47) | 0.509       | 1.35 (0.95–1.92) | 1.13 (0.67–1.91) | 0.85 (0.47–1.57) | 0.612       |
| Daytime activities       | 1.71 (1.34–2.18) | 1.22 (0.83–1.80) | 0.71 (0.45–1.13) | 0.149       | 1.63 (1.27–2.10) | 1.18 (0.76–1.82) | 0.75 (0.46–1.20) | 0.227       |
| Social relationships     | 1.49 (1.12–1.99) | 1.64 (1.05–2.57) | 1.10 (0.65–1.86) | 0.719       | 1.33 (0.98–1.79) | 1.51 (0.93–2.44) | 1.16 (0.67–2.00) | 0.590       |
| Other contextual factors* |           |          |                                          |                     |           |          |                                          |                     |
| Living alone             | 1.37 (1.11–1.69) | 1.22 (0.86–1.72) | 0.88 (0.59–1.33) | 0.565       | 1.47 (1.18–1.83) | 1.10 (0.76–1.60) | 0.76 (0.50–1.16) | 0.204       |
| Disturbed sleep          | 1.75 (1.42–2.15) | 2.70 (1.89–3.86) | 1.55 (1.02–2.34) | 0.040       | 1.73 (1.39–2.17) | 2.90 (1.94–4.33) | 1.49 (0.97–2.28) | 0.070       |
symptoms, including hallucinations, are associated with delirium and the increase observed here could represent an increase in patients referred with delirium from all causes. It could further possibly represent withdrawal states from alcohol use, which was observed to increase early in the pandemic in the UK population, particularly in older adults.

Absolute referral numbers and the proportion of patients with dementia referred to MHOA services decreased during lockdown. However, any psychotic symptoms, and hallucinations, and delusions were more likely to be associated with dementia during this period, suggesting that these symptoms played an important role in their pathway into care. Psychotic symptoms tend to increase with severity of dementia, though there are disease-specific fluctuations.

The association demonstrated here may reflect late presentations of dementia, caused by the reduction in access to timely dementia diagnoses and interventions, as memory services activity decreased during the pandemic. In addition, neuropsychiatric symptoms of dementia, including psychotic symptoms, are associated with carer burden and distress, and the presence of these symptoms specifically might have led to carers or patients seeking help from mental health services.

In our regression analyses, non-White ethnicity was more frequently associated with psychotic symptoms during lockdown, compared to the pre-COVID period, whereas this was more pronounced for any psychiatric symptom and delusions than for hallucinations. Ethnic minority groups have been disproportionately affected by the pandemic in terms of severe illness and mortality, which might also have an impact on their mental health outcomes. These higher levels of distress, in combination with an increased likelihood of a negative life event and financial concerns, are echoed in the UK where people from ethnic minorities have been more vulnerable to being socially isolated and lonely as a result of the lockdown, both of which have been associated with psychotic symptoms.

The association of non-White ethnicity with any psychotic symptom and delusions during lockdown may represent delayed referrals to MHOA services, leading to more severe presentations of mental illness, including psychotic symptoms.

### Table 2 (Continued)

| Clinical characteristics | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) | Pre-COVID period | Lockdown period | Lockdown × characteristic interaction | P (interaction term) |
|--------------------------|-----------|----------|---------------------------------------|---------------------|------------------|----------------|---------------------------------------|---------------------|
| Pharmacotherapy a         |           |          |                                       |                     |                  |                |                                       |                     |
| Antipsychotic            | 3.85 (2.93–5.05) | 5.00 (3.39–7.39) | 1.30 (0.81–2.09) | 0.277 | 3.09 (2.30–4.14) | 3.94 (2.40–5.96) | 1.38 (0.85–2.25) | 0.190 |
| Antidepressant            | 1.22 (0.99–1.50) | 0.84 (0.60–1.18) | 0.69 (0.46–1.03) | 0.067 | 1.30 (1.03–1.64) | 0.91 (0.62–1.33) | 0.65 (0.43–0.99) | 0.043 |
| Mood stabiliser          | 2.05 (1.24–3.38) | 1.79 (0.94–3.42) | 0.87 (0.39–1.98) | 0.745 | 1.94 (1.15–3.29) | 2.01 (0.99–4.07) | 0.88 (0.38–2.02) | 0.759 |
| Sedative medication       | 1.90 (1.50–2.42) | 2.34 (1.64–3.33) | 1.23 (0.80–1.88) | 0.350 | 1.91 (1.49–2.45) | 2.51 (1.70–3.70) | 1.20 (0.77–1.86) | 0.425 |

Note: Adjusted models are adjusted for age, gender, ethnicity and diagnosis; bold = p < 0.05.

a At the time of referral.

b In a 6 months’ window around referral date.
### TABLE 3  Associations of demographics, mental and physical health problems, functioning, and pharmacotherapy with the presence of hallucinations

| Clinical characteristics | Unadjusted logistic regression models—Odds ratios (95% CI) | Adjusted logistic regression models—Odds ratios (95% CI) |
|--------------------------|----------------------------------------------------------|--------------------------------------------------------|
|                          | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) |
| **Socio-demographic status**<sup>a</sup> | | | | | | | | |
| Age above 78 | 1.13 (0.90–1.42) | 0.98 (0.70–1.39) | 0.87 (0.58–1.32) | 0.521 | 1.23 (0.96–1.58) | 0.89 (0.61–1.30) | 0.87 (0.57–1.33) | 0.521 |
| Gender | 0.98 (0.78–1.23) | 0.84 (0.59–1.18) | 0.86 (0.56–1.30) | 0.466 | 0.93 (0.73–1.18) | 0.86 (0.60–1.25) | 0.88 (0.58–1.36) | 0.576 |
| Non-White ethnicity | 1.04 (0.80–1.37) | 1.75 (1.13–2.70) | 1.68 (1.01–2.78) | 0.045 | 0.98 (0.74–1.31) | 1.56 (0.98–2.48) | 1.74 (1.03–2.95) | 0.040 |
| **Diagnosis**<sup>a</sup> | | | | | | | | |
| Dementia | 0.95 (0.75–1.20) | 1.73 (1.20–2.51) | 1.82 (1.17–2.82) | 0.007 | 1.67 (1.22–2.29) | 3.42 (2.08–5.62) | 2.02 (1.29–3.17) | 0.002 |
| Psychotic illness | 3.84 (2.48–5.94) | 5.02 (2.41–10.47) | 1.31 (0.56–3.08) | 0.538 | 6.56 (4.00–10.75) | 9.52 (4.22–21.50) | 1.31 (0.56–3.10) | 0.534 |
| Affective disorder | 1.42 (1.04–1.94) | 0.78 (0.49–1.22) | 0.55 (0.31–0.95) | 0.032 | 2.47 (1.69–3.60) | 1.94 (1.10–3.42) | 0.55 (0.32–0.96) | 0.037 |
| Delirium | 1.59 (1.07–2.36) | 1.14 (0.71–1.84) | 0.72 (0.38–1.33) | 0.294 | 2.63 (1.67–4.15) | 2.38 (1.47–4.78) | 0.71 (0.38–1.34) | 0.292 |
| **HoNOS symptoms/disorders**<sup>a</sup> | | | | | | | | |
| Agitated behaviour | 2.06 (1.51–2.81) | 201 (1.27–3.18) | 0.98 (1.51–2.81) | 0.926 | 1.90 (1.38–2.62) | 1.74 (1.07–2.82) | 1.02 (0.59–1.76) | 0.940 |
| Non-accidental self-injury | 1.57 (0.89–2.74) | 128 (0.63–2.61) | 0.82 (0.33–2.03) | 0.667 | 1.59 (0.88–2.87) | 1.76 (0.81–3.80) | 0.87 (0.35–2.18) | 0.766 |
| Problem-drinking or drug taking | 1.08 (0.60–1.98) | 0.81 (0.35–1.88) | 0.75 (0.28–1.99) | 0.560 | 1.03 (0.55–1.94) | 0.82 (0.32–2.08) | 0.82 (0.29–2.33) | 0.715 |
| Cognitive problems | 0.99 (0.77–1.29) | 129 (0.87–1.91) | 1.30 (0.82–2.06) | 0.268 | 1.07 (0.79–1.46) | 1.06 (0.64–1.77) | 1.31 (0.81–2.12) | 0.269 |
| Depressed mood | 1.17 (0.89–1.54) | 111 (0.72–1.71) | 0.95 (0.57–1.59) | 0.842 | 1.15 (0.84–1.58) | 1.49 (0.90–2.47) | 0.98 (0.58–1.66) | 0.937 |
| Physical illness or disability | 1.64 (1.25–2.15) | 123 (0.81–1.86) | 0.75 (0.46–1.21) | 0.236 | 1.62 (1.22–2.15) | 1.32 (0.83–2.09) | 0.74 (0.45–1.23) | 0.246 |
| **HoNOS functional problems**<sup>a</sup> | | | | | | | | |
| Activities of daily living | 1.81 (1.39–2.35) | 106 (0.71–1.57) | 0.59 (0.37–0.93) | 0.023 | 1.71 (1.30–2.26) | 1.03 (0.66–1.59) | 0.62 (0.38–1.00) | 0.050 |
| Living conditions | 1.60 (1.11–2.30) | 117 (0.73–1.88) | 0.73 (0.41–1.32) | 0.304 | 1.45 (0.99–2.11) | 1.07 (0.64–1.79) | 0.76 (0.41–1.40) | 0.381 |
| Daytime activities | 1.84 (1.42–2.39) | 138 (0.93–2.06) | 0.75 (0.47–1.20) | 0.228 | 1.70 (1.30–2.24) | 1.32 (0.86–2.02) | 0.79 (0.49–1.28) | 0.336 |
| Social relationships | 1.85 (1.37–2.50) | 154 (0.99–2.40) | 0.83 (0.49–1.41) | 0.498 | 1.67 (1.22–2.29) | 1.39 (0.87–2.23) | 0.88 (0.51–1.52) | 0.644 |
| **Other contextual factors**<sup>b</sup> | | | | | | | | |
| Living alone | 0.74 (0.59–0.93) | 1.19 (0.84–1.69) | 1.61 (1.06–2.44) | 0.026 | 0.80 (0.63–1.01) | 1.08 (0.75–1.57) | 1.41 (0.92–2.17) | 0.118 |
| Disturbed sleep | 2.35 (1.85–2.99) | 323 (2.22–4.72) | 1.38 (0.88–2.15) | 0.162 | 2.39 (1.85–3.08) | 3.78 (2.48–5.76) | 1.38 (0.87–2.20) | 0.165 |
Other secondary findings from our study include the observation that patients referred during lockdown were less likely to be living alone compared with the pre-COVID period, and that an association of living alone with delusions was less likely during lockdown compared to the pre-COVID period. This is perhaps surprising as other studies have reported living alone as a major risk factor for developing negative mental health outcomes during social isolation.

A possible explanation for our finding is that individuals cohabiting are more likely to have family members aware of their mental health problems, will detect delusional beliefs, and encourage them to seek care. Further, lockdown was less likely to predict antidepressant use in those with any psychotic symptom or hallucinations, and less likely to predict an affective disorder in referrals with hallucinations. This might reflect a predominance of non-affective psychosis in the referrals received during lockdown or that those with depressive psychosis received during lockdown or that those with depressive psychosis might have been less easily reached/detected during the pandemic.

5 STRENGTHS, LIMITATIONS, AND FUTURE DIRECTIONS

To our knowledge, this is the first study analysing the impact of the first UK lockdown on factors associated with psychotic symptoms in older adults. While the main strength of our study is the use of in-depth clinical information from a sample of older adults referred to a large mental health and dementia care provider during the lockdown period, there are several limitations. Firstly, the observational nature of this study limits us from establishing causality between social distancing measures and factors associated with psychosis. Secondly, the study only included referrals to specialist mental healthcare, wherein patients with mental illness of a certain severity access them and these are not necessarily comparable to patients attending primary care. Thirdly, the substantial decrease in the number of referrals during the lockdown period may have affected the statistical power of analyses and our ability to find potential associations in this time period group, although this does not explain the stronger associations observed for some characteristics in the lockdown period compared to the pre-COVID period. Fourthly, the substantial decrease in the number of referrals during the lockdown period may have affected the statistical power of analyses and our ability to detect the statistical significance of potential associations in this time period group. Finally, the substantial decrease in the number of referrals during the lockdown period may have affected the statistical power of analyses and our ability to detect potential associations in this time period group.
# Table 4
Associations of demographics, mental and physical health problems, functioning, and pharmacotherapy with the presence of delusions

| Clinical characteristics                  | Unadjusted logistic regression models—Odds ratios (95% CI) | Adjusted logistic regression models—Odds ratios (95% CI) |
|------------------------------------------|----------------------------------------------------------|--------------------------------------------------------|
|                                          | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) | Pre-Covid | Lockdown | Lockdown × characteristic interaction | P (interaction term) |
| Socio-demographic status<sup>a</sup>     |           |          |                                              |                      |           |          |                                              |                      |
| Age above 78                             | 0.84 (0.67–1.06) | 0.80 (0.55–1.16) | 0.95 (0.62–1.48)                      | 0.836                | 0.94 (0.73–1.21) | 0.80 (0.53–1.21) | 0.96 (0.61–1.50)                      | 0.845                |
| Gender                                   | 0.89 (0.71–1.13) | 0.94 (0.65–1.35) | 1.05 (0.68–1.63)                      | 0.833                | 0.85 (0.67–1.09) | 1.07 (0.71–1.61) | 1.19 (0.75–1.88)                      | 0.450                |
| Non-White ethnicity                      | 1.30 (0.99–1.69) | 2.24 (1.43–3.50) | 1.73 (1.03–2.91)                      | 0.040                | 1.08 (0.82–1.44) | 2.09 (1.28–3.40) | 1.92 (1.11–3.32)                      | 0.020                |
| Diagnosis<sup>a</sup>                    |           |          |                                              |                      |           |          |                                              |                      |
| Dementia                                 | 0.97 (0.76–1.22) | 1.20 (0.81–1.78) | 1.24 (0.79–1.97)                      | 0.350                | 1.40 (1.02–1.89) | 2.68 (1.53–4.70) | 1.31 (0.81–2.10)                      | 0.269                |
| Psychotic illness                        | 5.99 (3.81–9.43) | 9.98 (4.64–21.48) | 1.67 (0.68–4.06)                      | 0.261                | 7.02 (4.26–11.56) | 17.3 (7.25–41.4) | 1.65 (0.68–4.04)                      | 0.271                |
| Affective disorder                       | 0.92 (0.66–1.29) | 1.04 (0.65–1.68) | 1.13 (0.63–2.02)                      | 0.684                | 1.27 (0.70–1.89) | 2.46 (1.32–4.59) | 1.16 (0.64–2.10)                      | 0.621                |
| Delirium                                 | 0.79 (0.51–1.25) | 0.80 (0.47–1.36) | 1.00 (0.50–2.02)                      | 0.999                | 1.15 (0.87–1.89) | 1.98 (0.06–2.83) | 1.00 (0.49–2.03)                      | 0.996                |
| HoNOS symptoms/disorders<sup>a</sup>     |           |          |                                              |                      |           |          |                                              |                      |
| Agitated behaviour                       | 1.15 (0.84–1.59) | 1.12 (0.71–1.77) | 0.97 (0.56–1.69)                      | 0.918                | 1.09 (0.78–1.53) | 0.98 (0.58–1.64) | 0.95 (0.53–1.61)                      | 0.857                |
| Non-accidental self-injury               | 0.59 (0.29–1.19) | 0.92 (0.44–1.93) | 1.56 (0.56–4.31)                      | 0.394                | 0.63 (0.31–1.29) | 1.10 (0.48–2.51) | 1.56 (0.55–4.41)                      | 0.403                |
| Problem-drinking or drug taking          | 0.52 (0.26–1.05) | 0.66 (0.28–1.57) | 1.25 (0.42–3.77)                      | 0.685                | 0.43 (0.21–0.89) | 0.66 (0.26–1.72) | 1.48 (0.47–4.68)                      | 0.504                |
| Cognitive problems                       | 0.89 (0.69–1.16) | 0.90 (0.59–1.35) | 1.01 (0.62–1.63)                      | 0.983                | 1.00 (0.74–1.36) | 0.89 (0.52–1.54) | 1.03 (0.62–1.71)                      | 0.916                |
| Depressed mood                           | 0.81 (0.61–1.08) | 0.89 (0.56–1.39) | 1.10 (0.65–1.85)                      | 0.733                | 0.81 (0.58–1.12) | 0.94 (0.55–1.61) | 1.12 (0.65–1.93)                      | 0.676                |
| Physical illness or disability           | 0.68 (0.52–0.87) | 0.79 (0.51–1.21) | 1.16 (0.70–1.93)                      | 0.552                | 0.69 (0.53–0.90) | 0.81 (0.50–1.31) | 1.18 (0.70–1.99)                      | 0.543                |
| HoNOS functional problems<sup>a</sup>    |           |          |                                              |                      |           |          |                                              |                      |
| Activities of daily living               | 0.85 (0.65–1.09) | 0.67 (0.43–1.05) | 0.80 (0.48–1.31)                      | 0.369                | 0.84 (0.63–1.10) | 0.65 (0.39–1.06) | 0.83 (0.50–1.40)                      | 0.483                |
| Living conditions                        | 1.16 (0.80–1.68) | 0.94 (0.56–1.59) | 0.81 (0.43–1.54)                      | 0.530                | 0.98 (0.66–1.45) | 0.81 (0.46–1.44) | 0.86 (0.44–1.70)                      | 0.662                |
| Daytime activities                       | 1.30 (0.99–1.71) | 0.75 (0.48–1.17) | 0.58 (0.34–0.96)                      | 0.036                | 1.25 (0.94–1.65) | 0.71 (0.44–1.16) | 0.60 (0.35–1.03)                      | 0.063                |
| Social relationships                     | 1.31 (0.96–1.80) | 1.36 (0.86–2.16) | 1.04 (0.60–1.81)                      | 0.890                | 1.12 (0.80–1.56) | 1.19 (0.72–1.98) | 1.11 (0.62–1.98)                      | 0.734                |
| Other contextual factors<sup>b</sup>     |           |          |                                              |                      |           |          |                                              |                      |
| Living alone                             | 2.24 (1.76–2.86) | 1.52 (1.05–2.21) | 0.68 (0.43–1.06)                      | 0.086                | 2.47 (1.91–3.18) | 1.38 (0.93–2.07) | 0.57 (0.36–0.91)                      | 0.017                |
| Disturbed sleep                          | 1.31 (1.04–1.66) | 2.38 (1.59–3.57) | 1.82 (1.14–2.90)                      | 0.012                | 1.26 (0.98–1.62) | 2.17 (1.39–3.38) | 1.70 (1.05–2.75)                      | 0.032                |
CONCLUSIONS

Our study showed that there was a higher percentage of referrals to MHOA services with any psychotic symptom and, in particular hallucinations, during lockdown. Associations of psychosis with non-White ethnicity and a dementia diagnosis were stronger and these factors were present in a lower proportion of those referred during lockdown. This indicates that inequalities in access to care already present before the pandemic might have been exacerbated during lockdown, leading to fewer referrals and more severe presentations, especially those with disabling symptoms of psychosis. In situations when social distancing is required, older adult mental health services need to ensure access to care for people with dementia and those from ethnic minority backgrounds and should be vigilant to the potentially higher risk of presenting with psychosis in such circumstances.

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CONFLICT OF INTEREST

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DATA AVAILABILITY STATEMENT

All relevant aggregate data are found within the paper. The data used in this work have been obtained from the Clinical Record Interactive Search (CRIS), a system that has been developed for use within the NIHR Mental Health Biomedical Research Centre (BRC) at the South London and Maudsley NHS Foundation Trust (SLaM). It provides authorised researchers with regulated access to anonymised information extracted from SLaM’s electronic clinical records system. Individual-level data are restricted in accordance to the strict patient led governance established at South London and The Maudsley NHS Foundation Trust, and by NHS Digital for the case of linked data. Data are available for researchers who meet the criteria for access to this restricted data: (1) SLaM employees or (2) those having an honorary contract or letter of access from the trust. For further details, and to obtain an honorary research contract or letter of access, contact the CRIS Administrator at cris.administrator@kcl.ac.uk.
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