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**Loneliness in older adult mental health services during the COVID-19 pandemic and before:
Associations with disability, functioning and pharmacotherapy**

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Declarations of interest:

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Key points:

1. During the first UK lockdown, the total number of referrals to MHOA services decreased, but the proportion experiencing loneliness increased
2. Loneliness was associated with symptoms of depression and psychosis, with relationship or functional difficulties, and with antidepressant prescribing across the whole study group
3. During lockdown, loneliness was associated with increasing risk-taking behaviour such as non-accidental self-injury and alcohol/drug use
4. The impact of future social distancing measures on the older adult population must be considered, with approaches to mitigate them being prioritised

Abstract:**Objectives:**

Loneliness is associated with psychiatric morbidity. Restrictions placed on the population during the first COVID-19 lockdown may have disproportionately affected older adults, possibly through increasing loneliness. We sought to investigate this by examining loneliness in referrals to mental health of older adults (MHOA) services during the first UK COVID-19 lockdown.

Methods:

Referrals to MHOA services from a large South London catchment area were identified for the 16-week period of the UK lockdown starting in March 2020, and for the corresponding period in 2019. A natural language processing algorithm identified loneliness in the patients' records. We applied logistic regression models adjusted for age, gender, ethnicity and diagnosis, to examine associations of loneliness in the study population.

Results:

1,991 referrals were identified, 56.9% of whom were female, with a mean age of 77.9 years. Only 26.9% occurred during the 2020 lockdown, but with a higher prevalence of loneliness (22.0 vs. 17.7%, $p = 0.028$). In the whole sample, loneliness was associated with non-accidental self-injury (Odds ratio (OR): 1.65), depressed mood (OR: 1.73), psychotic symptoms (OR: 1.65), relationship problems (OR: 1.49), problems with daytime activities (OR: 1.36), and antidepressant use (OR: 2.11). During lockdown, loneliness was associated with non-accidental self-injury (OR: 2.52), problem drinking or drug-taking (OR 2.33), and antidepressant use (OR 2.10).

Conclusions:

Loneliness is associated with more severe symptoms of affective illness, worse functional problems and increased use of antidepressant medication in older adults. During lockdown loneliness in referrals to MHOA services increased, and was associated with increased risk-taking behaviour. Loneliness is a potential modifiable risk factor for mental illness, and efforts to minimise it in older adults should be prioritised as we emerge from the pandemic.

Keywords:

Loneliness, Lockdown, Older adult, mental illness, COVID-19

Introduction:

Loneliness is described as a subjective feeling of distress caused by an individual's perception of a discrepancy between their actual and their desired social relationships¹. It is associated with a number of physical and mental health conditions, and in the UK is reported by approximately 15% of the population². Given the large numbers affected, understanding the relationship between loneliness and health is of increasing importance, as demonstrated by the UK Government's publication of a 'Loneliness Strategy' in 2018³.

Although loneliness can affect any age group, its impact on older adults is of particular concern⁴. Increased rates have been found in those aged over 65^{5,6} and in one study, 40% of those over the age of 60 reported feeling lonely⁷. For this population, being female, living alone, having social relationships of poor quality, and declining physical health, are risk factors for loneliness^{8,9}.

Loneliness has been linked with an increased risk of several mental health problems including depression^{10,11}, anxiety¹², psychosis¹³ and personality disorder¹ and in older adults and mental health service users, it has been associated with hospitalisation¹⁴⁻¹⁶. Although there is ample evidence of a relationship between loneliness and mental illness, understanding the nature of this has been hampered by the predominance of cross-sectional studies in this area. Recently, however, longitudinal studies have found evidence that loneliness predicts future depression¹⁷ and cognitive decline¹⁸.

On the 11th March 2020 the WHO announced that the COVID-19 outbreak was a pandemic¹⁹. In response, governments worldwide introduced physical limitations on social contact in an effort to restrict the spread of the virus. Within the UK, the government announced its first 'lockdown' on the 23rd March 2020, with the introduction of the 'stay at home' order²⁰. For a period of 16 weeks the population were advised to stay at home and keep physical social contact to a minimum. It has been suggested that this policy may have disproportionately affected older adults, increasing the risk factors associated with loneliness in this population^{21,22}.

Although in the UK, the roll out of vaccines has reduced the immediate threat of further lockdowns and attention has turned to how we live with the virus, elsewhere these policies remain in place. Whatever the local situation, it seems likely that periods of self-isolation and social distancing measures will be with us for the foreseeable future. As age remains amongst the most significant risk factors for COVID-19 disease severity and mortality²³, older adults will be particularly affected by any restrictions in the future. Understanding the relationship between lockdown, mental illness and loneliness during the pandemic, will not only inform the debate about the relationship between mental illness and loneliness in general, but also provide useful data to inform policy decisions regarding future measures to 'live with the

virus'. We sought to further understanding in this area through studying data on routine referrals to mental health of older adults (MHOA) services, in a large south London catchment area before and during the first covid-19 lockdown.

Methods:

Data source

We extracted data for this study using the South London and Maudsley NHS Foundation Trust (SLaM) Clinical Record Interactive Search (CRIS) platform. SLaM serves a population of over 1.4 million residents in Southeast London and is one of Europe's largest specialist healthcare providers for mental illness of all age groups, including dementia care. CRIS delivers research access to over 500,000 de-identified health records within a robust governance framework²⁴ and has ethical approval as an anonymized data resource (Oxford Research Ethics Committee C, reference 18/SC/0372). We extracted data from structured fields routinely in the source record, supplemented by a bespoke natural language processing (NLP) algorithm using General Architecture for Text Engineering (GATE) software²⁵ to obtain data from clinical documents (events, correspondence).

Study population & loneliness

We identified all accepted referrals to mental health of older people (MHOA) community services (community mental health teams, care home intervention teams, memory services), and general hospital older adult liaison psychiatry services during the first UK COVID lockdown (16/3/2020 – 5/7/2020, 16 weeks) and the corresponding period in the preceding year (18/03/2019 – 7/7/2019, 16 weeks). Only referrals, not accepted by a MHOA community team were excluded from the analysis. The date of referral served as the index date for all analyses. Data on loneliness is not routinely collected via structured assessments held within the health record. Instead, using a natural language processing algorithm¹⁶, we identified whether the patients referred were recorded as experiencing and/or reporting loneliness around the index date (maximum of 6 months before or after), within routine clinical documentation. The development of this machine-learning natural language processing algorithm has previously been described in detail¹⁶; in summary, the accuracy for identifying loneliness in a sample of 100 documents in the health record was high (precision = 87%, recall = 100%)²⁶.

Covariates and predictors

We ascertained age, gender, and ethnicity (dichotomised to White and non-White) as recorded at the index date. We identified the diagnosis given closest to index date in structured fields, supplemented by a free-text diagnosis. According to WHO ICD-10²⁷, we established the following diagnosis groups: dementia (F00-F03), psychotic disorder (F20-29), affective disorder (F30-F39), anxiety disorder (F40-F42) and adjustment disorder or stress reaction (F43).

We established mental and physical health problems, as well as functional difficulties, related to the referral using the Health of the Nation Outcome Scales (HoNOS65+), a routine structured instrument completed in UK mental health services²⁸. Each subscale is rated on a scale ranging from 0 (no problem) to 4 (severe or very severe problem) and to ease

interpretation, we dichotomised the scores to 'minor or no problems' (scores 0 or 1) and 'mild to severe problems' (scores 2 to 4). For example, on the non-accidental self-injury scale a score of '1' refers to 'fleeting thoughts of self-harm or suicide, but little or no risk' while a score of '4' refers to a 'Suicidal attempt or deliberate self-injury'. For the problem-drinking or drug use scale, a score of '1' is given for 'some over-indulgence, but within social norm, while a score of '3' indicates 'marked craving or dependence on alcohol or drug use with frequent loss of control, e.g. drunkenness'. In the functional scales, the 'problems with daytime activities' scale rates the quality of the daytime environment, for example whether there is help to cope with disabilities and opportunities to maintain skills²⁹.

We used an NLP algorithm to identify medications mentioned in the patient's record in a 6-month window before or after referral³⁰. We established recorded use of the following medication classes as binary variables: antipsychotics, antidepressants and mood stabilisers.

Analysis

Data were analysed using STATA 15 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC.) software. First, we generated descriptive statistics and compared those with and without loneliness. Then, using loneliness as the independent variable in logistic regression models, we assessed whether loneliness was associated with mental or physical health problems, functional difficulties and pharmacotherapy. Logistic regression models adjusted for age, gender, ethnicity and diagnosis were applied to the whole sample and to referrals accepted during the coronavirus lockdown and the corresponding period in the year before. As 37% of referrals had missing data on at least one covariate and we judged missingness to be at random, we generated 37 imputed datasets through replacing missing values with simulated values gathered from covariates and outcome values³¹.

Results:

We identified 1,991 accepted referrals to MHOA services across the two 16-week observation periods. Mean age (SD) was 77.9 (+/- 9.5) years and 56.9% were female. Of these 1,991 accepted referrals, 73.1% (n=1,455) occurred between 18th March to 7th July 2019 and 26.9% (n=536) between 16th March and 5th July 2020. In other words, MHOA services during the 2020 lockdown had 63.2% fewer referrals than in the same period in the year before. In the full sample, 38.2% (n=761) had a diagnosis of dementia, 6.5% (n=130) of a psychotic illness, 15.3% (n=305) of an affective disorder, 5.2% (n=103) of an anxiety disorder and 6.1% (n=122) of adjustment disorder. Loneliness was recorded in 18.8% (n=375) of all referrals, in 17.7% (n=257) of pre-pandemic referrals, and in 22.0% (n=118) of referrals during lockdown (p=0.028).

Patient characteristics are compared according to recorded loneliness status in Table 1. Patients with recorded loneliness were older and more likely to be female. Those with loneliness were also less likely to be diagnosed with dementia and more likely to have an affective, anxiety or adjustment disorder recorded. In terms of mental health symptoms, non-accidental self-injury, depressed mood and psychotic symptoms were more common in those with loneliness, and cognitive difficulties less likely. This was reflected in prescribing: patients with loneliness were more likely to be recorded as receiving an antipsychotic or antidepressant medication. In terms of functioning, those with loneliness were more likely to have relationship difficulties and problems with daytime activities.

Using logistic regression adjusted for age, gender, ethnicity and diagnosis (Table 2), across the whole sample loneliness was significantly associated with non-accident self-injury ((Odds ratio (OR): 1.86)), depressed mood (OR: 1.73) and psychotic symptoms (OR: 1.65), living conditions (OR: 1.42) problems with occupational/recreational activities (OR: 1.36) and social relationships (OR: 1.49) and antidepressant prescribing (OR: 2.11). Pre-pandemic there was no significant association of loneliness with non-accidental self-injury or living conditions. Factors loneliness was associated with during the lockdown period, were non-accidental self-injury (Odds ratio (OR): 2.52), problems drinking or drug taking (OR: 2.33) and antidepressant use (OR: 2.10). No significant association between loneliness and functional parameters was detected during the lockdown period.

Table 1: Sample characteristics by the presence of loneliness

Characteristics	Loneliness present (n=375)	No loneliness (n=1,616)	P-value ¹
Socio-demographic status and cognitive function²			
Mean age at referral (SD)	79.1 (8.9)	77.6 (9.6)	0.007
Female gender (%)	62.9%	55.5%	0.009
Non-White ethnicity (%)	26.7%	28.8%	0.465
Diagnosis (%)			
Dementia	31.5%	39.7%	0.003
Psychotic illness	7.7%	6.3%	0.295
Affective disorder	27.2%	12.6%	<0.001
Anxiety disorder	7.5%	4.6%	0.026
Adjustment disorder	10.1%	5.2%	<0.001
HoNOS symptoms/disorders (%)²			
Agitated behaviour	19.4%	19.8%	0.873
Non-accidental self-injury	10.2%	4.2%	<0.001
Problem-drinking or drug taking	6.9%	5.0%	0.176
Cognitive problems	47.0%	58.5%	<0.001
Depressed mood	44.6%	24.2%	<0.001
Psychotic symptoms	23.8%	17.2%	0.008
Physical illness or disability	63.5%	59.9%	0.255
HoNOS functional problems (%)²			
Activities of daily living	52.5%	51.9%	0.845
Living conditions	18.4%	14.0%	0.059
Daytime activities	40.5%	31.0%	0.002
Social relationships	27.3%	19.3%	0.002
Pharmacotherapy³			
Antipsychotic	29.1%	23.6%	0.028
Antidepressant	65.3%	41.2%	<0.001
Mood stabiliser	6.4%	5.3%	0.382

1 – t-test or chi² test; 2 - at the time of referral; 3 – in a 6 months' window around referral date;
HoNOS = Health of the Nation Outcome Scale (a score of 2-4 indicates a problem)

Table 2: Associations of loneliness with mental and physical health problems, functioning and pharmacotherapy in logistic regression models adjusted for age, gender, ethnicity and diagnosis

	Full sample (n=1,991)	Pre-COVID period (n=1,455) (18/02/2019-07/07/2019)	Lockdown period (n=536) (16/03/2020-05/07/2020)
HoNOS symptoms/disorders			
Agitated behaviour	1.33 (0.81-1.59)	1.09 (0.73-1.63)	1.15 (0.63-2.11)
Non-accidental self-injury	1.86 (1.10-3.15)	1.44 (0.71-2.92)	2.52 (1.14-5.56)
Problem-drinking or drug taking	1.55 (0.91-2.63)	1.14 (0.56-2.29)	2.33 (1.05-5.14)
Cognitive problems	0.86 (0.63-1.16)	0.86 (0.60-1.22)	0.82 (0.44-1.53)
Depressed mood	1.73 (1.28-2.34)	1.87 (1.30-2.68)	1.42 (0.82-2.46)
Psychotic symptoms	1.65 (1.18-2.32)	1.56 (1.03-2.37)	1.76 (0.97-3.19)
Physical illness or disability	0.94 (0.72-1.23)	1.04 (0.76-1.43)	0.73 (0.44-1.23)
HoNOS functional problems			
Activities of daily living	1.00 (0.77-1.29)	1.02 (0.75-1.39)	0.93 (0.57-1.49)
Living conditions	1.42 (1.00-1.99)	1.42 (0.93-2.16)	1.36 (0.77-2.41)
Daytime activities	1.36 (1.04-1.76)	1.42 (1.04-1.94)	1.20 (0.73-1.97)
Social relationships	1.49 (1.08-2.05)	1.49 (1.01-2.19)	1.45 (0.84-2.50)
Pharmacotherapy			
Antipsychotic	1.28 (0.97-1.69)	1.22 (0.85-1.75)	1.28 (0.81-2.03)
Antidepressant	2.11 (1.63-2.73)	2.10 (1.54-2.86)	2.10 (1.32-3.36)
Mood stabiliser	0.87 (0.52-1.44)	0.85 (0.44-1.64)	0.86 (0.39-1.89)

Bold = $p < 0.05$; HoNOS = Health of the Nation Outcome Scale (a score of 2-4 indicates a problem)

Discussion:

In this study we investigated associations of loneliness with patients' characteristics and prescribing in referrals to MHOA services during the first 2020 COVID lockdown in the UK, the same period in the previous year, and the combined sample. Loneliness in the whole cohort and pre-pandemic period was associated with depressed mood, psychotic symptoms, problems with daytime activities and social relationships, and antidepressant prescribing. During the lockdown, however, loneliness was only associated with non-accidental self-injury and problem drinking or drug taking, as well as antidepressant prescribing.

MHOA services for this provider only received about one third of the referrals during lockdown, compared to the year before. This echoes evidence of studies elsewhere, which have demonstrated a reduction in referrals to UK secondary mental health services during this period³² and is unsurprising given the overall reduction in mental health presentations recorded within primary care³³.

Reflecting previous studies on this topic⁹, loneliness across all referrals to MHOA services in this study was associated with female gender, older age and problems with social relationships. The relationship between gender and loneliness is complex. There is evidence that female gender is associated with loneliness when it is directly measured⁸. Conversely, when loneliness is indirectly examined, an association with male gender is found³⁴. Although the cause for this is unclear, it has been suggested that this may reflect a reluctance in men to disclose feelings of loneliness³⁵, which in turn may result in this being less likely recorded by clinical services.

Loneliness has been associated with cognitive decline and Alzheimer's dementia, and some studies have suggested a possible causal relationship between the two^{18,36}. Although loneliness is more commonly found in older adult women, there is evidence that loneliness has a greater negative impact on cognition in men³⁷. No such association was found here; loneliness was not associated with cognitive problems and was less likely to be present in those with a diagnosis of dementia. Evidence for an association between loneliness and cognition has come from general population cohorts, whereas our study specifically investigated patients referred to MHOA services. The lack of an association found here could be spurious and possibly reflect difficulties accessing services those living alone (therefore at increased risk of loneliness) with cognitive difficulties, might have experienced during the pandemic. Alternatively it may suggest that when patients with cognitive difficulties do present to MHOA services they are too impaired to express loneliness, or it may not be routinely assessed in these patients, representing a potential gap in the assessment process.

Despite the reduction in referrals, loneliness was more frequently recorded in those referred during lockdown. Although lockdown is likely to have increased objective social isolation, this is unlikely to be sufficient on its own to explain the increase in loneliness. In this study, although loneliness was associated with problems with social relationships (encompassing social isolation) and day time activities in the whole cohort and before the pandemic, this was not found during lockdown. This indicates that there is possibly something specific about lockdown that is associated with loneliness. By definition individuals experience loneliness when they view their social contacts to be inadequate to their needs¹, whereas social isolation is an objective measure of the number of social contacts one has. Indeed, not all those who have objectively fewer social contacts report loneliness³⁷.

Two features of the UK lockdown may have contributed to it being a specific risk factor for loneliness in this population. First, low levels of autonomy and control over social relationships can contribute to feelings of loneliness^{38,39}. The UK March 2020 lockdown is a classic example of this; it was a government-imposed restriction, required by law, which allowed little room for individual choice. An evolutionary theory of loneliness suggests that the distressing feelings of loneliness are designed to motivate individuals to seek and maintain social connections and relationships, as part of a feedback loop that supports the passing on of an individual's genes¹. Whilst fleeting experiences of this emotion can trigger adaptive responses, chronic experience of loneliness has been associated with maladaptive responses including hypervigilance and negative reinforcing cognitions, which result in further social withdrawal and loneliness¹. The restrictions imposed during the lockdown impede this feedback loop, potentially reinforcing negative cognitions, acting as a perpetuating factor for loneliness. Second, although the population as a whole was asked to 'stay at home'²⁰, many compensated for this through the use of information technology⁴⁰. Older adults however tend to be less able to access and use these tools⁴. In 2019 there were over 3 million older adults living alone^{41,40}. The unique situation of lockdown may have disproportionately affected this population, through limiting access to their usual social networks outside of the home, increasing perceptions of social isolation in comparison, perhaps, to those who live with others.

Loneliness in the whole cohort in this study, was associated with depressed mood, psychotic symptoms, increasing problems with daytime activities and social relationships and antidepressant prescribing. Longitudinal studies have suggested a causal relationship between loneliness and depression¹¹, and the association seen here may reflect the presentation of more severe depressive illness which includes psychotic symptoms and greater difficulties with daytime activities¹³. How this is mediated is unclear. It has been suggested that older adults lose certain skills required for social engagement and having a sense of belonging⁴², and this potentially mediates the relationship between loneliness and symptoms of depression. Others have suggested that loneliness is the mediator in a process by which self-stigma leads to more depressive symptoms, whereby people with mental illness

accept the negative stereotypes of mental illness and this not only results in negative views of themselves but also negative views of their relationships with others⁴³.

Loneliness was associated with non-accidental self-injury and problem drinking or drug taking during lockdown. Loneliness in general has been associated with poor health related behaviours including smoking, excess alcohol consumption and poor diet⁴⁴. Lockdown may have exacerbated these behaviours. Previous studies have found that both suicidal ideation and suicidal acts are associated with loneliness⁴⁵ and that social network size and social support have both been found to be protective against suicide⁴⁶. The limitations on accessing one's social support during this time may have contributed to the relationship found here. Previous evidence has demonstrated that in people with substance misuse problems, living alone and low levels of perceived social support, can predict suicidal acts⁴⁷.

Strengths, Limitations and Future Directions

The main strength of this study is the use of in-depth information on referrals to a large mental health and dementia care provider for older adults. With this in mind, the limitations for using routinely collected clinical data need to be considered. First, as the data for this study were gathered from clinical records, the documentation of any positive finding depends on what a patient chooses to report and what a clinician chooses to record, rather than being systematically ascertained as in prospective research cohorts. Consequently, this might have led to underreporting of loneliness pre-pandemic, as questions on this topic were not asked. In contrast during the pandemic, raised awareness in the general population of the importance of the subject, triggered by discussions in the media on the impact of lockdown, may have led to increased reports of loneliness. Second, there was a large reduction in the number of referrals during lockdown period and this may have affected the statistical power of analyses in this group and the potential associations seen. Third, the data set comprised all referrals to MHOA services from a number of different sources. Given the changes in the provision of healthcare during lockdown and the absolute reduction in referrals, the origin of referral may be an unanalysed confounder. Lastly, this is an observational study and as such we are unable to draw conclusions regarding causality. Longitudinal follow up to observe changes with ease of restrictions would be helpful.

Conclusions:

Loneliness in referrals to MHOA services was associated with symptoms of more severe mental illness, poorer functioning and increased use of antidepressant medication. The proportion of reported loneliness in referrals to MHOA services increased during lockdown. During lockdown, loneliness was possibly associated with increasing risk-taking behaviour such as non-accidental self-injury and alcohol or drug use, while we found no such association in the pre-COVID period. Addressing and preventing loneliness in this population should be a priority for both researchers and policy makers as we emerge from this pandemic. As

governments contemplate how we 'live with COVID', consideration needs to be taken of the impact of further social distancing measures on this already vulnerable population, with an emphasis on investigating interventions to mitigate against these.

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