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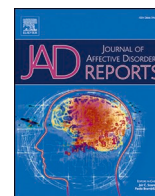
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Research Paper

Depression during the COVID-19 pandemic amongst residents of homeless shelters in France

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ABSTRACT

Background: Accumulating evidence suggests that the COVID-19 pandemic has negatively affected global mental health and well-being. However, the impact amongst homeless persons has not been fully evaluated. The ECHO study reports factors associated with depression amongst the homeless population living in shelters in France during the spring of 2020.

Methods: Interview data were collected from 527 participants living in temporary and/or emergency accommodation following France's first lockdown (02/05/20 – 07/06/20), in the metropolitan regions of Paris (74%), Lyon (19%) and Strasbourg (7%). Interviews were conducted in French, English, or with interpreters (33% of participants, ~20 languages). Presence of depression was ascertained using the Patient Health Questionnaire (PHQ-9).

Results: Amongst ECHO study participants, 30% had symptoms of moderate to severe depression (PHQ-9 \geq 10). Multivariate analysis revealed depression to be associated with being female (aOR: 2.15; CI: 1.26–3.69), single (aOR: 1.60; CI: 1.01–2.52), chronically ill (aOR: 2.32; CI: 1.43–3.78), facing food insecurity (aOR: 2.12; CI: 1.40–3.22) and participants' region of origin. Persons born African and Eastern Mediterranean regions showed higher levels of depression (30–33% of participants) than those migrating from other European countries (14%). Reduced rates of depression were observed amongst participants aged 30–49 (aOR: 0.60; CI: 0.38–0.95) and over 50 (aOR: 0.28; CI: 0.13–0.64), compared to 18–29-year-olds.

Limitations: These data are cross-sectional, only providing information on a given moment in time.

Conclusions: Our results indicate high levels of depression amongst homeless persons during the COVID-19 pandemic. Predicted future instability and economic repercussions could particularly impact the mental health of this vulnerable group.

1. Introduction

The instability and poor living conditions of both homeless people and migrants are known risk factors for depression, with rates higher than the general population (Foo et al., 2018; Guardia et al., 2017;

Hossain et al., 2020; Laporte et al., 2018). Although estimates vary considerably, studies have found the prevalence of depression within homeless populations to range from 11 to 58% (Fazel et al., 2008), with figures amongst migrants dependant on the host country (Lindert et al., 2009), time since arrival (Foo et al., 2018) and reason for departure

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(Heeren et al., 2014). Moreover, the number of homeless persons (INSEE and INED, 2012; Yaouancq and Duée, 2014) and the proportion of migrants amongst them (The Fondation Abbé Pierre, 2018; Roze et al., 2020) is increasing in France as in other European countries, with the forecasted economic recession following the pandemic likely to only accentuate this further (Flaming et al., 2021).

Unstable housing negatively impacts mental health both directly and indirectly. Influences extend from structural problems, such as crowding and poor lighting (Campagna, 2016; Liddell and Guiney, 2015; Lima et al., 2020), to social isolation and a lack of social support (Suglia et al., 2011), feelings of unsafety (Clark et al., 2008; Hernández, 2016; 2019), social stigma and a lack of control (Swope and Hernández, 2019). The relationship between homelessness and depression is also partly bidirectional, with mental health problems precipitating social exclusion and financial insecurity (Suglia et al., 2011). When combined with the challenges of migration, such as leaving family and loved ones, as well as difficulties in cultural integration which many migrants experience, even fewer supporting factors for good mental health remain (Pannetier et al., 2017).

Within the general population, mental health is of particular concern in the context of the COVID-19 pandemic, with research showing increased levels of depression (Fancourt et al., 2020; Jia et al., 2020; Shevlin et al., 2020; Vizard et al., 2020), anxiety (Sigdel et al., 2020), post-traumatic stress (Rossi et al., 2020) and sleep problems (Daly et al., 2020). Amongst homeless persons, risk factors for depression may have been exacerbated during the health crisis; however current available data on this issue are scarce. In the present study, we examine the prevalence of depression and associated risk factors amongst persons living in homeless shelters and temporary accommodation across the metropolitan areas of Paris, Lyon and Strasbourg during the spring of 2020, a large majority of whom were migrant.

2. Methods

2.1. Study design

The ECHO study is a cross-sectional investigation conducted from May to June (02/05/20 – 07/06/20) amongst persons living in temporary or emergency housing following the first lockdown period in France (17/03/2020 – 10/05/2020). During this period, the French Government actively housed persons residing on the street as a preventative measure against COVID-19, thereby providing a unique recruitment opportunity. Centres used for recruitment were located in the regions of Paris ($n = 12$), Lyon ($n = 5$) and Strasbourg ($n = 1$). Interviews were conducted both in person (98%) or by telephone (2%), in French, English or participants' chosen language, with the help of independent interpreters to minimise bias due to language barriers (33% of total sample). Over 20 languages were used, most frequently Arabic, Pashto and Dari. Participants were excluded if aged under 18 years, significantly inebriated or presenting cognitive disorders that prevented consent. The study protocol was approved by the Ethical Research Committee of the University of Paris (CER-2020-41).

2.2. Sample

Overall, the shelters used for recruitment were host to 929 persons, of which 669 were present and able to consent. Amongst those invited to participate, 80% (535) agreed to participate and 20% refused. Participants with insufficient depression (PHQ-9) data (1%) were also excluded from the following analyses.

2.3. Assessment of depression

To determine symptoms of depression, the nine-item Patient Health Questionnaire (PHQ-9), validated for use in multicultural settings (Arthurs et al., 2012; Huang et al., 2006), was used. Subjects were asked to

report the frequency of their symptoms over the preceding two weeks, rated via a 4-part Likert scale. Participants' depression score was calculated via the sum of responses to all nine items. As supported by previous literature (Manea et al., 2012), a cut-off score of 10 was used to define a depressed (PHQ-9 ≥ 10) group for subsequent analyses. Whilst the PHQ-9 does not provide a definitive diagnosis of depression, this cut-off score shows good predictive performance when compared to the structured clinical interview for DSM-IV (Udedi et al., 2019).

2.4. Relevant variables

Explanatory variables were selected based on review of the literature relevant to depression within homeless or migrant populations. Potential risk factors of depression included in the analyses were the following: age (18–29; 30–49; 50 years or more), sex (male; female), partnership status (stable partner; single), family status (no children; currently living with children; has children but living separately), highest completed education level, employment (none; only before lockdown; both before and during lockdown), region of origin based on the World Health Organization categories (World Health Organization, 2004) (Africa; Eastern Mediterranean; America; South-East Asian; Western Pacific; Europe excluding France; France), duration of stay in France (< 6 months; 6–12 months; 1–3 years; 3–5 years; 5+ years, including French natives), French language aptitude (low; moderate; fluent), administrative status (French native; residence permit holder; asylum seeker; no residence permit; other), health insurance (yes; no), chronic illness (yes; no), food insecurity (yes; no), feelings of safety (yes; no), exposure to theft or assault (yes; no), contact with friends/family (yes; no), and participants previous accommodation (other centre/association; unestablished shelter (e.g. camps, squats); street; friends/ family/ other).

French language aptitude was calculated from the sum score of self-reported French speaking, reading and writing ability, each rated on a 4-part Likert scale. Degree of loneliness was measured based on the UCLA loneliness scale (Hughes et al., 2004). In supplementary analyses, we aimed to describe associations between depression and worries surrounding: coronavirus in general; becoming ill; friends or family falling ill; social isolation; job insecurity; complications with administrative procedures; future uncertainty; and, if unwell, being rejected or being unable to receive treatment. Participants were also questioned on their willingness to cooperate with the following preventative measures: visiting a doctor; isolating if unwell; respecting another lockdown; and getting vaccinated.

2.5. Data analysis

The internal reliability between PHQ-9 questions was estimated via Cronbach's Alpha (Gliem and Gliem, 2003). To study associations between participants' characteristics and the likelihood of depression, generalised logistic regression models were used. Participants from American ($n = 6$), South-East Asian ($n = 5$), and Western Pacific ($n = 1$) regions were excluded due to insufficient sample size, resulting in a final sample of 515 participants. Variables relevant for inclusion in the multivariate statistical model were determined via univariate Chi-square (X^2) analysis, as supported by Hosmer and Lemeshow (2002; 2013). A 75% confidence limit was used, based on Bursac et al. (2008), to prevent the arbitrary exclusion of important variables (Bendel and Afifi, 1977; Mickey and Greenland, 1989). McFadden's Pseudo R^2 was also generated to show the respective fit of each variable (McFadden, 1973). Highly collinear variables were removed based on associations at 99% significance, and subsequently checked using Variance Inflation Factors (VIF) with a limit of VIF < 3. Additionally, centre type was included as a random effect in all models.

Missing covariate values were imputed using Multivariate Imputation by Chained Equations (MICE) (van Buuren and Groothuis-Oudshoorn, 2011). Post-hoc X^2 analysis was performed with

95% confidence intervals. All data analysis was performed on R Version 4.0.3.

3. Results

3.1. Demographics

Participants' demographic characteristics are shown in Table 1. Participants interviewed were primarily non-French (89%), male (76%), had been in France for less than 3 years (72%), were unemployed (71%), single or without a stable partner (61%), and scored low (vs moderate or high) on ratings for French language aptitude (54%). Roughly half (54%) of study participants had children, although only 19% were currently living with at least one them.

The severity of depression in the ECHO sample is shown in Fig. 1. Internal consistency between PHQ-9 questions was good ($\alpha = 0.82$). Less than half of participants (42%) showed no symptoms of depression, 28% had mild symptoms, 17% had moderate symptoms, 10% had moderately severe symptoms and 3% had severe symptoms.

3.2. Factors associated with depression

In binary analyses, characteristics associated with depression were being female ($p = 0.1$), young ($p < 0.05$), or without a stable partner ($p < 0.05$) and currently experiencing unemployment ($p = 0.2$), chronically ill ($p < 0.01$), food insecurity ($p < 0.001$) and feelings of unsafety ($p < 0.05$). Association was also seen for exposure to theft or assault since lockdown ($p < 0.05$), alongside participants region of origin ($p = 0.07$), administrative status ($p = 0.25$) and medical insurance status ($p < 0.05$).

Collinearity tests revealed significant associations between (a) administrative status and both employment and medical insurance, as well as (b) lack of safety and exposure to theft/assault. Therefore, only participants' administrative status and lack of safety were retained for the final model.

As shown in Table 2, in a multivariate regression model, being female (aOR: 2.15; 95% CI: 1.26–3.69), chronically ill (aOR: 2.32; 95% CI: 1.43–3.78), food insecure (aOR: 2.12; 95% CI: 1.40–3.22) or without a stable partner (aOR: 1.60; 95% CI: 1.01–2.52) were risk factors for depression. Lower rates of depression were seen amongst those aged 30–49 (aOR: 0.60; CI: 0.38–0.95) and 50+ (aOR: 0.28; 95% CI: 0.13–0.64), when compared to ages 18–29 years.

Compared to French participants, the rate of depression was significantly lower amongst non-French Europeans (aOR: 0.25; 95% CI: 0.08–0.75). Regarding administrative status, compared to persons who were French or had a residence permit, both asylum seekers (aOR: 1.41; 95% CI: 0.79–2.52) and participants without residence permits (aOR: 1.15; 95% CI: 0.61–2.16) had higher rates of depression, however neither were significant.

The estimated variance associated with the centre type ($n = 18$), was 0.01 +/- 0.07, suggesting a negligible effect on depression frequency.

3.3. Worries regarding the pandemic and depression

Associations between rates of depression and participants feelings surrounding the pandemic are shown in Supplementary Table 1. Participants with symptoms of depression had higher levels of worry surrounding coronavirus ($p < 0.001$), getting sick ($p < 0.01$), being rejected if sick ($p < 0.05$), future uncertainty ($p < 0.01$), isolation ($p < 0.001$), and access to treatment ($p < 0.05$) or friends and family ($p < 0.01$). Worries regarding administrative procedures ($p < 0.01$) were also seen amongst non-French participants. In comparison to the non-depressed group, depressed participants expressed greater reluctance towards respecting future lockdowns ($p < 0.01$).

Table 1

Characteristics of ECHO study participants according to depression status (PHQ-9 score ≥ 10). France, $n = 527$, May-June 2020. Chi-square, p-value and McFadden Pseudo R^2 .

	Non-depressed(%, n = 371)	Depressed(%, n = 156)	p	Pseudo R^2
Sex				
Male	72.3 (289)	27.8 (111)	0.10	0.00
Female	64.6 (82)	35.4 (45)		
Age				
18-29	65.1 (151)	34.9 (81)	*	0.01
30-49	72.3 (159)	27.7 (61)		
50+	81.3 (61)	18.7 (14)		
Partnership status				
No stable partner	67.1 (216)	32.9 (106)	*	0.06
Yes, has a stable partner	77.6 (142)	22.4 (41)		
Family status				
No children	71.0 (174)	29.0 (71)	0.75	0.09
Currently living with children	75.0 (75)	25.0 (25)		
Not living with children	71.9 (105)	28.1 (41)		
Highest education level				
No school/ incomplete primary education	72.1 (106)	27.9 (41)	0.48	0.02
Primary or high school education	72.0 (144)	28.0 (56)		
College/ Higher education	66.9 (113)	33.1 (56)		
Employment status				
Unemployed	69.4 (258)	30.6 (114)	0.20	0.05
Employed before lockdown	72.5 (74)	27.5 (28)		
Employed before and during lockdown	83.3 (30)	16.7 (6)		
Perceived food insecurity				
Food insecure	60.9 (123)	39.1 (79)	***	0.05
Not food insecure	76.8 (242)	23.2 (73)		
Accommodation before lockdown				
Other centre/charity	68.6 (70)	31.4 (32)	0.90	0.00
Unestablished shelter/squat	68.8 (88)	31.3 (40)		
Street	71.6 (154)	28.4 (61)		
Friends/family/other	72.0 (59)	28.0 (23)		
Region of birth				
French native	68.4 (39)	31.6 (18)	0.07	0.01
Africa	67.0 (135)	33.0 (66)		
Eastern Mediterranean ¹	70.4 (141)	29.6 (59)		
Europe (other than France)	86.0 (49)	14.0 (8)		
Other	58.3 (7)	41.7 (5)		
Administrative status				
French native	68.4 (39)	31.6 (18)	0.25	0.01
Residence permit	65.9 (93)	34.1 (27)		
Asylum seeker	77.5 (110)	22.5 (57)		
No residence permit	75.0 (92)	25.0 (43)		
Other	68.1 (33)	31.9 (11)		
Health status				
Chronic illness (yes)	61.2 (82)	38.8 (52)	**	0.04
Chronic illness (no)	73.8 (281)	26.2 (100)		
Healthcare				
Medically insured/ covered ²	73.1 (258)	26.9 (95)	*	0.01
Uninsured	64.7 (112)	35.3 (61)		
French aptitude (self-reported)				
Fluent	66.1 (76)	33.9 (39)	0.47	0.01
Moderate	73.0 (89)	27.0 (33)		
Low	71.2 (203)	28.8 (82)		
Duration of stay in France				
< 6 months	67.8 (101)	32.2 (48)	0.78	0.02
6 months - 1 year	73.6 (53)	26.4 (19)		
1 - 3 years	69.8 (74)	30.2 (32)		

(continued on next page)

Table 1 (continued)

	Non-depressed(% n = 371)	Depressed(% n = 156)	p	Pseudo R ²
3 - 5 years	66.0 (35)	34.0 (18)		
5+ years or French native	73.0 (100)	27.0 (37)		
Loneliness				
Currently lonely	63.2 (227)	36.8 (132)	***	0.06
Not currently lonely	85.9 (140)	14.1 (23)		
Loneliness since lockdown				
Increase in loneliness	59.3 (115)	40.7 (79)	***	0.04
No increase in loneliness	76.8 (252)	23.2 (76)		
Social contact				
In regular contact with friends and family	70.8 (323)	29.2 (133)	0.79	0.01
No contact with friends and family	69.2 (45)	30.8 (20)		
Safety				
Felt unsafe since lockdown	62.3 (96)	37.7 (58)	*	0.02
Has not felt unsafe since lockdown	73.4 (268)	26.6 (97)		
Exposure to crime				
Exposed to theft or assault since lockdown	67.7 (37)	32.3 (25)	*	0.04
No exposure to theft or assault	72.3 (324)	27.7 (124)		

¹ based on WHO categories (Organisation, 2004) (Eastern Mediterranean countries relevant to this sample: Afghanistan, Iran, Iraq, Libya, Morocco, Pakistan, Palestine, Saudi Arabia, Somalia, Sudan, Tunisia).

² Including State Medical Assistance (AME)for undocumented migrants. P-value scores: <0.05 = *; <0.01 = **; <0.001 = ***

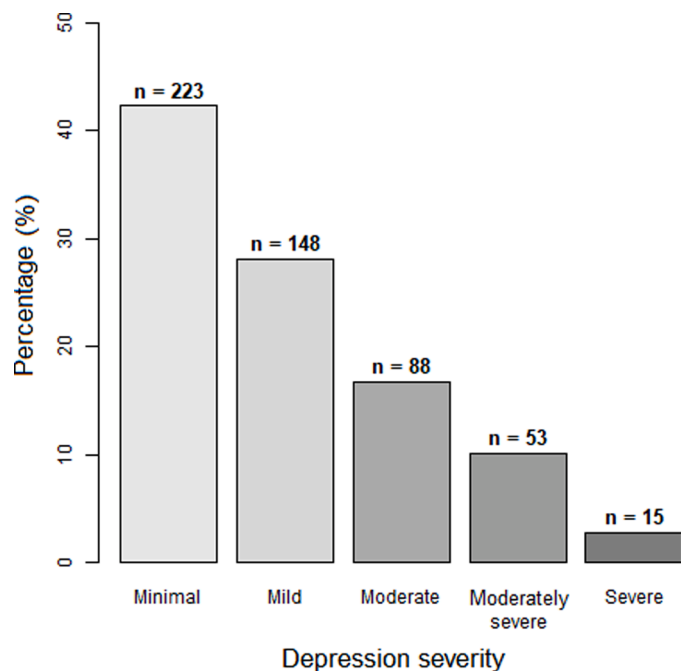


Fig. 1. The severity of depression amongst ECHO study participants during the Spring 2020 (n = 527), based on the Patient Health Questionnaire (PHQ-9). Depression categories: Minimal = 0-4; Mild = 5-9; Moderate = 10-14; Moderately Severe = 15-19; Severe 20-27.

4. Discussion

Within the ECHO study, consisting of homeless persons residing in temporary and/or emergency accommodation during the spring of 2020, 30% had moderate to severe depression. Associated risk factors

Table 2

Factors associated with depression (PHQ-9 ≥10) amongst adults living in temporary and/or emergency accommodation during the initial French lockdown period: ECHO, May-June 2020 (n = 515). Multivariate logistic regression

		n	aOR	CI
Sex	Male	391	1	
	Female	124	2.15	1.26-3.69
Age group	18-29	229	1	
	30-49	216	0.60	0.38-0.95
	50+	70	0.28	0.13-0.64
Partnership status	Has a stable partner	185	1	
	No stable partner	330	1.60	1.01-2.52
Chronic illness	No	384	1	
	Yes	131	2.32	1.43-3.78
Food insecurity	No	311	1	
	Yes	204	2.12	1.40-3.22
Region of origin	France	57	1	
	Africa	201	0.71	0.31-1.62
	Eastern Mediterranean ¹	200	0.70	0.30-1.63
	Europe (ex. France)	57	0.25	0.08-0.75
Administrative status	Residence permit ²	172	1	
	Asylum seeker	169	1.41	0.79-2.52
	No residence permit	131	1.15	0.61-2.16
	Other	43	0.98	0.40-2.35
Lack of safety	No	362	1	
	Yes	153	1.44	0.93-2.23

¹ Based on WHO categories (Organisation, 2004) (Eastern Mediterranean countries relevant to this sample: Afghanistan, Iran, Iraq, Libya, Morocco, Pakistan, Palestine, Saudi Arabia, Somalia, Sudan, Tunisia).

² Including French citizenship. aOR: Adjusted odds ratio; CI: 95% Confidence Interval.

for depression were being female, single, chronically ill or facing food insecurity. Moreover, persons who were French, or migrating from African or Eastern Mediterranean regions, had higher levels of depression than persons migrating from Europe. Depression was associated with multiple worries and reluctance towards future lockdowns. These findings highlight the frequency of mental health difficulties and the importance of mental health care amongst persons experiencing severe socioeconomic disadvantage, which should be accounted for in strategies aiming to address the impact of the COVID-19 pandemic in vulnerable groups. To our knowledge, this is one of the first studies on the prevalence of mental health difficulties amongst homeless persons in the context of the COVID-19 pandemic.

4.1. Limitations and strengths

Several limitations which may influence our findings must be acknowledged. Firstly, our study is cross-sectional, making it impossible to establish the longitudinal course of participants' depression or the duration of symptomatology. Thus, it may be that participants were already depressed prior to the pandemic. Further analyses using longitudinal samples are necessary to understand the chronology of mental health difficulties within this population, as well as the impact of homelessness on individuals' symptoms. Secondly, our study population is unrepresentative of France's total homeless population, consisting exclusively of those in temporary accommodation. Persons residing in alternative living situations, such as camps, squats, or the street, were not accounted for. Our findings may therefore disproportionately represent the prevalence of depression within this vulnerable population. Recruitment also consisted primarily of persons residing within two large cities (Paris and Lyon) and surrounding suburbs. Previous research has found increased loneliness during lockdown amongst adults living in urban areas compared to rural environments (Bu et al., 2020b). For this reason, the inclusion of other regions of France would have proven interesting, particularly non-urban areas.

Nevertheless, our sample is balanced and, although based on shelters expanded as a measure against the COVID-19 pandemic, includes persons who were sheltered for both short and long periods. The variety of

centres used for recruitment also provided a diverse range of family living situations compared to previous research, which has often focused on solely families (Roze et al., 2020; Vandentorren et al., 2016) or single persons (Roederer et al., 2021).

Another strong point of this study is the use of in-person interviews, which permitted the recruitment of those without access to a computer, smartphone, or internet connection. A key benefit to conducting interviews in person is the associated increase in participant response rate (Bowling, 2005) and the possibility to include participants with low literacy who could not complete self-reported questionnaires. Given the sensitive nature of some of the study questions, this study's low rate of missing data (1.3%) amongst variables used is commendable. Those with lower levels of education have been found to show higher rates of item non-response to health surveys, alongside males being less likely to respond to questions on depression (Tsiampalis and Panagiotakos, 2020); two factors in which this population saw a majority. The use of interpreters for those unable to respond in French or English is also likely to have greatly increased the inclusivity of our dataset. Finally, the ECHO questionnaire design benefitted from collaboration with the organisations managing the shelters included in our study.

4.2. Prevalence of depression

The rate of depression (30%) within the ECHO sample is higher than French national averages calculated within recent years (Gourier-Fr ery et al., 2011; L eon et al., 2018; Sapinho et al., 2008) alongside more global estimates (Murray et al., 2012; World Health Organization, 2017). However, research on the rate of depression amongst homeless populations shows figures both higher (Bassuk et al., 1998; Tinland et al., 2018) and lower (Laporte et al., 2018; Vandentorren et al., 2016) than in our study. These disparities may result from differences in methodology. For example, our data collection occurred mostly in Paris and surrounding regions (74% of participants), in which homelessness often results from a lack of affordable housing and is less reflective of severe poverty (Roze et al., 2020). And whilst a Parisian study on homeless mental health observed a depression prevalence of 57% (Rondet et al., 2013), their recruitment took place in a free healthcare clinic. As prior illness is a known risk factor for depression (Chandola et al., 2020; Goodwin, 2006), this elevated prevalence of depression is not surprising. In comparison, our study consisted of persons receiving accommodation after periods of exceptional adversity, considering that 65% of our sample were staying in a camp, squat, or on the street prior to lockdown. This may be reflected in the lower rate of depression. In support of this, depression in the general population during the COVID-19 pandemic was found to associate with living conditions (Ramiz et al., 2021).

Despite this, the rate of depression seen was still considerably higher than the French national average during lockdown (approximately 20%) (Sant eFrance, 2021). One could argue that the rate of depression in this population might simply demonstrate a brief, transient stage during this period of instability. However, even after treatment, the risk of relapse for depression is high, with research suggesting a 10–80% rate of recurrent episodes (dependant on depression severity) (Holma et al., 2008; Kessler and Bromet, 2013; Kumagai et al., 2019; K ohler et al., 2015; Limosin et al., 2004). Therefore, identifying the risk factors for depression within this population may not only alleviate suffering during equivalent periods of precariousness, but further improve the chance of mental stability in later life. Studies conducted during the pandemic also indicate changes to important predictors for depression; Within the French population, depression was seen to associate with increased alcohol consumption (Guignard et al., 2021) and anxiety (Andersen et al., 2021). These factors are likely to both increase vulnerability to depression and impair rehabilitation.

4.3. Migrant status

The rate of depression amongst French natives was similar to that of African and Eastern Mediterranean participants (32%, 33% and 30%, respectively), and higher than those migrating from Europe (14%). This was surprising, as previous research amongst homeless populations has found depression to be more prevalent amongst migrants than local residents (Rondet et al., 2013). Moreover, despite the “healthy migrant effect”, a recurrent finding that migrants often have better health than native residents (Puschmann et al., 2017), recent data also suggests that migrants may actually be more vulnerable to mental health problems than non-migrants (Aldridge et al., 2018). However, the causes for homelessness are also likely to vary between migrants and local residents. Our findings may then be explained by mental health difficulties increasing the likelihood of being homeless more so within native populations. Whether these rates are due to the pandemic, or our sample consisting of solely those experiencing homelessness, is not possible to establish from our data. However, seeing as the pandemic increased the rate of financial insecurity and unemployment (Johnson et al., 2020), and therefore housing instability (Albon et al., 2020), these factors are likely to confound each other.

4.4. Demographic characteristics

Within our sample, women showed over double the risk for depression than men. It must be noted that depression was self-reported, which has previously been found to enable gender bias due to men under-reporting symptoms (Sigmon et al., 2005). However, the association between sex and depression (with increased prevalence amongst women) is one of the most consistent findings amongst recent research, both in France (Fond et al., 2019) and globally (Mu noz et al., 2005; World Health Organization, 2008).

Contrary to pre-pandemic evidence (Arias de la Torre et al., 2021), older participants in our study showed lower rates of depression. Even more paradoxically, previous research has found that depression increased with age during the pandemic in association with higher levels of chronic illness (Chandola et al., 2020). Age is a known predictor of chronic illness (Divo et al., 2014), and within our study chronic illness increased the risk of depression significantly. One potential explanation for our findings may be that older participants felt less impacted by the pandemic. Younger subjects may be more concerned about their career, social life and future in general. Worries surrounding the future were significantly more common in depressed (75.7%) compared to non-depressed (61.2%) participants. Further research is needed to assess how the longitudinal effects of the pandemic differ between age groups. This is of particular relevance to migrants, as European Union statistics have found migrants to be, on average, much younger than a country's native population (Eurostat, 2020). This was echoed by our sample, in which the average age of French nationals was 12 years older than non-French subjects.

Relationship status also associated with depression, with single participants at greater risk. Albeit potentially linked to financial security, the positive effect of having a partner may result from associated comfort or support, thereby preventing loneliness. This is particularly relevant to the pandemic, with lockdown measures not only increasing loneliness (Bu et al., 2020a), but more severely so in those with low socioeconomic status (Bu et al., 2020b; Burchell et al., 2020). Within our population, increased loneliness since the start of lockdown was seen amongst 37% of subjects. This is considerably higher than figures from COVID-19 research on the US adult population, which saw loneliness increase from 11% in 2018 to 13.8% in April 2020 (McGinty et al., 2020). German data collected during spring 2020 also found roughly 50% of homeless persons were experiencing loneliness, compared to 11% of the national population (Bertram et al., 2021). Moreover, depressed participants within our study were significantly more likely to worry about remaining isolated. This may partly explain why depressed

subjects were also less willing to accept another lockdown.

4.5. Socioeconomic status (SES)

Food insecurity positively associated symptoms of depression, however job loss did not. This was surprising, as literature on mental health during the pandemic found depression to associate significantly with job loss (Posel et al., 2021). However, our populations' low rate of employment (27%) is likely to account for this disparity. Recent research on homeless families in Paris found food insecurity to be a major problem, affecting 77% of parents (Vandentorren et al., 2016). Whilst only 39% of our cohort declared food insecurity, as temporary accommodation for both winter and COVID-19 close, this figure is likely to increase. Lower SES has also been found to associate with increased depression during the pandemic (Sadarangani et al., 2021; Xue and McMunn, 2021), alongside greater levels of loneliness (Bu et al., 2020b; Burchell et al., 2020) and anxiety (Jia et al., 2020). Interestingly, several studies show parallel levels of depression between homeless populations and non-homeless cohorts with low SES (Fazel et al., 2005; Laporte et al., 2018). Together, these data demonstrate the evident benefit of reducing poverty to better mental health.

4.6. Health status

Chronic illness was found to significantly increase the rate of depression, which is consistent with other data collected during the COVID-19 pandemic (Riley et al., 2021; Wu et al., 2021). This is of particular concern for those without medical insurance (33% of the ECHO population), who may face greater difficulty getting treatment for both depression and chronic illness. Data collected from homeless persons during spring 2020 found physical pain to be the most frequent impediment to participants quality of life (47%), followed by depression or anxiety (32%) (van R  th et al., 2021). Alongside this, psychiatric conditions are likely to confound each other, especially amongst low-income persons (Bassuk et al., 1998). Seeing as the COVID-19 pandemic has also been found to trigger both post-traumatic stress (Wong et al., 2021) and anxiety (Liu et al., 2020; Torales et al., 2020), better targeting interventions for those most at-risk for all elements of chronic ill-health will likely support the prevention of depression.

4.7. Future applications

This research has applications relevant not only to the COVID-19 pandemic, but to future periods of mental health disparity resulting from immediate social or health crises. Much of the temporary accommodation this study recruited from, created in response to the pandemic, was, or will soon be, subsequently disbanded (Martin et al., 2020; Naik et al., 2020). The effects this may have on mental health warrant investigation. Moreover, due to data collection occurring in the very first stages of the pandemic, it is possible certain social and financial effects had not yet occurred. This may partly explain the lack of association seen between fiscal worries and depression. Further investigation within this population is needed to explore the relationship between mental health and financial disruption during later stages of the pandemic. We are currently (Spring 2021) conducting a second wave of the ECHO study in a similar population augmented with persons living on the street, to gain better understanding of long-term patterns of health within this population in relation to the COVID-19 pandemic.

5. Conclusion

Moderate to severe depression was seen in almost a third of homeless persons interviewed, with women, young people, those without stable partners, and chronically unwell or food insecure persons at greatest risk. Increased loneliness was also seen in 37% of subjects since the start of lockdown, alongside higher levels of worry surrounding isolation

amongst depressed participants. These findings can teach us about not only health inequalities in the context of COVID-19, but also how similar circumstances may affect the mental health of future populations with comparable disadvantage. Closer attention must be paid to those most at risk, as supporting good mental health within these communities will in turn increase the likelihood of their progression to stable housing and better living conditions in general.

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Data availability statement

The data that support the findings of this study are available from the Department of Social Epidemiology, Pierre Louis Institute of Epidemiology and Public Health. Restrictions apply to the availability of these data, which were used under license for this study.

Declaration of Competing Interest

The authors declare no conflicts of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jadr.2021.100243.

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