



## Factors associated with the psychosis continuum among homeless people: Comparison between natives and migrants in the SAMENTA study

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### ARTICLE INFO

#### Keywords:

Migrants  
Homelessness  
Psychosis  
Psychotic experiences

### ABSTRACT

**Background:** In the last decades, there has been a documented increase in the proportion of migrants among homeless people in Europe. While homelessness is associated with psychosis, little is known about the factors associated with psychosis among migrants in this context.

**Methods:** Our study analyzed data collected in the SAMENTA cross-sectional survey conducted among 859 adult French-speaking homeless people living in the Greater Paris area. We analyzed the prevalence of psychosis and psychotic-like experiences (PLE) and associated factors by migrant status, using bivariate analysis and multi-variable logistic regression models.

**Results:** Our sample comprised 280 natives and 559 migrants in France. Psychosis was significantly more prevalent among natives (21.6 %) than among migrants (7.5 %) ( $p = 0.003$ ). The total prevalence of PLE was 30.8% (95 % CI: 24.3 – 38.2), and not statistically different between groups ( $p = 0.215$ ) or sex ( $p = 0.528$ ). Adverse events over the past year were associated with the increased odds of psychosis in both groups and with PLE among migrants. Sexual abuse during childhood was associated with both outcomes among natives. Among migrants, exposure to war or life-threatening events increased the odds of psychosis and PLE. Increased odds of psychosis were found among migrants who had been living in France for more than 10 years (OR = 3.34, 95 % CI: 1.41–7.93,  $p = 0.007$ ).

**Conclusion:** Differences were found in the factors associated with the psychosis continuum by migrant status, they highlight the impact of experiences related to migration. Prospective studies are needed to better understand these underlying pathways.

### 1. Introduction

Over recent decades, there has been a documented increase in the proportion of migrants among homeless people in Europe, related to asylum policies and the management of increased migratory flows within and across European member states (Edgar et al., 2004; Pleace, 2010). France has welcomed migrants for many decades and is an important vector in a continual flow both of people from former French colonies in Africa and of people seeking asylum. Associations between migration and low social living conditions have occurred concomitantly:

due to the relatively low proportion of migrants granted refugee status every year (around 30 %), and to the low rates of renewal for work or study visas which leads to irregular administrative status. The number of irregular migrants in France is estimated to be approximately 400 000 (Defendeurs des droits, 2015; Ministère de l'Intérieur, 2017). The proportion of migrants among homeless people in the Greater Paris area increased from 38 % in 2001 to 53 % in 2012 (Yaouanq and Duée, 2014; Brutel, 2016).

Homelessness has major health impacts. It is associated with low quality of life, and higher morbidity and mortality in comparison to the

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general population (Fazel et al., 2014; Vuillermoz et al., 2016). Psychiatric disorders are among the most critical health problems associated with homeless living conditions, and are more prevalent than in the general population, as are severe disorders such as psychosis (Hossain et al., 2020; Gutwinski et al., 2021). A meta-analysis showed that the prevalence of psychosis (21.2 %) and more particularly schizophrenia (10.3 %) is significantly higher among homeless people than in the general population (Ayano et al., 2019).

Psychosis is associated with a more significant healthcare, burden, worse outcomes, and higher mortality than other psychiatric disorders (Rössler et al., 2005; Saha et al., 2007). Recent reviews on the social determinants of schizophrenia-spectrum psychotic disorders highlight childhood adversity, social fragmentation, urban settings with lower socioeconomic status, and especially point to immigrants, prisoners, and the homeless (30-fold higher prevalence of schizophrenia than the general population) (Varchmin et al., 2021; Jester et al., 2023). This suggests the association between homelessness and psychosis can be explained by different pathways: as a cause, as a consequence, or due to shared risk factors such as cumulative psychosocial adversity across life, notably childhood adversity and drug use (Mar et al., 2014; Campion et al., 2013).

Regarding migrants, an increased risk of psychosis compared to natives in the general population has been observed in two meta-analyses (Bourque et al., 2011; Selten et al., 2020). In the absence of evidence of a mass selective migration of people with severe mental disorders (Selten et al., 2002), this risk has been associated with cumulative exposure to environmental risk factors arising from the migration experience (Morgan et al., 2019). It includes pre-migration risk factors (such as war and violence) (Fazel et al., 2005; Brandt et al., 2019), and post-migration risk factors such as social disadvantage, discrimination, and isolation (Stilo et al., 2017; Jongasma et al., 2020; Tarricone et al., 2022).

Therefore migrants in the context of homelessness appear to be a high-risk group for psychosis, and warrant deeper attention (Abbott, 2016; Hossain et al., 2020) as suggested by the hypotheses concerning social defeat (Selten et al., 2013) and/or social deafferentation (Hoffman, 2007). There is also a need for a more nuanced consideration of the evidence for a decrease of the “healthy migrant effect” (migrants have better health than natives) occurring alongside the length of stay in the host country, psychosocial stresses over time, living conditions, and poor access to care (Moullan and Jusot, 2014; Gil-Salmeron et al., 2021; Calvo et al., 2023).

As far as we know, no study has examined factors associated with psychosis among migrants, and how they differ from natives in the context of homelessness. In a recent systematic review and meta-analysis of 38 studies on the prevalence of mental disorders among the homeless, only one collected data on migrant status. The study under investigation in this research, SAMENTA (SANTé MENTALe chez les sans-abri – Mental health among the homeless), was conducted in the Greater Paris area in 2009 among French-speaking homeless natives and migrants (Laporte et al., 2018).

Considering these findings and gaps in knowledge, this study analyses data collected in the SAMENTA study in order to explore factors associated with psychosis and migrant status in this homeless population. We extend our investigation to psychotic-like experiences (PLE), generally defined as the presence of delusions or hallucination experiences in the absence of a psychosis diagnosis (Verdoux and van Os, 2002). PLE is considered a proxy for the risk of psychosis that is based on the hypothesis of the psychosis continuum, where subclinical psychosis and psychotic disorders are continuously distributed in the general population and can share the same risk factors- but more broadly as a marker of the risk of developing psychiatric disorders (Linscott and van Os, 2013; DeRosse and Karlsgodt, 2015; van Os and Reininghaus, 2016). In migrant and ethnic minority populations, PLE provides additional advantages in avoiding specific methodological limits, such as differences in case ascertainment (mainly from barriers to mental healthcare

access) and misdiagnoses caused by categorical standardized diagnoses. As far as we know, there is no study on PLE among homeless people.

## 2. Methods

### 2.1. Study design, sample, and data collection

The SAMENTA study is a cross-sectional survey of the prevalence of psychiatric disorders conducted between February and April 2009 among a population of French-speaking homeless in the Greater Paris area (Laporte et al., 2018).

A homeless person was defined as anyone who had spent the night preceding the survey interview in a shelter (including users of day services, emergency shelters, hot meal distribution, and social accommodations) or in a place not intended or equipped for dwelling during the last 5 days. The sampling weight was calculated for each participant using the inverse of the product of the inclusion probabilities calculated at each stage of the sampling design. The Generalized Weight Share Method was used to adjust the weights to the heterogeneous use of services during the observation period (Ardilly and Le Blanc, 2001). Migrants were defined as people born outside France. The exclusion criteria were acute impaired consciousness, acute substance use, or the inability to give valid consent.

The number of subjects needed to estimate a prevalence of severe psychiatric disorders or addictions of 30 % was estimated at 800 for an expected precision of 3 % (Kovess and Mangin Lazarus, 1999). Data were collected from 859 subjects randomly selected (three-stage random sampling following the Time Location Sampling method) (Marpsat and Firdion, 2018) from an estimated sample size of 21,176 homeless people in the Greater Paris area (95 % CI: 17,582–24,770) (Brousse, 2006). Nineteen subjects met the exclusion criteria.

The study design, which was piloted among 45 people during a preliminary survey, took into account the risk of under- or over-diagnosis with this type of tool in the absence of a clinician (Narrow et al., 2002). Trained investigators pairs (a lay interviewer and a clinical psychologist) interviewed each person using a questionnaire that covered sociodemographic data, mental health, and details related to addiction, as well as items about social trajectories and living conditions. The Mini-International Neuropsychiatric Interview - MINI was used to assess psychiatric diagnosis and psychotic experiences (Sheehan et al., 1998). Substance use was evaluated through the “Alcohol Use Disorders Identification Test” (AUDIT) (Allen et al., 1997) and the “Assessment and Screening of Assistance Needs” (ASAN) (Tremblay et al., 2000), followed by questions on intake methods in the absence of housing, developed for the study. All the questionnaires and clinical reports were systematically reviewed by a psychiatrist, not in the subjects’ presence, to obtain a final “diagnosis” based on the 10th International Classification of Diseases (ICD-10) (World Health Organisation, 2004).

### 2.2. Main outcomes: psychosis and PLE

We used ICD-10 diagnosis categories F20-F29 (Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders) to define the presence of psychosis disorders. Having had a lifetime psychotic-like experience (PLE) was defined by at least one positive answer to both questions (“Have you ever believed that...?” and “Do you currently believe these things?”) in one of the 7 items from the MINI (i.e. ideas of persecution, influence, reference, thought echo, visual or auditory hallucinations, if friends consider the person’s beliefs strange or unusual). People with a current diagnosis of psychosis (F20-F29) were excluded from the PLE analysis.

### 2.3. Variables

We investigated socio-demographic characteristics (such as gender,

age, education level, and marital status), experiences of homelessness, and well-established factors associated with psychosis (outcome) and homelessness (exposure) in the literature: that is, childhood sexual abuse (Bebbington et al., 2004; Varese et al., 2012), problems with the law (Beards et al., 2013; Fazel et al., 2016), exposure to war or life-threatening events, and adverse events over the past year (Brandt et al., 2019) (defined in our study by exposure to sexual, physical or psychological abuse/assault, robbery, fighting, violence or threat). Substance use was also investigated in terms of cannabis use in the last 12 months and lifetime alcohol abuse. Among migrants, we additionally examined the length of stay in the host country (Kirkbride et al., 2017).

### 3. Analysis

The prevalence of psychosis and PLE in addition to frequencies of socio-demographic characteristics, with their 95 % confidence interval (95 %CI), were computed in the whole sample. Missing data were considered as a separate category when comparing frequencies of socio-demographic characteristics between natives and migrants and when estimating corresponding *p* values. Statistical significance was defined as *p* < 0.05.

Bivariate analyses were conducted to estimate odds ratios (95 % CI) of associations between the study outcomes (psychosis or PLE), socio-demographic characteristics, and covariates. We performed multivariable logistic regression adjusted for age and sex in the complete case sample only and included covariables in the bivariate analyses (*p* < 0.10). We used a backward manual selection method to identify covariables that remain independently statistically associated with the outcome. Sampling weights were considered, and all analyses were performed with STATA version 14.

### 4. Results

#### 4.1. Characteristics of the sample

From the original data (840 subjects), we were able to analyze data from 839 subjects (information about country of birth was missing for 1 subject).

Our sample was composed of 280 natives and 559 migrants (Table 1). Men were more numerous than women among both natives and migrants. Migrants were older (mean age = 39.0; *sd* = 12.2) than natives (mean age = 36.5, *sd* = 12.0), and more frequently in a stable

**Table 1**  
Socio-demographic characteristics by migrant status.

	Total <i>N</i> = 839 % (95 % CI)	Natives <i>N</i> = 280 % (95 % CI)	Migrants <i>N</i> = 559 % (95 % CI)	Migrants vs natives <i>p</i> -value
Sex (male)	65.1 (54.5–74.4)	70.2 (50.8–84.3)	61.7 (50.1–72.1)	0.407
Age mean ( <i>sd</i> )	38.0 (12.3)	36.5 (12.0)	39.0 (12.2)	0.200
Age > 30	69.4 (62.2–75.8)	56.9 (43.5–69.3)	77.8 (70.6–83.7)	<b>0.003</b>
Age of arrival in France > 25			57.7 (49.8–65.3)	
Length of stay in France mean ( <i>sd</i> )			13.2 (11.6)	
Length of stay in France > 10			48.2 (39.3–57.2)	
Level of education > secondary	16.4 (12.4–21.4)	14.1 (7.1–26.0)	17.9 (12.9–24.2)	0.543
Stable relationship	12.8 (9.7–16.6)	2.1 (0.5–8.3)	19.9 (14.6–26.5)	<b>&lt;0.001</b>
Age first time homeless > 26	40.1 (33.3–47.4)	54.4 (40.6–67.6)	30.6 (23.4–38.8)	<b>0.007</b>

\*in bold, *p* < 0.05.

relationship (19.9% vs 2.1 %, *p* < 0.001). Their mean age at arrival in France was 25.3 years old (*sd* = 10.5) and their mean length of stay in France was 13.2 years (*sd* = 11.6). No statistically significant differences were found in education levels between groups. Natives experienced their first homelessness period earlier in life than migrants: 54.4 % of natives were under 26 years of age when they first experienced homelessness compared with 30.6 % of migrants.

#### 4.2. Adverse life events and substance abuse in natives and migrants

In general, adverse life events were more often reported by natives than by migrants (Table 2). Among adverse life events, sexual abuse before the age of 18 was nearly 3.5 times more frequent among natives than migrants (13.8 % versus 3.9 %, *p* = 0.001). Migrants were more likely to report exposure to war (40.8 %) than natives (2.5 %). The incidence of problems with the law and exposure to life-threatening events were similar in both groups. Cannabis use during the past year was reported by 20.4 % of migrants and did not significantly differ from cannabis use in natives (23.6 %, *p* = 0.689). Lifetime alcohol abuse was more frequent in natives than migrants (44.6% vs. 18.5 % respectively, *p* < 0.001).

#### 4.3. Psychosis

Table 2 shows that psychosis was identified among 13.2 % of subjects, with migrants showing a lower prevalence (7.5 %) of psychosis than natives (21.6 %) (*p* = 0.006). As shown in Table 3, the bivariate analysis did not show any association between sex and psychosis among natives; however, being a woman had a protective effect among migrants (OR = 0.33, 95 %CI: 0.11–0.98, *p* = 0.046). Age and education were not associated with psychosis in either group. Regarding adverse life events, an increased odds ratio of psychosis was found in homeless natives and migrants who had experienced adverse events in the past year (OR = 4.39, 95 %CI: 1.34–14.45, *p* = 0.016 and OR = 5.43, 95 %CI: 1.60–18.39, *p* = 0.007, respectively). Among natives, childhood sexual abuse (OR = 8.00, 95 %CI: 2.44–26.30, *p* = 0.001), lifetime exposure to life-threatening events (OR = 4.78, 95 %CI: 1.48–15.5, *p* = 0.010), and

**Table 2**  
Prevalence of psychosis, PLE, drug use, and adverse life events by migrant status.

	Total <i>N</i> = 839 % (95 % CI)	Natives <i>N</i> = 280 % (95 % CI)	Migrants <i>N</i> = 559 % (95 % CI)	Migrants vs natives <i>p</i> -value
<b>Psychiatric disorders</b>				
Psychosis (F20-F29)	13.2 (8.6–19.8)	21.6 (12.6–34.4)	7.5 (4.1–13.4)	<b>0.006</b>
Psychotic-like experience (PLE)	35.5 (28.2–43.5)	42.7 (29.4–57.2)	31.4 (22.4–41.9)	0.215
<b>Substance use</b>				
Alcohol abuse	28.9 (21.9–37.2)	44.6 (33.6–56.2)	18.5 (11.4–28.6)	<b>&lt; 0,001</b>
Cannabis use last 12 months	21.7 (16.0–28.7)	23.6 (15.5–34.1)	20.4 (11.9–32.7)	0.689
<b>Adverse life events</b>				
Childhood sexual abuse	7.9 (5.0–12.1)	13.8 (7.9–22.9)	3.9 (2.2–6.8)	0.001
Adverse events in the past year	56.7 (48.8–64.3)	70.8 (61.3–78.7)	47.4 (37.4–57.6)	<b>0.001</b>
Exposure to war	25.4 (19.6–32.3)	2.5 (1.4–4.3)	40.8 (31.9–50.3)	<b>&lt; 0,001</b>
Exposure to life- threatening events	47.8 (41.7–54.0)	49.1 (40.9–57.2)	47.0 (38.9–55.3)	0.724
Problems with the law	25.4 (19.1–33.0)	27.9 (18.2–40.3)	23.8 (15.3–34.9)	0.594

\*in bold, *p* < 0.05.

**Table 3**  
Bivariate analysis of factors associated with psychosis, by migrant status.

	Natives		Migrants	
	OR (95 %CI)	p-value	OR (95 %CI)	p-value
Sex (being female vs being male)	0.87 (0.21–3.06)	0.749	<b>0.33</b> ( <b>0.11–0.98</b> )	<b>0.046</b>
Age > 30	1.12 (0.23–5.30)	0.890	2.70 (0.86–8.47)	0.088
Age of arrival in France > 25			0.76 (0.19–2.99)	0.696
Length of stay in France > 10			<b>3.37</b> ( <b>1.45–7.85</b> )	<b>0.005</b>
Level of education > secondary	1.44 (0.26–8.02)	0.675	1.38 (0.43–4.40)	0.583
Stable relationship	0.34 (0.04–2.80)	0.313	<b>0.33</b> ( <b>0.09–1.18</b> )	<b>0.087</b>
Alcohol abuse	<b>2.86</b> ( <b>1.06–7.69</b> )	<b>0.038</b>	1.19 (0.21–6.87)	0.842
Cannabis use last 12 months	2.64 (0.60–11.56)	0.195	2.56 (0.60–10.99)	0.204
Childhood sexual abuse	<b>8.00</b> ( <b>2.44–26.30</b> )	<b>0.001</b>	1.71 (0.44–6.68)	0.437
Adverse events in the past year	<b>4.39</b> ( <b>1.34–14.45</b> )	<b>0.016</b>	<b>5.43</b> ( <b>1.60–18.39</b> )	<b>0.007</b>
Exposure to war	0.74 (0.11–4.80)	0.751	<b>3.01</b> ( <b>1.03–8.77</b> )	<b>0.044</b>
Exposure to life-threatening events	<b>4.78</b> ( <b>1.48–15.5</b> )	<b>0.010</b>	1.00 (0.98–1.03)	0.746
Problems with the law	1.65 (0.48–5.74)	0.423	1.54 (0.41–5.80)	0.516

Percentages and OR are weighted / in bold, covariates included in the multivariable model ( $p < 0.10$ ).

alcohol abuse (OR = 2.86, 95 %CI: 1.06–7.69,  $p = 0.038$ ) were associated with increased odds of psychosis. Among migrants, the odds ratio of psychosis was higher in those living in France for more than 10 years (OR = 3.37, 95 %CI: 1.45–7.85,  $p = 0.005$ ) and exposure to war (OR = 3.01, 95 %CI: 1.03–8.77,  $p = 0.044$ ). Being in stable relationship had a protective effect on the development of psychosis in both groups, but without reaching statistical significance. No differences in the odds ratio of psychosis were found in either group regarding cannabis use or problems with the law.

In the multivariable regression analysis (Table 4), among natives, psychosis was found to be associated with childhood sexual abuse (OR = 7.40, 95 %CI: 2.42–22.63,  $p = 0.001$ ) and with adverse events in the past year (OR = 4.48, 95 %CI: 1.78–17.03,  $p = 0.028$ ). Among migrants, preceding year adverse events (OR = 6.37, 95 %CI: 1.50–27.10),  $p = 0.013$ , being in France for more than 10 years (OR = 3.34, 95 %CI: 1.41–7.93,  $p = 0.007$ ), and exposure to war (OR = 3.99, 95 % CI: 1.12–14.14,  $p = 0.032$ ) all remained independent factors associated with psychosis.

**Table 4**  
Multivariable regression analysis of factors associated with psychosis, by migrant status.

Initial model	OR (95 %CI)	p-value	Initial model	OR (95 %CI)	p-value
Childhood sexual abuse	6.01 (2,08–17,39)	0.001	Adverse events in the past year	7.07 (1,58–31,67)	0.011
Adverse events in the past year	3.08 (0,78–12,13)	0.106	Length of stay in France > 10	2.58 (1,27–5,25)	0.009
Exposure to life-threatening events	2.37 (0,80–7,01)	0.118	Exposure to war	3.51 (1,05–11,73)	0.041
Alcohol abuse	2.41 (0,79–7,32)	0.120	Age > 30	2.23 (0,67–7,42)	0.188
			Sex	0.71 (0,24–2,08)	0.527
			Stable relationship	0.67 (0,21–2,18)	0.501
<b>Final model</b>			<b>Final Model</b>		
Childhood sexual abuse	7.40 (2,42–22,63)	0.001	Adverse events in the past year	6.37 (1,50–27,10)	0.013
Adverse events in the past year	4.48 (1,78–17,03)	0.028	Exposure to war	3.99 (1,12–14,14)	0.032
			Length of stay in France > 10	3.34 (1,41–7,93)	0.007

Percentages and OR are weighted /in bold,  $p < 0.05$ .

#### 4.4. PLE

Table 5 shows that in bivariate analyses, no differences were established in the odds of PLE related to sex or education among migrants or natives.

In both groups, increased odds of PLE were found among those who reported sexual abuse during childhood (OR = 24.94, 95 %CI: 7.02–88.55,  $p < 0.001$  and OR = 3.74, 95 %CI: 1.04–13.39,  $p = 0.043$  for native and migrants respectively).

Among natives, subjects who were older than 30 years experienced fewer PLE (OR = 0.35, 95 %CI: 0.13–0.94,  $p = 0.038$ ) while problems with the law were associated with increased odds of PLE (OR = 3.29, 95 %CI: 1.08–10.07,  $p = 0.037$ ). Being in a stable relationship increased the odds of PLE, though was not statistically significant.

Among migrants, no association was found with age at the time of arrival in France or with the length of stay in France. On the other hand, increased odds of PLE were found to be associated with additional adverse life events such as exposure to life-threatening events (OR = 2.85, 95 %CI: 1.23–6.59,  $p = 0.015$ , and past year adverse events (OR = 6.36, 95 %CI: 2.52–16.07,  $p < 0.001$ ).

Substance use was associated with an increased odds of PLE among

**Table 5**  
Bivariate analysis of factors associated with PLE, by migrant status.

	Natives		Migrants	
	OR (95 %CI)	p-value	OR (95 %CI)	p-value
Sex (being female vs being male)	1.59 (0.65–3.88)	0.307	0.60 (0.30–1.76)	0.134
Age > 30	<b>0.35</b> ( <b>0.13–0.94</b> )	<b>0.038</b>	0.56 (0.23–1.38)	0.206
Age of arrival in France > 25			0.51 (0.22–1.20)	0.122
Length of stay in France > 10			<b>2.11</b> ( <b>0.89–4.98</b> )	<b>0.089</b>
Level of education > secondary	0.34 (0.11–1.08)	0.066	1.31 (0.56–3.06)	0.53
Stable relationship	<b>6.56</b> ( <b>0.88–49.15</b> )	<b>0.067</b>	0.71 (0.35–1.45)	0.343
Alcohol abuse	0.54 (0.17–1.72)	0.293	<b>5.16</b> ( <b>1.66–15.99</b> )	<b>0.005</b>
Cannabis use last 12 months	1.80 (0.36–9.12)	0.471	<b>9.51</b> ( <b>3.61–25.06</b> )	<b>&lt;0.001</b>
Childhood sexual abuse	<b>24.94</b> ( <b>7.02–88.55</b> )	<b>&lt;0.001</b>	<b>3.74</b> ( <b>1.04–13.39</b> )	<b>0.043</b>
Adverse event in the past year	1.42 (0.47–4.24)	0.528	<b>6.36</b> ( <b>2.52–16.07</b> )	<b>&lt;0.001</b>
Exposure to war	1.18 (0.31–4.51)	0.811	0.66 (0.29–1.47)	0.301
Exposure to life-threatening events	1.79 (0.64–5.03)	0.264	<b>2.85</b> ( <b>1.23–6.59</b> )	<b>0.015</b>
Problems with the law	<b>3.29</b> ( <b>1.08–10.07</b> )	<b>0.037</b>	<b>2.99</b> ( <b>0.89–10.03</b> )	<b>0.075</b>

Percentages and OR are weighted /in bold covariates included in the multivariable model ( $p < 0.10$ ).

migrants only, with OR = 9.51, 95 %CI: 3.61–25.06,  $p < 0.001$  for past-year cannabis use, and OR = 5.16, 95 %CI: 1.66–15.99,  $p = 0.005$ ) for alcohol abuse.

In multivariable regression analysis (Table 6), childhood sexual abuse (OR = 15.17, 95 %CI: 4.76–48.41,  $p < 0.001$ ) and problems with the law (OR = 3.65, 95 %CI: 1.27–10.44,  $p = 0.017$ ) remained associated with the odds of PLE among natives while being older than 30 years had a protective effect regarding PLE (OR = 0.31, 95 %CI: 0.11–0.93,  $p = 0.036$ ). Among migrants, adverse events over the past year (OR = 5.24, 95 % CI: 2.41–11.41,  $p < 0.001$ ), cannabis use in the last 12 months (OR = 6.30, 95 %CI: 2.01–19.73,  $p = 0.002$ ), and exposure to life-threatening events (OR = 2.09, 95 %CI: 1.10–3.96,  $p = 0.024$ ) were all independently associated with PLE.

## 5. Discussion

### 5.1. Main findings

Using data from the SAMENTA survey, we focused our investigation on the prevalence, characteristics, and associated factors for the psychosis continuum, analyzed by migrant status in the context of homelessness in the Greater Paris area.

The socio-demographic data showed that migrants were older, had experienced homelessness for the first time later in life than natives, and were more often in stable relationships. No differences between groups were found according to sex or education level.

Psychosis was identified among 13.1 % of subjects, with migrants showing a lower prevalence (7.5 %) of psychosis than natives (21.6 %) ( $p = 0.003$ ). PLE was investigated in this migrant population for the first time as far as we know, with a total prevalence of 30.8 %, and no statistically significant difference between groups.

Natives were more often exposed to risk factors than migrants, except for exposure to war. There were similar findings for both groups regarding exposure to life-threatening events and problems with the law. Factors associated with psychosis and PLE were similar within each group (natives and migrants). On the other hand, between groups, there was a difference in terms of childhood sexual abuse among natives and exposure to life-threatening events/war among migrants. Psychosis among migrants was associated with a length of stay in France of more than 10 years.

### 5.2. Comparison to previous literature

We compared our findings with studies conducted on homeless people irrespective of migrant status and in the general population. We emphasize that the homeless population is not comparable to the general population due to complex, multiple factors associated with this condition.

**Table 6**

Multivariable regression analysis of factors associated with PLE, by migrant status.

Natives			Migrants		
Initial Model	OR (95 %CI)	p-value	Initial Model	OR (95 %CI)	p-value
Age > 30	0.33 (0.12–0.96)	0.036	Cannabis use last 12 months	3.85 (1.02–14.59)	<b>0.047</b>
Childhood sexual abuse	15.74 (5.02–49.34)	< 0.001	Past year adverse event	4.69 (2.21–9.94)	<b>&lt;0.001</b>
Problems with the law	2.49 (1.30–10.71)	0.017	Alcohol abuse	1.33 (0.33–5.25)	0.685
Stable relationship	1.93 (0.94–40.77)	0.057	Childhood sexual abuse	2.07 (0.61–7.04)	0.240
			Exposure to life-threatening events	2.76 (1.51–5.04)	<b>0.001</b>
			Length of stay in France > 10	2.00 (0.93–4.32)	0.076
			Problems with the law	1.48 (0.50–4.42)	0.476
<b>Final model</b>			<b>Final Model</b>	<b>Odds Ratio</b>	<b>p-value</b>
Age > 30	0.31 (0.11–0.93)	0.036	Cannabis use last 12 months	6.30 (2.01–19.73)	0.002
Childhood sexual abuse	15.17 (4.76–48.40)	< 0.001	Past year adverse event	5.24 (2.41–11.41)	< 0,001
Problems with the law	3.65 (1.27–10.48)	0.017	Exposure to life-threatening events	2.09 (1.10–3.96)	0.024

Percentages and OR are weighted /in bold,  $p < 0.05$ .

Our sample would appear to be compatible with characteristics found in other studies conducted on the homeless population in the Great Paris area that show a greater proportion of migrants in comparison with natives, and also that migrants are more often in stable relationships with children (Guyavarch and Le Méner, 2014).

The increased prevalence of psychosis among homeless people in comparison to the general population (about 4 to 7 per 1000 persons) (Saha et al., 2005) is in accordance with existing research on the homeless (Ayano et al., 2019). However, when we take into account migrant status, our results diverge from studies conducted in the general population where migrants usually typify an increased prevalence of psychosis when compared to natives (Saha et al., 2005; Amad et al., 2013).

We found an increased prevalence of PLE in comparison to studies of the general population. That is, a large cross-country meta-analysis on PLE by McGrath and colleagues in the general population that used the CIDI (Composite International Diagnostic Interview) found a prevalence of around 6 %. (McGrath et al., 2015). In France, a cross-national study in the general population using the same instrument as our study (MINI) found a total prevalence of 22,3 %, compared with approximately 30 % in our study (Pignon et al., 2018). Our study, which found no statically significant difference between natives and migrants, is in line with McGrath’s meta-analysis but not with the French study.

The association between childhood sexual abuse and psychosis/PLE is comprehensively reviewed in the literature (Varese et al., 2012) and appears to be especially strong among the homeless (Sundin and Baguley, 2015). The impact of recent life events and exposure to life-threatening events/war on the odds of the psychosis continuum is in line with several recent studies among both the general population and also asylum seekers/refugees (Fazel et al., 2005; Beards et al., 2013; Steel et al., 2009; Hollander et al., 2016; Brandt et al., 2019).

In our study, cannabis use was associated with PLE among migrants but not natives. One recent systematic review found that migrants in the general population migrants are generally at lower risk of cannabis use than natives, but that those at increased risk included refugees, males, people who were single, non-religious, with lower educational levels, and living in urban areas. It showed, importantly, that risk increases through generations, suggesting acculturation or other environmental factors (Kortas et al., 2022).

Finally, the association between problems with the law and psychosis supports literature that shows an increased prevalence of psychosis among prisoners (Fazel et al., 2016); as well as an increased proportion of homeless people who have experienced incarceration (Greenberg and Rosenheck, 2008).

### 5.3. Strengths and limitations

Our study has the advantage of controlling “per se” for homelessness,

which is an important risk factor of psychosis, and a key aspect of social adversity experienced by migrants living in Europe. The study allowed us to establish the strength of other factors associated with the odds of psychosis in these groups. Our diagnoses were established with the MINI and verified by psychiatrists, which increased their specificity and sensibility (Fazel et al., 2005).

While the data from 2009 could suggest obsolescence, this is to an extent refuted by a recent systematic review of 38 studies on the prevalence of mental disorders among homeless people in high-income countries (Gutwinski et al., 2021) covering the period from 1983 to 2014, and included 11 studies conducted between 2008 and 2012 and one in 2014. Moreover, none of the selected studies analyzed the prevalence of psychosis according to migrant status. While it does rely on past data, our study provides robust results. Further, to the best of our knowledge, no study has been conducted on the topic since the SAMENTA study. By including 840 individuals, this survey represents one of the largest samples of studies on mental health among homeless people. In France, two recent studies focusing on families living in shelters (Vandentorren et al., 2016) and on irregular migrants (Jusot et al., 2020; Prieur et al., 2022) endorsed a high prevalence of psychiatric disorders among these groups, citing the association between migration and low living conditions, exposure to war, and violence. A second iteration of the SAMENTA survey is planned in the coming years. This will allow us to both describe changes in the characteristics of the homeless population and provide updated prevalence data on the main psychiatric disorders.

Non-French-speaking migrants were excluded from the study, leading to a selection bias. Notwithstanding, the majority of migrants in France come from former French colonies in Africa (North and sub-Saharan) (<https://www.insee.fr/fr/statistiques/3633212>). We point to the survey TeO (Trajectories and Origins) on the living conditions of migrants in France (<https://teo-english.site.ined.fr/>), which was conducted in the same period, between 2008 and 2009 among 22 000 adults, and found that more than 2/3 had very good or sufficient French on arrival in France. Another limitation is that migrants were defined as having been born abroad. Therefore, we did not collect information specifically for second-generation migrants, and factors related to psychosis have not been investigated for this group. This is a promising avenue for future research: the TeO survey found that descendants had better access to education, housing, and jobs than their parents, but still were not equal to the position of natives on social indices.

The main limitation in our opinion, as in any cross-sectional study, concerns inferences about any causal pathway linking the covariates studied and psychosis. That is, we do not have information about the onset of psychosis and in regard to whether- among migrants- exposures were experienced before or after migration. It is also the case that recall bias in the case of childhood sexual abuse must not be overlooked, notwithstanding that we suppose it may similarly affect both natives and migrants. Finally, we acknowledge that the quality of information may have been influenced by the symptoms of people with severe mental disorders.

The underestimation of the prevalence of mental disorders and associated factors is a possibility in both groups. This could be a consequence of excluded subjects who were unable to participate due to severe mental illness or acute substance use (Fazel et al., 2008; Knudsen et al., 2010). Among migrants, selection bias occurred due to our exclusion criteria: the recruitment of only French-speaking people increasing the likelihood of underestimating factors associated with acculturative stress (DeVylder et al., 2013; Scott et al., 2006).

Finally, the SAMENTA data limited our ability to investigate potential confounding or mediating factors related to both psychosis and homelessness such as discrimination, social defeat, and social capital (Berchet and Jusot, 2012; Paradies et al., 2015; Jaya and Lincoln, 2016; Oh et al., 2016).

#### 5.4. Interpretation of findings

Psychosocial adversity is a complex longitudinal factor across life as well as in the migration process, and therefore difficult to capture in a cross-sectional study. This means that questions remain concerning differences in the causal pathways to homelessness between groups, as well as in the interplay between exposures.

However, since our study found that exposures were different between natives and migrants, we argue that the migration experience poses a risk of psychosis. It is possible that the increased prevalence of psychosis among natives might mean that homelessness is a consequence of psychosis among natives, whereas, among migrants, homelessness is a cause. While it is highly interesting to speculate in this regard, by all means, prospective studies are needed to verify these hypotheses.

The increased prevalence of PLE in the sample among natives and migrants provides evidence of homelessness as a risk factor for the psychosis continuum (van Os et al., 2009; Breetvelt et al., 2010; Kaymaz et al., 2012; DeVlylder et al., 2014). It may indeed suggest greater vulnerability to psychiatric disorders in general (Verdoux and van Os, 2002; van Os and Reininghaus, 2016). Of note is the likely link between trauma and the psychosis continuum among migrants in our sample, since established evidence exists of an increased lifetime prevalence of PTSD among psychotic subjects (30 % against 8 % in the general population) (Morrison et al., 2005; Gibson et al., 2016; Hardy and Mueser, 2017): (Buckley et al., 2009). There is also increased exposure to trauma among psychotic subjects (Mayo et al., 2017), as well as among those experiencing PLE (Alsawy et al., 2015). If we add together the rates of PLE to those of psychosis in our sample, the total prevalence of the psychosis continuum is increased to 55.1 % among natives and 33.6 % among migrants.

Additionally, our findings lend support to the social developmental hypothesis (Morgan et al., 2019). This highlights the interaction between the cumulative effect of exposure to social adversity and trauma across the lifetime, and the underlying genetic risk and impact on neurobiological development of the risk for psychosis and PLE (van Os et al., 2009; Mothersill and Donohoe, 2016). For instance, robust evidence exists of the impact of childhood adversity on increased risks of psychosis (Rosenfield et al., 2022), drug abuse (Groenman et al., 2017), and PLE (Trotta et al., 2015), as well as the synchronic role of childhood adversity in later adult life events (Morgan et al., 2014; Morgan and Gayer-Anderson, 2016). Although the impact of adult life events alone on the risk of psychosis has been less investigated, there is some evidence of a dose-response relationship in regard to severity (or intrusiveness) (Bebbington et al., 2004) and to the timing of exposure (about 1 to 3 years before psychotic disorders /experiences) (Faravelli et al., 2007; Lataster et al., 2012). Finally, social exclusion posits an important explanation for increased risks of psychosis among the homeless population in general, as described in the social defeat model (Selten et al., 2013). Importantly our findings highlight the impact of pre-migration factors (life-threatening events). These are less investigated in studies on migrants that do not focus on refugees or asylum seekers.

Additionally, our findings may embolden research on the biological mechanisms underlying the link between stress and psychosis. Stress is an important factor in a growing number of studies that find evidence of altered sensitivity to stress in psychosis (Myin-Germeys and van Os, 2007; Lardinois et al., 2011). Others, more broadly, point to the role of the hypothalamic-pituitary-adrenocortical axis (Zorn et al., 2017; Langgartner et al., 2019; Jeste et al., 2023) and its interaction with the dopamine system (Soosay et al., 2012; Crager et al., 2013; Howes et al., 2017; Jeste et al., 2023).

Finally, our study highlights the impact of factors related to the migration experience, in addition to better-known factors related to psychosis among the homeless population in general. Given recent waves of migration affecting Europe, it is of critical importance to conduct prospective studies that can produce an enhanced

understanding of not only risk but also protective factors related to the psychosis continuum. Last—which we underscore—is the impact of European migration policies on this risk, and their role as a proximate cause of psychological distress linked to social insecurity.

## 6. Conclusion

Our findings show differences in factors associated with the psychosis continuum by migrant status among the homeless, and they highlight the impact of pre- and post-migration exposures on this risk. However, prospective studies are needed to better understand the mechanisms underlying these associations.

## Ethics

This study has been approved by 2 ethics committees: the Comité pour la Protection des Personnes at Necker University Hospital in Paris (No. 08.553) and the National Comité Consultatif sur le Traitement de l'Information en Matière de Recherche (No. 909,007); and the Commission Nationale de l'Informatique et des Libertés in charge of citizens' data protection.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Funding

This research received no external funding

## Acknowledgments

We are very thankful to the SAMENTA study authors for allowing us to use and analyze the data collected.

We are also very thankful to Professor Nichola Khan from the University of Edinburgh for the English editing.

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