

# First episode of psychosis in rural Greece: A multi-center study of the Mobile Mental Health Units

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## Abstract

**Background:** Over the last decades the study of schizophrenia-spectrum disorders has been focused on early and comprehensive intervention during the first episode of psychosis (FEP), but studies in rural settings are only rare. In Greece mental healthcare in rural areas is mostly delivered by the locally-based Mobile Mental Health Units (MMHUs).

**Aims:** The aim of the present study was to address treatment of FEP patients by the MMHUs in rural areas in Greece, focusing on patients with a first episode of schizophrenia.

**Method:** This is a multicenter, retrospective observational study with the participation of nine MMHUs across several areas in rural mainland and some islands of Greece. Patients of the age range of 15 to 55 years with a diagnosis of non-affective psychosis were included in the study.

**Results:** The study sample consisted of 216 patients, while analysis was performed for patients with a diagnosis of schizophrenia ( $n=153$ , 70.8% of the sample). Most patients were males ( $n=93$ , 60.8%), with a mean age at first presentation 34.9 years ( $Md=34.5$ ,  $SD=11.94$ ). The mean duration of untreated psychosis (DUP) was 7.85 months ( $Md=3$ ,  $IQR=10.00$ ) and was shorter in younger (15–25 years) patients. More than 60% of patients had been successfully engaged to treatment with the MMHUs, with a mean follow-up duration of 5.17 years ( $Md=5.00$ ,  $IQR=5.00$ ). Younger patients (26–35 years) tend to disengage from treatment, while those aged 36 to 45 years were more likely to continue follow-up. A reduction of 47.22% in hospital admissions among patients with schizophrenia was observed over follow-up of patients by the MMHUS.

**Conclusion:** The most noteworthy findings of the study are the low percentage of patients seeking help from the MMHUs, compared to the expected cases and the high attendance rate of those that are examined in this context. Further research on psychosis/schizophrenia in the rural context is warranted.

## Keywords

First-episode of psychosis, Mobile Mental Health Units, non-affective psychosis, rural areas, schizophrenia

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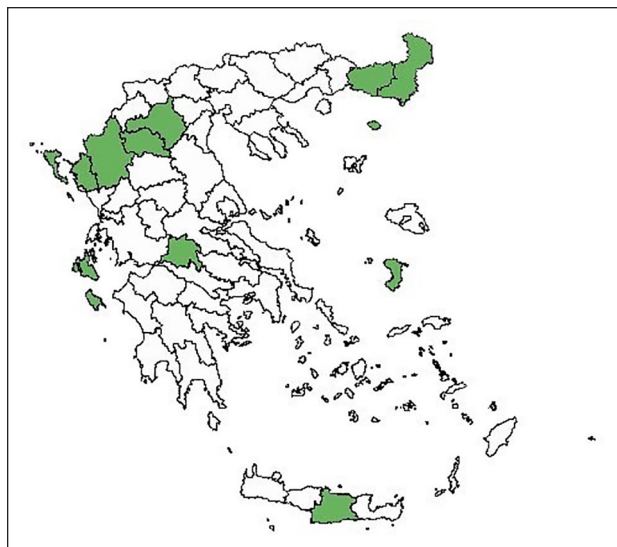
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## Introduction

Schizophrenia and related psychoses, the so-called psychotic disorders, are chronic and severe mental disorders that usually begin in young age (Jones, 2013; Solmi et al., 2022) and may have unfavorable long-term outcomes for a substantial proportion of patients (Peritogiannis, Gogou & Samakouri, 2020). These disorders account for significant disability in patients and are associated with high costs and burden (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, 2018). Research over the last decades has demonstrated that treatment of psychotic disorders should begin as early as possible in the course of the first episode of the illness (first episode of psychosis, FEP), because long duration of untreated psychosis (DUP) has been associated with adverse long-term outcomes (Howes et al., 2021; Penttilä et al., 2014). Accordingly, several countries have launched highly-specialized early intervention services to these patients (Hegelstad et al., 2012; Posselt et al., 2021) that appear to effectively engage patients to treatment and improve their long-term outcomes (Fusar-Poli et al., 2017). Less is known with regard to the treatment of FEP in rural areas. A recent systematic review of five studies reported that early intervention services in rural areas were associated with positive outcomes such as reducing positive symptoms and hospitalizations, as well as improving quality of life (Pipkin, 2021).

In Greece, a previous epidemiological study reported that the incidence of FEP was 30 new cases per 100,000 inhabitants per year (Peritogiannis, Mantas et al., 2013). Accordingly, several pilot early intervention services have been founded over the last years, which, consistent with international experience, appear to be effective in the treatment of FEP patients (Kollias et al., 2018; Mantas & Mavreas, 2012). These services were established mostly by academic centers in large cities and metropolitan areas, whereas there is no such specialized care for patients residing in rural and remote areas.

In rural areas in Greece mental healthcare is almost exclusively being delivered by locally-based community mental health teams, the so-called Mobile Mental Health Units (MMHUs). The MMHUs deliver generic services according to the principles of social and community psychiatry in residents of rural and remote communities in the mainland and in several of the numerous Greek islands (Peritogiannis, Fragouli-Sakellaropoulou et al., 2022; Samakouri et al., 2022). They have been shown to effectively engage patients with psychotic disorders to treatment (Peritogiannis, Tatsioni et al., 2013) and may reduce admissions and length of hospital stay in those patients (Garbi et al., 2021; Peritogiannis, Gioti et al., 2020). These findings mostly represent chronic patients with psychotic disorders, whereas no data exist regarding FEP patients. The aim of the present study was therefore to examine the treatment delivered to these patients by the MMHUs in the



**Figure 1.** The map of Greece. The study sites are highlighted with green color.

rural context; and to report on several characteristics and outcomes of FEP patients, with a special focus on those diagnosed with schizophrenia.

## Methods

### *The Treatment Setting*

This is a multicenter study with the participation of nine MMHUs across several areas in rural mainland and some islands. Those MMHUs deliver services for a population estimated at >650,000 that reside in rural and in a few occasions also in semi-urban areas. The study sites are depicted in Figure 1.

### *Study Design and Data Acquisition*

This is a 15-year retrospective observational study. All data were retrieved from the patients' charts that are kept by each MMHU. Demographic information include age, gender, education, living status and vocational status, whereas clinical data include DUP, alcohol/substance abuse, mental retardation comorbidity and treatment engagement. The history of patients' alcohol/substance abuse and DUP was based on information provided by the patients and their families. Mental retardation was confirmed with the use of the Wechsler Adult Intelligence Scale.

### *Inclusion/Exclusion Criteria*

Patients were included based on: a diagnosis of non-affective psychosis, in the F20 to F29 cluster according to the

International Classification of Diseases, 10th revision (ICD-10); age of 15 to 55 years at first examination by MMHU. Exclusion criteria included: previous treatment in another mental healthcare service for >1 year; chronic patients that have never received treatment; drug-induced psychotic episodes; psychotic symptoms that were clearly related to an organic cause; and severe mental retardation.

All the study procedures had been approved by the ethics committee of the Democritus University of Thrace. Due to the retrospective design of the study the need for patients' informed consent had been waived.

### Statistical Analysis

All statistical analyses were performed using the statistical software package IBM SPSS version 29.0. Descriptive statistics, including means, medians, standard deviations (SD) or interquartile range (IQR), were calculated for all continuous variables and frequency counts, and percentages were calculated for categorical variables.

Data were examined for missing values and normality assumptions using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Visual methods (histograms, *Q-Q* plots) and Levene's test for homogeneity of variances were also used. The dependent variables 'Duration of Untreated Psychosis' and 'Duration of follow-up' did not meet the assumptions of normal distribution and variance equality. Violations were addressed through data transformations and non-parametric tests for mean comparisons to ensure the validity and reliability of the analyses.

For comparisons between independent groups, the non-parametric Kruskal-Wallis test was applied. Post-hoc tests were conducted using the Bonferroni correction with the significance level adjustment method (Adj. Sig.) to identify which groups are significantly different from each other. For associations or differences between categorical variables, testing independency, chi-squared test ( $\chi^2$ ) was employed. A *p*-value of <.05 was considered statistically significant. Cramer's *V* for chi-square tests was also employed, providing information about the effect size or the strength of the observed associations.

In the study, multiple linear regression analyses were employed to investigate the associations between the dependent variable (age at FEP examination, DUP, and duration of follow-up) and a set of independent variables, while controlling for potential confounding factors. To ensure the validity of the regression analyses, all assumptions were met, including the normality assumption achieved through logarithmic transformations of the dependent variables ('DUP' and 'duration of follow-up'). The log-transformed variables demonstrated normal distribution compared to their original form, thereby satisfying the assumption of normality of residuals for linear regression. Additionally, other assumptions, such as linearity, independence of observations, homoscedasticity, absence

of multicollinearity, and autocorrelation (Durbin-Watson test), were also verified to ensure the robustness of the regression models. Categorical dummy variables were utilized to represent the levels of socio-demographic factors, such as gender, caregiver, vocational status, etc., in the multiple linear regression analyses.

Finally, to examine the factors associated with hospital admissions during the follow-up period, a binary logistic regression analysis was performed. The dependent variable was hospital admission during follow-up (0=no admission, 1=admission). The predictor variables included age at first-episode psychosis (FEP) examination, duration of untreated psychosis (DUP), gender, substance abuse, presence of a caregiver, education level, presence of mental retardation, referral status, specific diagnoses, and vocational status. The model aimed to identify the odds ratios (Exp(*B*)) and their 95% confidence intervals (CI) for each predictor, along with the significance levels (Sig.) to determine which factors were significantly associated with hospital admissions during the follow-up period.

## Results

### Socio-demographic and Clinical Characteristics

A total of 216 patients with FEP met the inclusion criteria. Concerning patients' diagnosis, 70.8% (*n*=153) received a diagnosis of schizophrenia (F20) during the follow-up period and 33 patients (15.3%) were diagnosed with unspecified psychosis (F29). Less common diagnoses were schizoaffective disorder (*n*=9, 4.2%) and acute and transient psychotic disorder (*n*=10, 4.6%). In our analysis we focused on patients with a diagnosis of schizophrenia because schizophrenia is a multifactorial disorder with complex origins and characteristics that warrant special consideration. The basic demographic and clinical characteristics of the sample of patients with schizophrenia are summarized in Table 1. Most were males, whereas the mean age at first presentation was 34.9 years, with more than half of the patients being ≤35 years old. Slightly more than half of the patients had attended primary education (up to 9 years) and only 13.5% had attended university. Almost half of the patients were self- or family-referred to the MMHUs and a large proportion had been referrals from community healthcare or mental healthcare services. The majority of them (*n*=115, 75.2%) had a caregiver.

The mean DUP was 7.85 months with a range from several days to 36 months. A minority of patients had a history of alcohol/substance abuse (15.3%), and 9.5% had comorbid mild or moderate mental retardation (IQ < 70). With regard to vocational status, 45.9% of patients were unemployed, almost 30% continued their work or their studies, and one in four received disability benefits over the follow-up period.

**Table 1.** Socio-demographic and clinical characteristics of patients with first episode schizophrenia.

Patients' characteristics	Mean (SD or Median)/n (%)
Duration of untreated psychosis (months)	7.85 (3.00), IQR = 10.00
Duration of follow-up (years)	
Engaged patients	5.17 (5.00), IQR = 5.00/95 (62.1)
Disengaged patients	2.62 (2.00), IQR = 2.95/53 (34.6%)
Age at first episode of psychosis	34.90 (11.94)
15–25 years old	40 (27.2)
26–35 years old	36 (24.5)
36–45 years old	36 (24.5)
46–55 years old	35 (23.8)
Gender	
Female	60 (39.2)
Male	93 (60.8)
Educational level	
0–9 years	78 (52.7)
9–12 years	50 (33.8)
>12 years	20 (13.5)
Vocational status	
Unemployed	68 (45.9)
Employed	30 (20.3)
Student	10 (6.8)
Disability benefits	40 (27.0)
Alcohol/substance abuse	
No	116 (84.7)
Yes	21 (15.3)
Mental retardation (IQ < 70)	
No	105 (90.5)
Yes	11 (9.5)
Caregiver	
No	38 (24.8)
Yes	115 (75.2)
Referral	
Patient/family	71 (49.7)
Health service	72 (50.3)

Note. IQ = intelligence quotient.

### Engaged Versus Disengaged Patients

More than 60% of patients ( $n=95$ ) had been successfully engaged to mental health treatment with the MMHUs, with a mean follow-up duration of 5.17 years ( $Md=5.00$ ,  $IQR=5.00$ ), ranging up to 15 years for several patients; whereas a substantial proportion (34.6%) disengaged from treatment with a mean follow-up duration of 2.62 years ( $Md=2.00$ ,  $IQR=3.00$ ). Four patients died over the follow-up period, whereas discharge to other mental health providers or the primary healthcare occurred in one case. The Mann-Witney  $U$  test comparing age at examination for FEP and DUP, between those disengaged from service and those continuing with follow-up care revealed no significant differences in age at FEP examination or DUP

between these two groups. Pairwise comparisons of follow-up groups, adjusted with the Bonferroni correction, revealed a significant difference between engaged and disengaged groups (test statistic =  $-4.224$ , Adj. Sig. = .000,  $p < .001$ ). This finding suggests a meaningful distinction in follow-up duration between participants who disengaged and those who remained engaged, warranting further investigation into the factors influencing engagement. Statistical analysis revealed no significant differences between engaged and disengaged patients in terms of gender, substance abuse, caregiver presence, or mental retardation. There appears to be a trend where younger patients (26–35 years) are more likely to disengage, while those aged 36 to 45 years tend to remain engaged in follow-up. However, the Pearson Chi-Square test ( $\chi^2=12.474$ ,  $df=9$ ,  $p=.188$ ) indicates that age-related engagement differences do not meet the threshold for significance.

### Admissions

The analysis of admissions for patients with first-episode schizophrenia reveals a notable reduction in hospital admissions after engagement with the MMHUs. Before service entry, the sample included 135 valid cases with a mean of 0.97 admissions ( $SD=1.85$ ,  $Md=1.00$ ), ranging from 0 to 9 admissions including outliers. During the follow-up period, the number of valid cases were 129, with a reduced mean of 0.43 admissions ( $SD=0.92$ ,  $Md=0.00$ ), ranging from 0 to 6 admissions. A Wilcoxon Signed Ranks Test confirmed the statistical significance of this reduction ( $z=-5.688$ ,  $p < .001$ ). This indicates that been followed-up by a MMHU is associated with a reduction of approximately 47.22% in hospital admissions among FEP patients (Table 2). For patients who continued the follow-up ( $n=95$ ), a significant reduction (38%) in hospital admissions was observed ( $z=-5.118$ ,  $p < .001$ ), indicating that ongoing engagement with mental health services was associated with a decrease in admissions during the follow-up period; from 50 patients before the examination to 31 patients admitted to hospitals during follow up. Similarly, for patients who disengaged from follow-up ( $n=53$ ), a significant reduction (68.18%) in hospital admissions was also evident ( $z=-2.530$ ,  $p=.011$ ) (Tables 2 and 3).

The Kruskal-Wallis test was employed to examine the association between engagement in MMHUs and the number of hospital admissions among patients with first-episode schizophrenia. The analysis was conducted on two sets of data: admissions prior to examination and admissions during follow-up. Results revealed no statistically significant difference in hospital admissions between patients who were engaged with the MMHU and those who were not both before examination ( $H=0.380$ ,  $df=1$ ,  $p=.537$ ) and during follow-up ( $H=1.949$ ,  $df=1$ ,  $p=.163$ ).



**Table 2.** Admissions before examination and during follow-up stratified by engagement status.

	Admissions prior to examination	Admissions during follow up	p-value
Disengaged patients	0.625 (SD = 0.627)	0.235 (SD = 0.495)	.011
Engaged patients	1.115 (SD = 2.157)	0.505 (SD = 1.030)	<.001
Total	0.970 (SD = 1.852)	0.434 (SD = 0.925)	<.001

**Table 3.** Hospital admissions for patients prior to examination and during follow-up period.

	Patients admitted to hospitals	Count of patients admitted to hospitals	% Within admissions
Prior to examination	Disengaged	22	30.6
	Engaged	50	69.4
During follow up	Disengaged	7	18.4
	Engaged	31	81.6

**Table 4.** Correlations of the age of examination with socio-demographics in patients with first-episode schizophrenia.

Predictor	Coefficient ( $\beta$ )	T	Sig.	95% CI (Lower)	95% CI (Upper)
Gender (male)	.163	0.057	.955	-5.470	5.796
Substance abuse	-2.818	-0.670	.505	-11.062	5.426
Caregiver	-0.572	-0.169	.866	-7.205	6.061
Referral (patient/family)	-1.678	-0.578	.565	-7.366	4.010
Mental retardation	-6.966	-1.408	.164	-16.660	2.728
Vocational status (employed)	3.432	0.928	.357	-3.814	10.678
Vocational status (student)	-18.793	-2.722	.008*	-32.323	-5.263
Education (university)	-6.557	-1.336	.186	-16.177	3.063
Education (highschool)	-11.275	-3.813	<.001**	-17.071	-5.479

Note. CI = confidence interval.

\* $p < .05$ . \*\* $p < .001$ .

### Correlations of the Age at Examination with Socio-demographics in Patients with First-episode Schizophrenia

The analysis revealed significant associations between age and vocational status, as well as key predictors influencing the age at FEP examination. A Chi-square test indicated a statistically significant relation between age at first examination for psychosis and vocational status ( $\chi^2 = 22.714$ ,  $p = .007$ ), with younger individuals more likely to be students and older individuals more likely to receive disability benefits. Complementing this finding, a multiple regression analysis revealed significant predictors influencing the age at FEP examination. Controlling for various factors, the model exhibited an overall fit ( $F(9, 61) = 2.828$ ,  $p = .008$ ), explaining 19% of the variance in age at FEP examination. Among the predictors, status of being a student ( $\beta = -18.793$ ,  $t = -2.722$ ,  $p = .008$ ), and educational level (high school:  $\beta = -11.275$ ,  $t = -3.813$ ,  $p < .001$ ) emerged as significant predictors of earlier age at FEP examination. Other variables such as gender, substance abuse, caregiver status and referral source did not show

significant associations with the age at FEP examination. Table 4 presents coefficients,  $t$ -values, and significance levels for each predictor in the regression model, along with 95% confidence intervals.

### Correlations of the Duration of Untreated Psychosis with Socio-demographics in Patients with First-episode Schizophrenia

Multiple regression analysis was conducted to examine the relationship between the natural logarithm of the duration of untreated psychosis (LnDUP) and several independent variables while controlling for potential confounding factors. The model exhibited a significant overall fit ( $F(11, 29) = 3.050$ ,  $p = .008$ ), explaining approximately 36.1% of the variance in LnDUP (Table 5).

Among the predictors, age at first examination for FEP in the 15 to 25 years old category showed a significant negative association with LnDUP ( $\beta = -1.401$ ,  $t = -1.819$ ,  $p = .079$ ), though this did not reach statistical significance. This trend suggests that younger individuals within this

**Table 5.** Correlations of the duration of untreated psychosis (DUP) with socio-demographics in patients with first-episode schizophrenia.

Predictor	Coefficient ( $\beta$ )	t	Sig.	95% CI (Lower)	95% CI (Upper)
Gender (male)	-.332	-0.698	.491	-1.263	0.599
Caregiver	.874	1.555	.131	-0.288	1.976
Referral (patient/family)	.059	0.126	.901	-0.868	0.986
Substance abuse	.045	0.066	.893	-1.272	1.362
Education (highschool)	-.964	-1.719	.096	-2.064	0.136
Education (university)	-1.795	-2.457	.020*	-3.228	-0.362
Vocational status (unemployed)	-.650	-1.435	.162	-1.538	0.238
Vocational status (student)	-1.194	-0.828	.414	-4.022	1.634
Age FEP examination (15–25 years old)	-1.401	-1.819	.079	-2.910	0.108
Age FEP examination (26–35 years old)	1.095	1.312	.200	-0.540	2.730
Age FEP examination (36–45 years old)	.158	0.223	.825	-1.234	1.550

Note. FEP=first episode psychosis; CI=confidence interval.

\* $p < .05$ .

age group are more likely to experience shorter duration of untreated psychosis compared to older individuals especially those in 26 to 35 years old category. Education level also appeared to influence DUP. Patients with a university education showed a significant negative association with LnDUP ( $\beta = -1.795$ ,  $t = -2.457$ ,  $p = .020$ ), suggesting a shorter duration of untreated psychosis relative to those with basic education. Additionally, patients with a high school education exhibited a negative association with LnDUP ( $\beta = -.964$ ,  $t = -1.719$ ,  $p = .096$ ), though this association did not reach statistical significance. These findings indicate that individuals with higher education levels may experience shorter duration of untreated psychosis.

Taking into consideration all the diagnoses, there were indications that diagnoses F23 ( $\beta = -1.570$ ,  $t = -2.095$ ,  $p = .039$ ), F20 ( $\beta = -.616$ ,  $t = -1.355$ ,  $p = .179$ ), and F29 ( $\beta = -.718$ ,  $t = -1.473$ ,  $p = .144$ ) tended toward shorter DUP. The F29 diagnosis demonstrated the longest DUP compared to the other two diagnoses.

### Correlations of the Duration of Follow-up with Socio-demographics in Patients with First Episode of Schizophrenia

The regression analysis aimed to predict the duration of follow-up in engaged patients (LnDFU) based on various socio-demographic and clinical factors. The model did not explain the differences observed in follow-up duration ( $F(15,28) = 1.654$ ,  $p = .121$ ). Factors such as gender, caregiver status, referral source, substance abuse, education level, and vocational status did not have a significant impact on LnDFU in engaged patients. The regression analysis revealed a statistically significant positive association between age at first examination within the 15 to 25 years category and the duration of follow-up (LnDFU) ( $B = 0.856$ ,  $t = 2.293$ ,  $p = .030$ ). This result suggests that

individuals who were younger at their first examination for first-episode schizophrenia tended to remain engaged for a longer period compared to those who were older at first examination.

### Predictors of Hospital Admissions During the Follow-up Period

The binary logistic regression analysis aimed to identify predictors of hospital admissions during the follow-up period for patients with FEP. The model included several predictors: age at examination, DUP, gender, substance abuse and education level. Substance abuse emerged as a significant predictor ( $B = 2.728$ ,  $SE = 1.019$ ,  $p = .007$ ), with an odds ratio ( $\text{Exp}(B)$ ) of 15.307, indicating that patients with a history of substance abuse were 15.3 times more likely to be admitted to the hospital during the follow-up period. Age at first examination for psychosis was another significant predictor. Specifically, patients aged 46 to 55 years ( $B = 2.371$ ,  $SE = 1.340$ ,  $p = .047$ ) showed an odds ratio ( $\text{Exp}(B)$ ) of 10.704, indicating a high likelihood (10.7 times more likely) of hospital admission. The model fit was confirmed by the Omnibus Tests of Model Coefficients (chi-square = 12.906,  $df = 9$ ,  $p = .046$ ) and the Model Summary ( $-2 \text{ Log Likelihood} = 43.791$ , Cox & Snell  $R$  Square = .232, Nagelkerke  $R$  Square = .338), suggesting that approximately 33.8% of the variability in hospital admissions could be explained by the predictors. These findings underscore the significant role of substance abuse and late examination for psychosis in predicting hospital admissions among this patient population (Table 6).

### Discussion

This is the first study on FEP in rural areas in Greece that extends the limited literature regarding the study of psychotic disorders in a rural context. According to the

**Table 6.** Logistic regression analysis predicting hospital admissions during follow up for patients with first-episode schizophrenia.

Predictor variable	B	S.E.	Df	Sig.	Odds ratio Exp(B)	95% CI for Exp(B)
Age FEP examination (15–25 years old)			3	.344		
Age FEP examination (26–35 years old)	0.212	1.223	1	.862	1.237	[0.112–13.596]
Age FEP examination (36–45 years old)	0.664	1.184	1	.575	1.942	[0.191–19.795]
Age FEP examination (46–55 years old)	2.371	1.340	1	.047*	10.704	[0.775–147.845]
DUP (0–12 months)			2	.909		
DUP (12–24 months)	−0.633	1.446	1	.662	0.531	[0.031–9.033]
DUP (24–36 months)	−20.424	27443.5	1	.999	0.000	0.000
Gender (male)	0.141	0.859	1	.870	1.151	[0.214–6.199]
Substance abuse (yes)	2.728	1.019	1	.007*	15.307	[2.076–112.878]
Education (0–9 years)			2	.780		
Education (9–12 years)	0.732	1.039	1	.481	2.078	[0.271–15.915]
Education (12+ years)	0.398	1.384	1	.774	1.488	[0.099–22.428]
Constant	−2.742	1.323	1	.038*	0.064	

Note. B = unstandardized regression coefficient; S.E. = standard error of the coefficient; df = degrees of freedom; Sig. = significance level (*p*-value); Exp(B) = exponentiated coefficient (odds ratio); CI = confidence interval; FEP = first episode psychosis; DUP = duration of untreated psychosis.

\**p* < .05.

epidemiological data in Greece (Peritogiannis, Mantas et al., 2013), the number of expected new cases over the 15-year observation period in the catchment areas that were involved in the study would be 2,925. Considering that most FEP cases (61.4%, according to the above-mentioned study) are treated in the private sector, a total of 1,129 cases would be expected to have been examined by the MMHUs over the 15-year study period. The difference with the actual number of examined cases (*n* = 216) is very large, more than fivefold. Several considerations should be taken into account to explain this difference. First, the population of rural areas in Greece consists largely of older adults. According to the latest census, the proportion of older adults in rural areas is higher than in urban ones (23.5% vs. 13%) (Hellenic Statistical Authority, 2021). This means that the so-called population at risk for psychosis is significantly lower in rural areas. Another point to be taken into consideration when interpreting the results of the present study, is that over the 15-year period most of the MMHUs that participated in the study did not deliver services for children and adolescents. In a proportion of FEP cases symptoms may appear in adolescence (Solmi et al., 2022), but those cases would rather have been referred to the respective services. Another possible explanation for the low number of FEP cases is that the incidence of FEP may indeed be lower in rural areas. It has been shown that urban environment may be associated with the development of psychotic symptoms (Vassos et al., 2012), thus the incidence of 30/100,000 new cases per year that has been recorded in Greece, may be significantly lower in rural locations. For instance, a previous study in France reported an annual incidence rate in rural areas less than half the incidence observed in urban areas (17.2 vs. 36 per 100,000 person-year at risk) (Szöke et al., 2014). Similar results had been yielded by research in

Denmark (Vassos et al., 2016). Last but not least is the possibility that patients with first displayed psychotic symptoms may have not visited a local mental healthcare service due to the perceived stigmatization of patients. It has been previously suggested that in Western countries mental health-related stigma may be higher in rural areas than in urban ones (Townley et al., 2017; Yin et al., 2014). This could be even stronger in Greece (Economou et al., 2009) where nuclear and extended families are closely knit and try hard to protect their young offsprings from the stigma of severe mental illness (Paschalidou et al., 2022). These patients and their families would probably prefer to be examined by private practice clinicians or in the outpatient clinics of urban public hospitals.

Further examination of cases diagnosed with schizophrenia showed that treatment attendance rate was quite high in the present study, as more than 60% of patients had been successfully engaged to treatment, with a mean follow-up of 5.17 years. Indeed, several patients had been retained in treatment for many years. In the present study no statistically significant difference in DUP was detected between engaged and disengaged patients. However, providing early and timely intervention may facilitate patient engagement and better outcomes concerning symptomatology and functioning (Bidargaddi et al., 2021). This finding differs substantially from the recently published study from Athens, Greece where only 38.7% of FEP patients were engaged in treatment over a 1-year follow-up, probably because the only FEP outpatient service in Athens does not operate within a clear catchment area, neither provides outreach services to the community (Dimitrakopoulos et al., 2022). It has been previously shown that MMHUs, through the development of a community network including primary health care centers, municipal social services and local institutions such as churches, may effectively

engage patients with chronic psychotic disorders in treatment (Peritogiannis, Tatsioni et al., 2013), and this seems to be the case of FEP patients as well. A significant reduction in hospital admissions was observed in first episode schizophrenia patients that attended the MMHUs, in line with previous research involving chronic patients with severe and persistent mental disorders (Garbi et al., 2021; Peritogiannis, Gioti et al., 2020). Importantly, the history of alcohol/substance abuse and the late onset of schizophrenia were predictors of patients' hospitalizations. Accordingly, interventions toward those patients should be even more intense, in order to reduce hospital admissions.

A noteworthy finding was that individuals who were younger at their first examination for first-episode schizophrenia tended to remain engaged for a longer period compared to those who were older at first examination. This finding implies that early-age detection of FEP may be associated with more sustained engagement in treatment and follow-up, which could reflect a greater emphasis on continuous care or stronger therapeutic alliance formed with younger patients. Younger individuals may also benefit from a longer duration of structured support as they progress through critical developmental stages, potentially enhancing their adherence to follow-up. Additionally, this pattern might indicate that early intervention programs are particularly effective in encouraging sustained treatment engagement among younger patients, which aligns with the goals of early psychosis intervention frameworks aimed at improving long-term outcomes for youth.

A large proportion of patients received disability benefits, a finding that corresponds to the Greek social insurance system, according to which patients with severe mental illness are eligible for receiving disability benefits. It should be noted that in rural areas patients tend to work full-time or part-time in the agricultural sector, usually in businesses owned by their family. This means that several patients may indeed work but they are still registered as unemployed or receive disability benefits. It has been previously shown that employment rates are generally low in patients with schizophrenia (Haro et al., 2011), and that years of working life are significantly less in patients with schizophrenia-spectrum disorders compared with the general population (Plana-Ripoll et al., 2023).

Age was found to be related with vocational status, that is younger patients were more likely to be unemployed, whereas in the 46 to 55 age group patients were more likely to receive disability benefits. A plausible explanation could be that rates of unemployment in younger ages correspond to the respective rates of the general population, in which the highest unemployment rates are recorded in the 15 to 24 age-range, whereas in persons >45 years the unemployment rates are the lowest (Hellenic Statistic Authority, 2023). Moreover, at this age range patients and their families would feel more stigmatized to apply for a disability pension. Also, they would probably hope to recover in the future and be

able to work. With regard to ages 46 to 55, it could be hypothesized that patients would be more willing to apply for disability benefits, in order to contribute to their families' income, or because they were urged by their elderly parents, who may worry about patients' financial future.

Vocational status was found not to be related with the DUP in the present sample of patients with first episode schizophrenia. Although longer DUP has been consistently associated with poorer outcomes, such measurements mostly involve psychopathology and social functioning (Drake et al., 2020; Primavera et al., 2012), whereas the association of DUP with employment may be less clear.

The mean DUP that was recorded in patients was almost 8 months (median 3 months). Although MMHUs are locally-based and it would be expected patients' referrals to be timely, several limitations should be considered, mostly the missing data with regard to the DUP. Moreover, in routine clinical practice the estimation of DUP is based solely on the information provided by patients and their relatives, without the use of a structured inventory or schedule. Nevertheless, it should be noted that the DUP in the present sample of patients with schizophrenia is significantly shorter (threefold) than that reported in the epidemiological study of FEP (all non-affective psychotic disorders) in Greece, more than a decade ago, for patients that had been examined in public services (Peritogiannis, Mantas et al., 2013). Data with regard to DUP in community treatment settings are scarce. A previous study in the United States found median DUP to be 74 weeks, whereas 68% of participants had DUP longer than 6 months (Addington et al., 2015). Other research in rural Latvia found a significantly shorter DUP (median 8 weeks) in FEP patients (Bērze et al., 2019). In the present study, DUP did not differ between patients living with a caregiver and those living alone. However, it is possible that in rural areas the caregivers of FEP patients may undermine the patients' symptoms, due to lack of mental health literacy and may tend to conceal the patient's condition due to self-stigmatizing attitudes. It has been previously shown that stigmatizing views of mental illness from the patient's and their families' perspectives can result in delayed access to care (Franz et al., 2010; Kular et al., 2019). Age at first examination for first episode schizophrenia and educational level significantly influenced DUP in the present study, highlighting the importance of these factors in understanding and potentially reducing DUP in clinical settings.

The examination of the whole sample of FEP patients revealed a correlation of DUP with diagnosis, suggesting shorter duration in cases of schizophrenia, and longer duration in patients with unspecified psychotic disorder. In cases of schizophrenia, DUP may be shorter due to the severity of symptoms that raise concerns to the patients and/or their families and push them to seek mental health care. On the contrary, patients with the diagnosis of unspecified psychotic disorder (F29) may have somewhat



unclear symptoms and vague complaints, that may delay the request for mental care.

## Limitations and Strengths

The present study has some limitations. The retrospective design of the study resulted in missing data, mainly regarding the DUP variable. Also, from the originally registered 20 MMHUs in rural Greece, only nine participated in this study. Moreover, patients' outcomes in terms of psychopathology and functioning were not measured with a standardized instrument. Still, there are several notable strengths in the present research. This is the first Greek study on FEP in rural areas and one of the few world-wide, as research on psychotic disorders in rural areas is scarce (Peritogiannis & Samakouri, 2021). Also, the study is multicenter and comprises real-world FEP patients.

## Potential Research and Clinical Implications

Despite the aforementioned limitations the present study may have implications for clinical practice and mental healthcare policy in rural areas in Greece. It is the first attempt to record FEP cases in remote and underserved areas and the results could be used as a baseline for further research. Also, it is a multi-center study, a rarity in rural settings in Greece (Peritogiannis et al., 2023; Peritogiannis, Rousoudi et al., 2022).

Although previous research has shown that specialized rural FEP services may outperform the usual community mental health services in a variety of patients' outcomes (Pipkin, 2021), a more recent meta-analysis found that long-term clinical recovery in FEP patients is just 21% and the rate did not differ between patients attending early intervention services versus those that received usual interventions in other settings (Hansen et al., 2023). Given the scarce resources and lack of highly specialized services in rural areas in Greece, it appears that community mental health services, such as the MMHUs, could be the best treatment option for those patients.

To increase the number of FEP patients that could receive comprehensive care by the MMHUs a closest collaboration with primary healthcare physicians and local authorities should be pursued, to facilitate referrals. In this regard, initiatives for the reduction of stigma in rural areas would be helpful. Since it may not be realistic to establish specialized early interventions in rural areas in Greece, MMHUs as interdisciplinary teams may provide early and comprehensive care for those patients.

## Conclusion

The present study is the first attempt to address the care of patients with FEP by interdisciplinary community mental

health services in rural Greece. The most noteworthy findings of the study are the low percentage of patients seeking help from the MMHUs, compared to the expected cases and the high attendance rate of those that are examined in this context. Accordingly, a close collaboration with other health providers and local authorities should be pursued, in order to increase referrals of FEP patients that could receive comprehensive care. Given that the study was based on data drawn from every day clinical practice, information on several factors such as psychopathology and functioning was missing, that renders the interpretation of the findings difficult. It appears that future research on FEP in the Greek rural context should expand to include as many MMHUs as possible so that the findings are more generalizable and address important aspects of patients' outcome, such as psychopathology and functioning.

## Coordinating Committee of the Mobile Mental Health Units Members

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