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RESEARCH ARTICLE

Assessment of the Mobile Mental Health Units' effectiveness in Cyclades islands

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---------- **ABSTRACT** ----------

In Greece, the provision of mental health shows inefficiencies in remote and inaccessible areas due to the lack of appropriate structures and access to healthcare. The purpose of this study was to assess the effectiveness of the Mobile Mental Health Units (MMHUs) in Cyclades with and without MMHUs' operation based on Real-World Evidence (RWE). The study population consisted of 724 people who visited the MMHUs of the western and northeastern Cyclades in 2015. The data derived from the patients' medical records of EPAPSY classified by International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) and the Global Assessment of Functioning (GAF) scale. The analysis revealed that 60.9% of the participants were women and the average age was 50.1. 50.4% of the people who visited MMHUs without referral from primary health care professionals and 18.8% with referral. The calculation of effectiveness was based on DALYs (Disability-Adjusted Life Years) and was performed according to the World Health Organization methodology. In the specific population, there are no recorded deaths caused by mental disorders and thus DALYs are equal to Years Lost due to Disability (YLDs) with MMHUs' operation. 18% of the population was diagnosed with mood disorders (F30-F39) and morbidity burden 9.49 (YLDs), while 17.5% of the patients were diagnosed with neurotic, stress-related and somatoform disorders (F40-F48) and corresponding morbidity burden 4.53 (YLDs). Our results revealed that the effectiveness of MMHUs corresponds to 17.98 Disability-Adjusted Life Years (DALYs) averted in 2015. The mood disorders and the neurotic, stress-related disorders have shown a high morbidity burden. Advanced age, non-permanent employment, existence of psychopathology in the family and referral on patients' own will were found to significantly affect the mental health status of the participants. The implementation and expansion of flexible and alternative community-based interventions, such as MMHUs, constitute a best practice both for obtaining higher clinical outcomes and for facing regional inefficiencies related to population's access to healthcare.

KEYWORDS: Mobile Mental Health Units (MMHUs), Disability-Adjusted Life Years (DALYs), mental health, remote areas, Greece.

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Introduction

Health policy experts and analysts have identified deficiencies in the access and provision of the mental health services in remote and inaccessible areas, in Greece and elsewhere.[1-6] The operation of the community-based[7-8] Mobile Mental Health Units (MMHUs) has been shown to be a cost-effective option for decision-making purposes internationally.[9-22] The Scientific Association for the Regional Development and Mental Health (EPAPSY) launched in 2003 the MMHUs in the Northeastern and Western Cyclades in the islands of Paros, Antiparos, Syros, Tinos, Mykonos, Andros, Kea, Kythnos, Serifos, Sifnos, Kimolos and Milos. These units provide free mental health services to children, adolescents and adults, are funded by the Ministry of Health and are also supported by the local government and other local agencies.[23-24]

It's worth mentioning that in the above islands and before the MMHUs' operation, patients were facing major difficulties in access to mental health services, with adverse consequences on their health condition.[25] Mental care was only delivered at the outpatient units of the Hospital of Syros. The geographical dispersion among the islands, the difficulties in transportation related with the low frequency of itineraries and the unpredictable weather conditions hampered disproportionately patients' access to health services.[23] In addition, the unpropitious fiscal situation in the country had created a climate of uncertainty, unemployment, financial difficulties, etc., which are directly related to the impact of psychiatric morbidity.[6, 26-34]

Throughout these years plenty of actions have taken place by the MMHUs covering the islands' population in need and also providing preventive and consultation mental health services. In particular, workshops and training seminars addressed to doctors, teachers, police officers, civil servants and other local professional groups have been organized. Furthermore, the creation of volunteer groups and the undertaking of actions addressed to specific groups of the population, such as the elderly, victims of domestic violence, parents, children, etc. is a significant part of the operation of MMHUs.[23]

Given the MMHUs' operation and the lack of mental health infrastructure in these islands as well as the geographical features of the country, it was considered critical to evaluate patients' clinical outcomes. Thus, the purpose of this study is to assess the effectiveness of the MMHUs in the Northeastern and Western Cyclades population with symptoms of mental disorders.

Material and method

Study population

The data were extracted from the patients' medical records (Real-World Evidence, RWE) addressed to the MMHUs of the Northeastern and Western Cyclades. The collected data was anonymous and referred to patients' demographic and socio-economic characteristics, the diagnosis according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10),[35] comorbidities, health services use and the overall cases' management. Figure 1 illustrates the sample's stratification for subsequent analysis. The study

was undertaken by the University of Peloponnese and has been approved by the Ethics Committee of EPAPSY.

[Figure 1]

Clinical data

Medical records were classified in accordance with the diagnostic categories (ICD-10) and the Global Assessment of Functioning scale (GAF).[36] GAF assesses person's health status and the symptoms of mental disorder that affect his/her daily life. The Disability-Adjusted Life Years Index (DALYs) has been used for the outcomes' assessment. DALYs refer to the present value of future life years lost due to premature mortality and morbidity associated with various mental and physical health conditions.[37-42] DALYs for a disease or health condition are calculated as the sum of Years of Life Lost (YLLs) lost due to premature mortality in the population and Years of Lost due to Disability (YLDs). The methodology of the World Health Organization (WHO) was used to calculate the DALYs:[39-41]

DALYs = YLLs + YLDs, where:
YLLs = Years of Life Lost due to premature death
YLDs = Years Lost due to Disability
YLLs were calculated by the formula:[37-42]

YLLs = N * L, where:
N = number of deaths
L = standard life expectancy at age of death in years
YLDs were estimated by the formula (GBD 2010):[40]

YLDs = P * D, where:
P = number of prevalent cases (prevalence)
D = disability weight for each disease (0-1)
Due to the cases of comorbidities, the calculation was formulated as follows:[39]
$YLD_{1+2} = 1-(1-YLD_1) *(1-YLD_2)$

Statistical analyses

The statistical program IBM SPSS 22.0 was used for data processing (Statistical Package for Social Sciences). The statistical analysis of the results includes descriptive and inferential statistics (linear regression). In the multiple linear regression, DALYs of the mental and physical illnesses were used as dependent variable while the demographic, socio-economic data, health services' use and the cases' overall management were used as independent variables. Logarithmic transformations were performed and the stepwise method was used. Statistical significance levels were set at 0.05.

Results

Characteristics of the Sample

The study population (Table 1) consisted of 724 people, who addressed the MMHUs in 2015. The majority were women, married, secondary and tertiary education graduates and full-time employees. In addition, the mean age of the sample was 50.1 years (SD = 17.0 years). The 62.9% of participants was married and the median number of children was 2 (1-2 children). 71.0% of the participants lived with their family, while 13.7% lived alone. The majority (91.6%) of the sample were Greeks and 21.4% were lived in Paros, 16.7% in Mykonos and 15.5% in Tinos. 4.3% of participants were uninsured. In addition, 33.7% of people had visited a mental health professional

at some point in the past. Specifically, the mean age of the first visit was 44.0 years (SD = 17.5 years). The 20.9% reported cases of psychopathology in the family environment. A small number (2.4%) had been hospitalized for mental disorders with an average number of one hospitalization. 28.0% of the participants had serious health problems and 31.4% had been diagnosed with chronic physical illness.

[Table 1 about here]

Table 2 presents the reasons for attendance, as well as the referral methods from 2013 to 2017. The reasons for attendance were mainly related to cases of parental counseling, anxiety, depression and relationship or social problems. It was found that over time, the majority of participants addressed the MMHUs on their own will. It is also worth noting that this method of referral became an increasing trend over time: in 2013 the patients who addressed the units voluntarily approached 61.8% while the percentage reached 82.6% in 2017. As a result, there was a reduction in the other means of referral. In 2015, out of the 365 participants who addressed voluntarily the MMHUs, the majority mentioned as primary reason for their visit the parent counseling (88 patients), anxiety cases (87 patients), and depression cases (66 patients).

[Table 2 about here]

Clinical characteristics

Table 3 presents the patients' diagnosis. The majority was addressed for counseling, mood and neurotic, stress-related and somatoform disorders. Regarding the individualized care plan, 48.9% of participants followed psychological treatments, 21.8% pharmacotherapy and 12.3% a combination of psychological therapies and pharmacotherapy. Specifically, 24.4% followed treatment with antidepressants and 9.4% anxiolytics.

[Table 3 about here]

Based on the patients' diagnosis combined with the mortality (YLDs) and morbidity (YLLs) data, DALYs estimation is presented in the Table 4 with and without the MMHUs' operation. Thus, 17.98 DALYs were found for the MMHUs' operation and 115.79 in the case of the non MMHUs' operation.

[Table 4 about here]

The results of the multiple linear regression (Table 5) were:

- The older the patients, the greater their DALYs.
- Full-time employees had significantly fewer DALYs than the non-permanent work ones.
- Patients who visited MMHUs because of referral had significantly fewer DALYs than those who voluntarily visited MMHUs.
- Patients with a family history of psychopathology had more DALYs than those without family history of psychopathology.

[Table 5 about here]

Discussion

The operation of the MMHUs in the Northeastern and Western Cyclades contributed to the aversion of about 98 DALYs (115.79 - 17.98) in 2015. This result is due to the prevention of premature mortality and the reduction of the mental health burden. More specifically, before the MMHUs' operation, there were no suitable structures to care for people with symptoms of mental disorders resulting in deficient treatment. It is clear that the MMHUs health services provision cover a significant part of Primary Health Care (PHC) in the field of mental health. The cooperation among PHC and MMHUs health professionals would significantly contribute to the continuation

of treatment and access to mental care as well as the overall improvement of patients' health status.

Our results indicate that the highest DALYs' scores are found in the diagnostic categories of mood disorders (DALYs: 9.49) and neurotic, stress-related disorders (DALYs: 4.53) under the MMHUs' operation. These findings are similar to a previous research conducted in Greece indicating high numbers of patients diagnosed with neurotic disorders and mood disorders.[6] It is essential to point out that the results of our study converge with other studies conducted in Greece. In particular, our finding revealing that patients with psychotic disorders show a higher degree of comorbidity compared to those diagnosed with other mental disorders is also presented in a study conducted in Ioannina-Thesprotia.[43-44] Obviously, these patients have a greater difficulty in finding appropriate treatment and the presence of MMHUs is considered as of added value for the continuation of their treatment. Also, relevant studies have shown that women outnumber men in terms of the onset of mental disorders symptoms,[6, 30-31, 34] married[30-31, 34] as well as people with higher education and higher income have higher incidence of mental disorders.[6] Our results support the above findings since 60.9% of the participants who addressed the MMHUs were women, 62.9% were married and 20.6% were scientists, businessmen, senior public and private sector executives.

Advanced age, non-permanent employment, existence of psychopathology in the family (heredity) as well patients' referral on their own will, are factors that seem to significantly affect individuals' mental health condition. These findings are in agreement with the international literature that shows increased risk of developing psychopathology and morbidity in these specific population groups.[6, 23, 26-27, 29, 31-34, 45]

Although DALYs for clinical evaluation of interventions is revealed as among the most valid indices used in the field of mental health internationally,[46-50] it lags far behind in Greece. The present study measures the effectiveness of an intervention using the DALYs index for the first time in the field of mental health in the country. However, the lack of comparative chronological data on DALYs and the use of only one year for the evaluation of MMHUs constitutes a methodological limitation that should be pointed out. Therefore, DALYs calculation for one year period is indicative and cannot be reproduced over time. The existence of chronological real world evidence data would provide more reliable and robust results.

The results of this study highlighted the contribution of MMHUs to cover unmet mental medical needs. The expansion of the activities of MMHUs is deemed necessary and beneficial in a country such as Greece where remote areas are inaccessible. Evaluation of health services should be considered as priority in health policy decision making.

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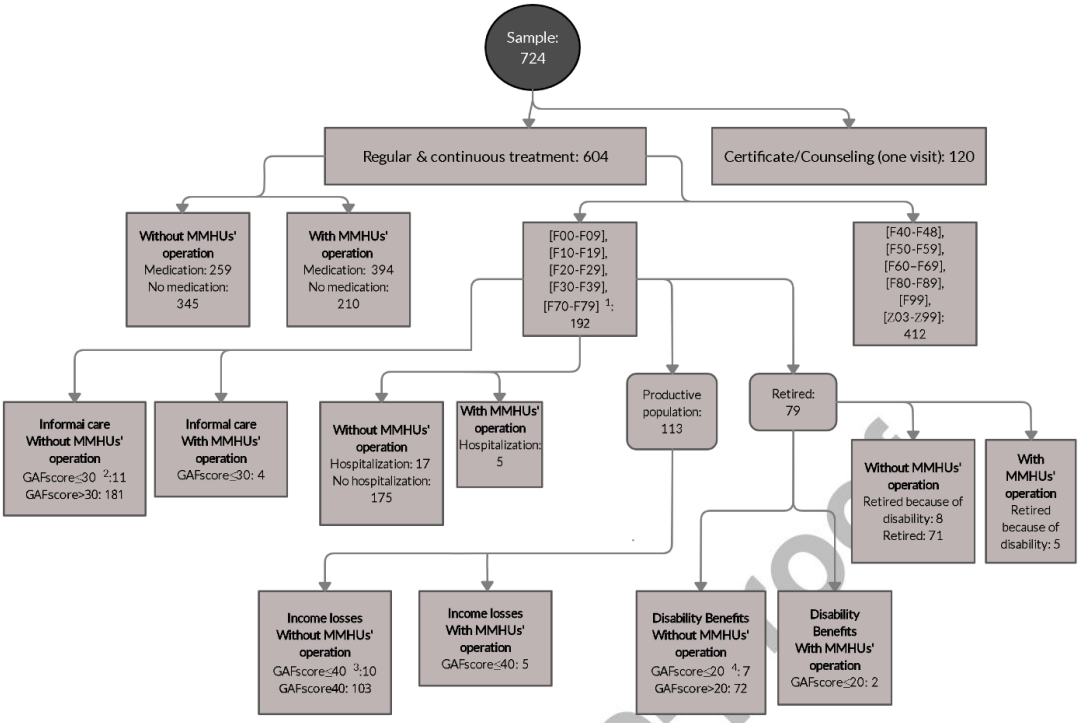

Figure 1: Sample Stratification

Table 1: Characteristics of the sample

		N	%
Gender	Male	283	39,1
	Female	441	60,9
	Total	724	100
Marital status	Single	129	18,1
	Married	447	62,9
	Divorced/ Separated	64	9
	Widow	52	7,3
	Domestic Partnership	19	2,7
	Total	711	100
Educatiom	No	12	1,7
	Primary school	136	18,8
	Secondary school	70	9,7
	High school	224	30,9
	IEK/College/Vocational training institute	72	9,9
	Technological Educational Institute	62	8,6
	University/Higher Educational Institute	148	20,4
	Total	724	100
Occupation	Full-time	327	45,2
	Part-time/seasonal/unemployed	109	15
	Household	156	21,5
	Pupil/Student	4	0,6
	Retired	128	17,7
	Total	724	100

Table 2: Reasons for attendance and referral methods to MMHUs 2013- 2017

	2013		2014		2015		2016		2017	
	N	%	N	%	N	%	N	%	N	%
Reasons for attendance										
Anxiety	75	18,9%	70	17,9%	138	19,1%	72	23,7%	72	18,9%
Depression	76	19,2%	73	18,6%	105	14,5%	52	17,1%	63	16,5%
Psychosis	12	3,0%	12	3,1%	24	3,3%	11	3,6%	9	2,4%
Dementia	16	4,0%	13	3,3%	28	3,9%	14	4,6%	29	7,6%
Drugs	2	0,5%	2	0,5%	6	0,8%	3	1,0%	0	0,0%
Prescription-	45	11,4%	36	9,2%	79	10,9%	30	9,9%	45	11,8%
Problems in relationship-Social-Other	156	39,4%	114	29,1%	98	13,5%	57	18,8%	83	21,8%
Problem of conduct	4	1,0%	4	1,0%	16	2,2%	3	1,0%	5	1,3%
Parents' counseling	10	2,5%	68	17,3%	230	31,8%	62	20,4%	75	19,7%
Total	396	100,0%	392	100,0%	724	100,0%	304	100,0%	381	100,0%
Referral methods										
Without referral/on their own will	275	61,8%	198	50,3%	365	50,4%	199	65,7%	314	82,6%
Primary health care units	35	7,9%	74	18,8%	136	18,8%	36	11,9%	12	3,2%
Private doctor	17	3,8%	32	8,1%	43	5,9%	10	3,3%	3	0,8%
Local municipality	26	5,8%	27	6,9%	53	7,3%	17	5,6%	14	3,7%
Public authorities (police, school etc.)	72	16,2%	55	14,0%	80	11,0%	19	6,3%	14	3,7%
Church	7	1,6%	6	1,5%	10	1,4%	5	1,7%	0	0,0%
Other (family, friends etc.)	13	2,9%	2	0,5%	37	5,1%	17	5,6%	23	6,1%
Total	445	100,0%	394	100,0%	724	100,0%	303	100,0%	380	100,0%

Table 3: Sample diagnoses

Diagnoses according to ICD-10	N	%
Organic, including symptomatic, mental disorders [F00-F09]	39	5,4
Mental and behavioural disorders due to psychoactive substance use [F10-F19]	5	0,7
Schizophrenia, schizotypal and delusional disorders [F20-F29]	20	2,8
Mood [affective] disorders [F30-F39]	130	18
Neurotic, stress-related and somatoform disorders [F40-F48]	127	17,5
Behavioural syndromes associated with physiological disturbances and physical factors [F50-F59]	5	0,7
Disorders of adult personality and behavior [F60–F69]	12	1,7
Mental retardation [F70-F79]	4	0,6
Disorders of psychological development [F80-F89]	1	0,1
Factors influencing health status and contact with health services, counseling [Z03-Z99]	279	38,5
Examination for administrative purposes [Z00-Z02]	62	8,6
Unspecified mental disorder [F99]	40	5,5
Total	724	100

Table 4: DALYs measurement with and without MMHUs' operation

Diagnostic Categories ICD-10		With MMHUs' operation			Without MMHUs' operation		
	N	YLD	YLL	DALYs	YLD	YLL	DALYs
Organic, including symptomatic, mental disorders [F00-F09]	39	1,17	0,00	1,17	1,69	0,00	1,69
Mental and behavioural disorders due to psychoactive substance use [F10-F19]	5	0,03	0,00	0,03	0,04	0,00	0,04
Schizophrenia, schizotypal and delusional disorders [F20-F29]	20	0,43	0,00	0,43	0,49	79,40	79,89
Mood [affective] disorders [F30-F39]	130	9,49	0,00	9,49	15,60	0,00	15,60
Neurotic, stress-related and somatoform disorders [F40-F48]	127	4,53	0,00	4,53	10,79	0,00	10,79
Behavioural syndromes associated with physiological disturbances and physical factors [F50-F59]	5	0,05	0,00	0,05	0,05	0,00	0,05
Disorders of adult personality and behavior [F60–F69]	12	0,13	0,00	0,13	0,13	0,00	0,13
Mental retardation [F70-F79]	4	0,00	0,00	0,00	0,00	0,00	0,00
Disorders of psychological development [F80-F89]	1	0,00	0,00	0,00	0,00	0,00	0,00
Unspecified mental disorder [F99]	40	0,24	0,00	0,24	0,41	0,00	0,41
Examination for administrative purposes [Z00-Z02]	62	0,15	0,00	0,15	0,65	0,00	0,65
Factors influencing health status and contact with health services, counseling [Z03-Z99]	279	1,75	0,00	1,75	6,53	0,00	6,53
Total	724	17,98	0,00	17,98	36,39	79,40	115,79

Table 5: Results of multiple linear regression

		β+	SE++	P
Age		0,001	0,0001	<0,001
Occupation	Household/ Student/ Pupil/ Retired (refer.)			
	Part-time/ Seasonal/ Unemployed	-0,004	0,004	0,287
	Full-time/stable	-0,009	0,003	0,003
Referral	No (refer.)			
	Yes	-0,007	0,002	0,006
Existent psychopathology in the	No (refer.)			
family	Yes	0,007	0,003	0,015

+beta coefficient ++standard error

ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

Αξιολόγηση της Αποτελεσματικότητας των Κινητών Μονάδων Ψυχικής Υγείας στις Κυκλάδες

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----------**ΠΕΡΙΛΗΨΗ** ----------

Η ύπαρξη ελλείψεων σε απαραίτητες και κατάλληλες δομές του συστήματος παροχής υπηρεσιών ψυχικής υγείας σε απομακρυσμένες και δυσπρόσιτες περιοχές έχει διαπιστωθεί και εντείνεται σημαντικά στη νησιωτική χώρα. Αντικείμενο της παρούσας μελέτης είναι η μέτρηση της αποτελεσματικότητας της λειτουργίας των Κινητών Μονάδων Ψυχικής Υγείας (ΚΜΨΥ) βάσει πραγματικών δεδομένων (Real-World Evidence, RWE) για την αντιμετώπιση περιστατικών με συμπτώματα ψυχικών διαταραχών στις Κυκλάδες. Τον πληθυσμό της μελέτης αποτέλεσαν οι 724 εξυπηρετούμενοι που προσήλθαν στις ΚΜΨΥ των Βορειοανατολικών και Δυτικών Κυκλάδων από τα δώδεκα (12) νησιά ευθύνης κατά το έτος 2015. Τα δεδομένα της ανάλυσης προήλθαν από τους ιατρικούς φακέλους των εξυπηρετούμενων της Ε.Π.Α.Ψ.Υ και ταξινομήθηκαν με βάση τη Διεθνή Στατιστική Ταξινόμηση Νόσων και Συναφών Προβλημάτων Υγείας Δέκατη Αναθεώρηση (ICD-10) και την κλίμακα Global Assessment of Functioning (GAF). Από την ανάλυση προέκυψε ότι το 60,9% των εξυπηρετούμενων ήταν γυναίκες και η μέση ηλικία των εξυπηρετούμενων ήταν 50,1 έτη. Το 50,4% των εξυπηρετούμενων απευθύνθηκε για βοήθεια στις ΚΜΨΥ αυτοβούλως και το 18,8% παραπέμφθηκε από τις μονάδες της Πρωτοβάθμιας Φροντίδας Υγείας (ΠΦΥ). Η μέτρηση της αποτελεσματικότητας βασίστηκε στη χρήση του δείκτη των Σταθμισμένων Ετών Ζωής ως προς την Ανικανότητα (Disability-Adjusted Life Years, DALYs), σύμφωνα με τη μεθοδολογία του Παγκόσμιου Οργανισμού Υγείας. Με δεδομένο ότι στον υπό μελέτη πληθυσμό δεν υπάρχει θάνατος από ψυχική διαταραχή, τα DALYs ισούνται με τα Years Lost due to Disability (YLDs). Το 18% του πληθυσμού διαγνώστηκε με διαταραχές της διάθεσης (F30-F39) και φορτίο νοσηρότητας ίσο με 9,49 (YLDs), ενώ το 17,5% των εξυπηρετούμενων με νευρωσικές διαταραχές, οι οποίες σχετίζονται με άγχος και σωματόμορφες διαταραχές (F40-F48) και αντίστοιχο φορτίο νοσηρότητας 4,53 (YLDs). Η αποτελεσματικότητα της λειτουργίας των ΚΜΨΥ καταγράφεται σε 17,98 DALYs που αποτρέπονται κατά το έτος 2015, όπου οι διαταραχές της διάθεσης και οι νευρωσικές σχετιζόμενες με άγχος διαταραχές εμφανίζουν υψηλό φορτίο νοσηρότητας. Η προχωρημένη ηλικία, η μη σταθερή απασχόληση, η ύπαρξη ψυχοπαθολογίας στην οικογένεια και η παραπομπή με πρωτοβουλία του ασθενή βρέθηκε ότι επηρεάζουν σημαντικά την ψυχική υγεία του ατόμου. Η ανάπτυξη ευέλικτων μορφών παρεμβάσεων που θέτουν στο κέντρο τους την κοινότητα, όπως οι ΚΜΨΥ αποτελεί μια άριστη πρακτική με όρους κλινικής αποτελεσματικότητας και παρέχει λύσεις στο πρόβλημα της γεωγραφικής ιδιαιτερότητας και πληθυσμιακής κατανομής στον ελλαδικό χώρο.

ΛΕΞΕΙΣ ΕΥΡΕΤΗΡΙΟΥ: Κινητή Μονάδα Ψυχικής Υγείας (ΚΜΨΥ), Σταθμισμένα Έτη Ζωής ως προς την Ανικανότητα (Disability-Adjusted Life Years, DALYs), ψυχική υγεία, δυσπρόσιτες περιοχές, Ελλάδα.

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