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## Healthcare resource utilization and direct medical costs in patients with dual diagnosis in Italy

### Summary

#### Objectives

This study is aimed at analyzing the patterns of care and annual costs of services in patients with dual diagnosis treated in an Italian Mental Health and Pathological Dependency Department (MH-PDD).

#### Methods

In this retrospective prevalence-based study, healthcare accesses of 331 patients with dual diagnosis being treated at the MH-PDD were obtained through a linkage of 7 administrative databases (Tab. I). All adult patients with at least one contact with the MH-PDD are recorded in the database, which includes demographic characteristics, the ICD-9-CM diagnosis and information on each type of service provided. The ICD-9-CM are grouped into diagnostic categories, defined in Table II. Costs were assigned using different drivers and cost objects (national, regional tariffs and ad hoc estimated MH costs).

#### Results

The study population consisted of 331 patients with a diagnosis of substance abuse and a mental health disorder who had at least one contact with the MH-PDD in 2013. Patients were 68% male, with a mean age of 45 years and 93% Italian (Tab. III). A large proportion ( $n = 228$ , 68.6%) had a > 2 year duration of contact with MH-PDD. The substance of abuse or dependence was alcohol in the large majority ( $n = 196$ , 59.2%), followed by drugs ( $n = 99$ , 29.9%) and other substances ( $n = 16$ , 4.8%). Among the MH-PDD services that patients received, psychiatric-clinical treatment and initial assessment/reassessment and were the most frequent interventions, while vocational training, psychosocial rehabilitation and day center services were uncommon (Tab. IV). Total MH-PDD costs were 867,080€ and costs per patient ranged from 25€ (three psychiatric follow-up visits) to 239,125€ in one outlier patient with psychosis and alcohol use disorder, who received 1,100 MH services and 22 home visits (Tab. V). The median cost was 279€ and the mean cost 2,620€. The amount of non-MH-PDD costs almost equaled that of MH-PDD costs, and was largely ascribable to hospitalization in psychiatric and non-psychiatric wards (Fig. 1). Overall costs per patient ranged from 45€ (first MH-PDD assessment) to €239,287 (the same outlier patient, with 1,100 MH services, 22 home visits and 4 specialty services). Median cost was 1,423€, mean cost 5.381€ and the overall total was 1,780,958€. Classification of patients in cost tertiles revealed that one third of patients accounted for 88.1% of overall costs (Fig. 2). The costs borne by the MH-PDD increased from the first to the third tertile while the vice versa was true for non-MH-PDD costs. Median costs by psychiatric diagnosis ranged from 205€ for other mental disorders to 2,085€ for dementia (Tab. V, Fig. 3).

#### Conclusions

An integrated healthcare system based on outpatient management of patients with substance abuse/dependence costs less than other countries with different healthcare systems. In the absence of outcome data, cost-effectiveness studies are warranted.

#### Key words

Dual diagnosis • Substance use disorder • Costs • Drugs • Alcohol

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## Introduction

Individuals with co-occurring mental illness and addiction (the so-called dual diagnosis, DD) comprise at least half of patients in most mental health treatment systems<sup>1-4</sup>. These patients present several challenges to health professionals because of their increased risk of psychiatric relapse, poor medication compliance, violence, suicide, legal problems, high utilization of emergency room or inpatient services, and HIV and HCV infection compared to those with either mental or substance use disorders alone<sup>5-7</sup>. Data reported by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) indicate that in Italy psychiatric comorbidity among drug users in treatment amounts to 22%<sup>8</sup>. No population surveys on this topic were conducted in Italy and available data refer to the treated prevalence in a Local Health Authority (LHA) or in a limited number of drug addiction services<sup>9-12</sup>, except for two multicenter studies (ASSALT and CORRAL) focused on identifying prognostic factors associated with alcoholism treatment outcomes and on investigating the history of alcohol treatment and the socio-demographic and clinical variables of patients hospitalized in Italian residential alcohol abuse rehabilitation units for alcohol dependence or abuse<sup>13</sup>.

Patients with DD consult both mental health and addiction services, according to the predominant problem, with a risk of treatment fragmentation<sup>14</sup>.

The recommended organizational response for DD patients is nowadays an integrated and 'managed care' model, in which a single health professional acts as case manager, by translating the 'unique' needs of the patient and ensuring a good coordination of psychiatric and addiction services<sup>7</sup>. Although evidence on the efficacy of an integrated service model over standard and non-integrated ones is weak and inconsistent<sup>15</sup>, the integrated model is widely accepted as an evidence-based practice for DD patients and is endorsed by clinicians and managers because it improves some outputs (e.g. lowers staff-to-patient ratios)<sup>16</sup>. Over the last three decades, innovative ways of liaison between psychiatry and drug addiction services have suggested that integrated care tailored on DD patients' needs may reduce ambulatory consultations, long-term care, and hospital admissions<sup>17</sup>.

The complexity of this group of patients raises many questions regarding the effectiveness of the combination and intensity of the available interventions. The expected outcomes depend on patient characteristics and on the quality and amount of treatment they received. Although there is no consensus on the intensity of treatment that DD patients would require, some evidence exists regarding the determinants of intervention effectiveness. For instance, severity and duration of addiction are strong predictors of lower recovery rates. In fact, patients with moderate to high severity of illness

have poorer health, social and legal outcomes<sup>18</sup>. Moreover, severe patients are more likely to receive inpatient care besides community care and drug treatment<sup>19</sup>. Despite the lack of clear evidence on a dose-response relationship, several studies suggest a strong positive association between severity of DD related problems and the total amount and intensity of care required. A review of interventions and their effectiveness is provided by the NICE guidelines<sup>20</sup>.

Costs of illness studies on mental health and substance use disorders show higher annual and lifelong costs for DD patients, independently of the mental health financing policies<sup>21-24</sup>. The aim of this study is to estimate the direct medical costs of patients with dual diagnosis by quantifying the resource consumption and the costs borne by an Italian LHA to treat this special case mix. This will be done by analyzing both the patterns of access and the costs of services provided by the Mental Health and Pathological Dependences Department (MH-PDD) and those generated by the use of other services (hospital, emergency, outpatient services, domiciliary care, long-term rehabilitation and pharmacy) in a given year. The specific focus on DD patients is chosen because their access to care is voluntary, likely to involve several services due to complex health needs related to the psychiatric and substance abuse problems.

## Material and methods

### Overview

This is a retrospective, prevalence-based study consisting of patients with substance abuse/dependence who had at least one contact with MHS in 2013.

### Population studied and services organization

We included all patients admitted to the MH-PDD in 2013 with a diagnosis of substance abuse and a co-occurring psychiatric condition or referred to the mental health services for a psychiatric assessment. The MH-PDD consists of two units: the MH unit provides services for patients with psychiatric disorders, and the PD unit, provides services for patients with pathological dependences. Usually, when patients have both conditions, the main clinical problem is a psychiatric disorder and the substance abuse or dependence does not require intensive management in PDD, patients are treated at the MH services. However, in order to ensure continuity of care and compliance of patients with co-occurring psychiatric disorders and substance abuse/dependence, the healthcare services in the study area have implemented a specific clinical pathway with a shared management of patients between MH and PDD services. Patients with complex clinical or social problems may receive specific treatments delivered in dedi-

cated facilities. Community day hospital interventions include drip, and parenteral or oral drug administration to patients in an acute illness phase, as an alternative to hospitalization. They are carried out in non-hospital facilities. Day center activities are daytime group rehabilitative therapeutic activities for patients with severe mental illness. Socio-rehabilitation consists of individual or group daytime activities, tailored to the needs of care or rehabilitation of patients with a high degree of disability / chronicity. Socio-rehabilitation activities are aimed at providing patients social and/or economic support,

or helping them reacquire daily activity skills and interpersonal functioning. They are carried out outside day centers or day hospital <sup>25</sup>.

#### Data source

Healthcare accesses to mental health services, outpatient care provided by other community services, hospital care, home care and drug supply were obtained through a record linkage of 7 administrative databases using the unique anonymous patient identifier. The data sources to calculate healthcare services utilization and costs are provided in Table I.

**TABLE I.** Summary of cost objects by service domain, source of information and methodology.

Service domain	Type of service	Costing unit	Monetary value	Method	Source
MH-PDD	MH unit services (45 services)	Per service	Unit Cost given number and type of health professionals involved	Av. Unit cost, bottom-up approach	SISM
Acute inpatient care by the Hospital Trust (SPDC)	Acute in patient care	Hospital episode (discharge)	Regional tariffs applied to specific DRG considering LOS	Charges	SDO
Community intensive hospitalization (public or private)	Sub-acute inpatient care and rehabilitation	Hospital episode (discharge)	Regional tariffs applied to specific DRG, for LOS (eventual integration pro die if hospitalization lasts longer)	Charges	SDO and SDRES
Inpatient acute	Hospital services (public/private)	Hospital episode (discharge)	DRG charge reported by the hospital (trimmed, adjusted per LOS, per type of hospital)	Charges	SDO and SDRES
Emergency	Public hospital emergency admissions	Per admission (Short observation and discharge)	DRG charge reported by the hospital, only the episodes not followed by hospitalization were valued	Charges	PS
Homecare*	Home care provided by GPs and LHA homecare nurses for health problems other than MH and SA	Per visit		Av. Unit cost Top-down approach 98,49€ per visit	Model LA for ADI services and ADI activity database
Out-patient ambulatory services	Non Mental Outpatient medical Service	Per consultation (visit, rehab session, therapy)	ASA regional charges 2013	Charges	ASA
Out-patient ambulatory services	Diagnostic services	Lab tests	ASA regional charges 2013	Charges	ASA
Pharmaceutical expenditure	Drug supply (direct supply and self-purchased)	Per prescription	Drug regional prices (Different VAT, and wholesaler and retailer margins apply for FED and AFT)	Charges	FED and AFT

\*This is estimated by taking the total COA cost for 'home care' and dividing it by the number of home visits delivered in 2013. This method was used as no reliable information on the length and type of visit was available. Once excluded the direct healthcare costs (drugs supplied at home are recorded in the FED) the average unit cost per visit is 98.49€ and it encompasses the payment provided to GPs for participating in this activity and the LHA costs to run and support this activity.

**TABLE II.** ICD-9-CM diagnostic categories included in the study.

ICD-9-CM codes	Diagnostic cluster
295.xx, 297.xx, 298.xx, 299.1x, 299.9x	Psychotic disorders
296.0x, 296.1x, 296.4x, 296.5x, 296.6x, 296.23, 296.24, 296.33, 296.34	Bipolar affective disorder
311 and residual 29	Depressive disorders
300.xx	Anxiety
301.xx	Personality disorders
	<b>Substance abuse and dependence</b>
291.xx, 303.xx	Alcohol
292.xx (excluding 292.8), 304.xx (excluding 304.1), 305.xx (excluding 305.4x)	Drugs
305.4x 304.1x, 292.8	Other substances
290.xx, 293.xx, 294.xx	Dementia
302.xx, 306.xx-310.xx, 312.xx, 316-319	Other mental health disorders
309.xx	Adjustment Disorder

Note: the diagnostic category "Other mental health disorders" (ICD-9-CM codes 302.xx, 306.xx-310.xx, 312.xx, 316-319) includes intellectual disabilities, adjustment disorders and other miscellaneous disorders.

The mental health information system (SISM) was implemented in 2005 for administrative and epidemiological purposes. All adult patients with at least one contact with the MH-PDD are recorded in the database, which includes demographic characteristics, the ICD-9-CM diagnosis and information on each type of service provided. The ICD-9-CM are grouped into categories, defined in Table II.

The hospital discharge record (HDR) database includes demographic characteristics, admission and discharge dates, main diagnosis, up to five secondary diagnoses, up to six interventions (identified using the ICD-9-CM coding system) and discharge status. HDRs are sent by public and private hospitals to the Regional Authority and on a regular basis from the Regional Authority to the Ministry of Health after data quality control. Since 1995, the diagnosis-related group system has been systematically used to allocate funds to hospitals and to monitor quality of care and outcomes.

Residential mental healthcare discharge record database is active since 2008 and includes mandatory information on patients discharged from accredited non-profit or private facilities, that is, admission and discharge dates, main diagnosis and discharge status. Accredited facilities are private hospitals where fees are reimbursed by the Italian National Health Service if the patient is resident in Italy.

The outpatient pharmaceutical database includes information on patients' gender and age, prescriptions (substance name, ATC System code-V.2013, trade name, date of prescription filling and number of packages) and prescribers. This register includes drugs reim-

bursed by the healthcare system that are prescribed by the general practitioner or a specialist, or directly delivered by the hospital pharmacies. Each region tracks the drug prescriptions in the AFT (Outpatient Pharmaceutical Supply) and FED (Direct Supply Drugs) databases (Tab. I).

The emergency room database records accesses in Emilia-Romagna region, patients' gender and age, residence, citizenship, number and type of services provided to the patients, main and secondary diagnoses, waiting time, severity of patient, type of trauma, transfer to hospital unit (if applicable).

The specialist outpatient services database includes laboratory tests, diagnostic, therapeutic and rehabilitation services and specialty visits.

The home services database was established in 2002, and includes information on the care pathway for each patient: demographic characteristics, social and health characteristics, information about the episode of home care delivered, the total number of accesses to address made by the different professionals during the take-over period, the presence of social and health care protection, and patients' needs.

Demographic information was retrieved from the SISM database. The methods used to calculate costs are described in detail elsewhere<sup>25</sup>. In short, gross hourly cost was estimated for each service provided by the MH-PDD in 2013 up to a maximum of 4 health professionals involved in each activity, then multiplied by the duration of the service. The duration in minutes was set to the validated standard time when provided in the main setting, otherwise a weight varying between 1.25-1.50

was applied if provided in a secondary location (home, residential facility, prison).

The study was carried out in conformity with the regulations on data management of the Regional Health Authority of Emilia-Romagna, and with the Italian law on privacy (Art. 20–21, DL 196/2003) (<http://www.garanteprivacy.it/web/guest/home/docweb/-/docweb-display/docweb/1115480>, published in the Official Journal no. 190 of August 14, 2004) which explicitly exempts the need of ethical approval for anonymous data (Preamble #8).

Data were anonymized prior to the analysis at the regional statistical office, where each patient was assigned a unique identifier. This identifier does not allow to trace the patient's identity and other sensitive data. As anonymized administrative data are used routinely for health-care management no specific written informed consent was needed to use patient information.

### Costs

The ultimate cost unit in this study is any contact or access with the MH-PDD and any other LHA unit in 2013. The aggregation of contacts by user allows subsequently an estimation of aggregated costs per-case, per diagnostic cluster and MH-PDD clinical pathway. For outpatient 'accesses' occurred outside the MH-PDD, including laboratory tests, specialty visits and rehabilitation, regional tariffs are applied.

Hospitalization and day-hospital costs are based on regional tariffs applied to specific DRG and on the length of stay. The medication costs are borne by the National Health Service (NHS) (with a co-payment by patients with high income). The drug retail prices are the NHS list prices, which are the prices at which the pharmacies are reimbursed. Medication price is set through negotiations between the Italian Medicines Agency and pharmaceutical companies.

### Data analytic procedures

Categorical data were summarized as absolute and percentage frequencies and continuous variables as mean  $\pm$  SD or median and range.  $\chi^2$  was used to compare frequencies among groups and t-test to compare means between groups. Pooled df were used for t-tests comparing groups with unequal variance.

## Results

### Patient characteristics

The study population consists of 331 patients with an ICD-9-CM diagnosis of substance abuse and a mental health disorder, who had at least one contact with the MH-PDD in 2013. They comprise 4.4% of all patients recorded in the mental health services database in 2013. Patients' characteristics are provided in Table III. They

**TABLE III.** Patients' demographic and clinical characteristics (n = 331).

Sex (n, %)		
Males	225	68.0
Females	106	32.0
Age (Mean, SD)	45.3	13.3
Citizenship (n, %)		
Italian	308	93.1
Other	23	6.9
Education (n, %)		
Primary	167	69.9
Secondary	58	24.3
Tertiary	14	5.8
Missing	92	
Employment status (n, %)		
Unemployed	126	97.7
Employed	3	2.3
Missing	202	
Living arrangement (n, %)		
Own family or cohabiting	37	15.9
Alone	186	79.8
Health social housing	10	4.3
Missing	98	
Diagnosis (n, %)		
Psychosis	37	11.2
Bipolar disorder	6	1.8
Depression	54	16.3
Anxiety	25	7.6
Dementia	6	1.8
Personality disorder	123	37.2
Other MH disorders*	4	1.2
Adjustment disorder	21	6.3
Substance of abuse/dependence (n, %)		
Alcohol	196	59.2
Drugs	99	29.9
Barbiturates	16	4.8
Polysubstances	21	6.3
Contacts with MHS (Mean, SD)		
Years	8	7.1
Days	16	28.0

\*The diagnostic category "Other mental health disorders" (ICD-9-CM codes 302.xx, 306.xx-310.xx, 312.xx, 316-319) includes intellectual disabilities, adjustment reactions and other miscellaneous disorders.

were 68% male, with a mean age of 45 years and 93% Italian. A large proportion (n = 228, 68.6%) had a > 2 year durations of contact with MH-PDD, denoting an established relationship with mental health services. The substance of abuse or dependence was alcohol in the large majority (n = 196, 59.2%), followed by drugs (n = 99, 29.9%) and other substances (n = 16, 4.8%), including barbiturates, sedatives, hypnotics or anxiolytics. Twenty-one patients (6.3%) used multiple substances. Compared with the rest of patients recorded in the 2013 SISM database 25, the 331 patients of the present study were more frequently male (68% vs 40.3%,  $\chi^2 = 99.9$ ,  $df = 1$ ,  $p < .001$ ) younger (mean  $\pm$  SD 45.3  $\pm$  13.3 vs 51.9  $\pm$  17.1,  $t$ -test = 8.6, pooled  $df = 381$ ,  $p < .001$ ), single (65% vs 53.7%,  $\chi^2 = 11.6$ ,  $df = 1$ ,  $p = .001$ ), unemployed (25.7% vs 12.5%,  $\chi^2 = 90.0$ ,  $df = 1$ ,  $p < .001$ ) and with a longer contact with mental health services.

### Healthcare services use

The percentage of patients receiving each type of MH-PDD services, organized in broad categories is shown in Table IV. Psychiatric-clinical treatment and initial assessment/reassessment and were the most frequent interventions, while vocational training, psychosocial rehabilitation and day center services were uncommon. The pattern of the full range of healthcare services provided out of the MH-PDD (hospital, community, home, prison services and drug administration) is shown in Table V.

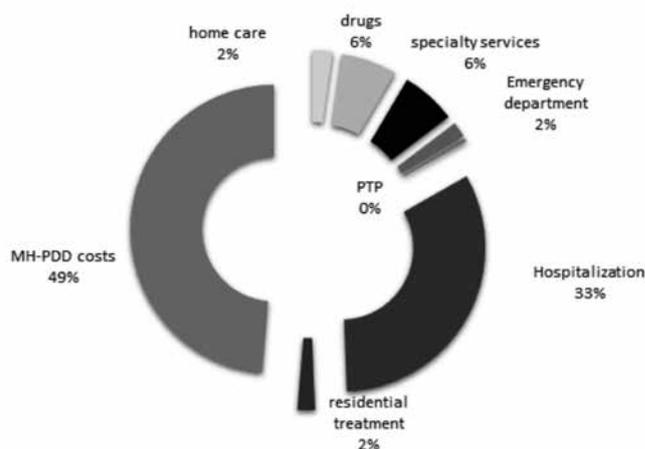
Outpatient medical services (such as specialty visits, diagnostic and laboratory services) were the most frequently provided (82% of patients). Nearly three quarters of patients received drug prescriptions and more than a half had an ER access. Only 90 patients were hospitalized, for a total of 1,524 days, mostly in non-psychiatric wards. Home visits were provided only to 8 patients, for a total of 402 accesses.

### Costs of MH-PDD and of other health care services

Total MH-PDD costs were 867,080€ and costs per patient ranged from 25€ (three psychiatric follow-up visits) to 239,125€ in one outlier patient with psychosis and

alcohol use disorder, who received 1,100 MH services and 22 home visits. The median cost was 279€ and the mean cost 2,620€, underscoring that the use of the mean may be misleading to summarize costs per patient, when the cost distribution is very skewed and includes important outliers, as is the case in the present study. Notably, the amount of non-MH-PDD costs almost equaled that of MH-PDD costs, and was largely ascribable to hospitalization in psychiatric and non-psychiatric wards (Fig. 1).

Overall costs per patient ranged from 45€ (first MH-PDD assessment) to €239,287 (the same outlier patient, with 1,100 MH services, 22 home visits and 4 specialty services). Median cost was 1,423€, mean cost 5.381€ and the overall total was 1,780,958€. Classification of patients in cost tertiles revealed that one third of patients accounted for 88.1% of overall costs (Fig. 2). The costs borne by the MH-PDD increased from the first to the third tertile while the vice versa was true for non-MH-PDD costs. Comparison of patients' characteristics among tertiles revealed that the gender and age distri-



**FIGURE 1.** Health care costs for MH-PDD and non-MH-PDD services.

**TABLE IV.** Patients receiving MH-PDD services by pathway.

	N	%	Mean	SD	95% CI	Median	Min	Max
First contact/reassessment	175	52.87	2.33	2.04	2.02 - 2.63	2	1	13
Vocational training	11	3.32	6.58	5.37	3.17 - 9.99	5	1	18
Psychiatric treatment	217	65.56	27.45	34.32	22.88 - 32.02	18	1	329
Day center	14	4.23	246.57	328.65	56.81 - 436.33	119	20	1073
Community DH care	5	1.51	304.60	230.20	18.77 - 590.43	387	7	593
Socio-rehabilitation	17	5.14	40.06	60.00	9.21 - 70.91	23	2	248

bution was similar (data not shown). However, less costly patients had been in contact with MH-PDD for a median of 3.3 years vs 7.4 and 8.1 in the second and third tertiles (Kruskal-Wallis test 12.5,  $p = 0.002$ ). Moreover, patients in the second tertile were more likely to have a diagnosis of psychosis ( $\chi^2 = 8.8$ ,  $p < 0.05$ ) or bipolar disorder (Fisher exact test,  $p = 0.019$ ) compared with those of the first tertile.

Median costs by psychiatric diagnosis ranged from 205€ for other mental disorders to 2,085€ for dementia (see Table V and Figure 3 for details).

## Discussion

To our knowledge, this is the first study to investigate costs and utilization of services by patients with dual diagnosis in a large area of a country with a universal healthcare system. An Italian study carried out in Lombardy region and using administrative databases for the year 2010 reported a higher consumption of healthcare resources among patients with dual diagnosis compared with patients with mental health problems, but did not estimate the associated costs<sup>26</sup>.

We used a previously applied methodology to estimate the direct costs of patients being treated by community mental health services<sup>25</sup>.

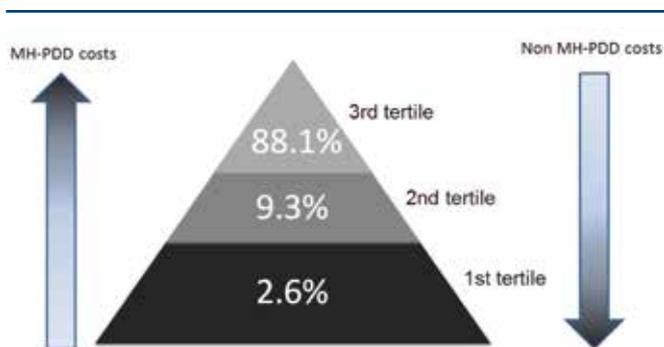
Consistent with epidemiological data on substance use disorder, patients in our population were mostly male, unemployed and single, with a predominant diagnostic pattern including alcohol drug use associated with personality disorders<sup>27-28</sup>.

Our results show that the annual costs of patients with dual diagnosis in Italy are lower than in other countries with similar healthcare systems. One study from Norway reported a median individual cost/year of 57,548€ in 2010, which is 40 times higher than ours (median = 1,423€, mean 5,381€)<sup>29</sup>. Other US studies reported adjusted means of 7,400\$ per patient in 1998 and 4,757\$ per patient in 1996<sup>28,30</sup>. Our findings are consistent with previous reports that Italy's longstanding tradition of a community-based mental health management, integrating different services in a public-funded universal healthcare system, can lead to lower costs and high quality outcomes for patients<sup>31</sup>.

In our study population, one third of patients generated

**TABLE V.** Health care accesses and costs of patients.

	Total patients	Total days/ accesses/ services	Costs (€)			
			Total	Mean	Median	Range
Days of hospitalization	90	1524	554,755	6,164	3952	320-39,125
Psychiatric ward	25	365	115,041	4,602	2,521	315-26,790
Other wards	72	1,159	439,714	6,107	3,891	220-38,810
DH accesses	12	146	25,772	2,148	1,385	125-9,750
ER accesses	186	478	30,591	185	101	23-1,479
Days in residential facilities	8	166	34,712	4,959	5,043	1,470-8,405
Personalized treatment plan (PTP)	110	110	6,768	61,53	60	36-120
Outpatient medical services	270		109,898	413	175	2-37,038
Specialty visits	210		16,458	82	46	18-3,712
Diagnostic serv.	191		25,762	139	83	13-852
Lab serv.	197		21,450	112	61	2-917
Rehabilitation	13		2,069	159	70	14-511
Treatment	76		44,159	581	50	4-33,082
Home visits	8	402	39,593	3,940	886	492-14,281
Prison	48	50				
Psychotropic drug prescriptions	243		55,127	227	98	0.06-2,502
Non-psychotropic drug prescriptions	249		56,671	228	55	1.46-10,756
MH services provided	331	12,168				
MH-PDD costs	331		867,080	2,620	279	25-239,125
Total costs	331		1,780,966	5,381	1,423	45-239,287



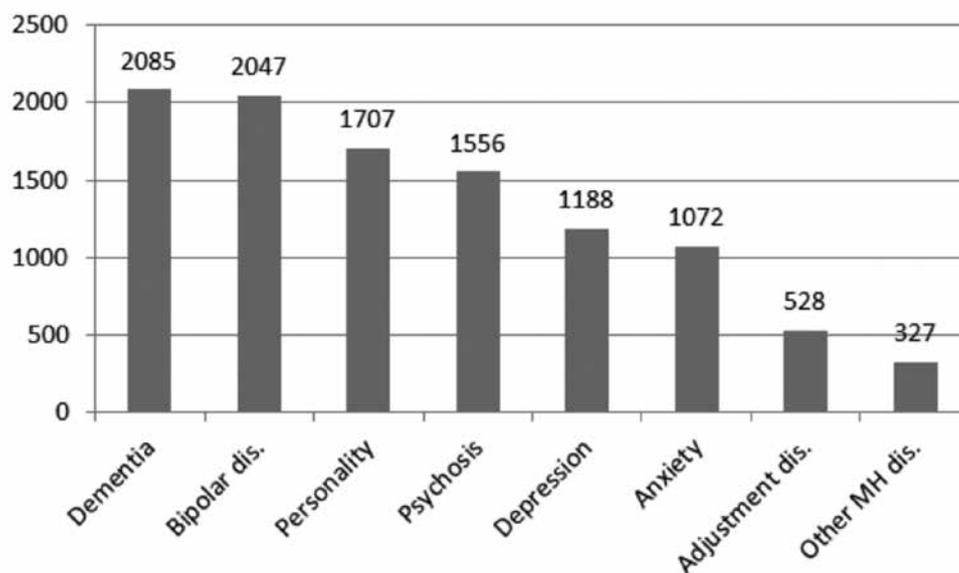
**FIGURE 2.** Classification of patients in cost tertiles.

88% of overall costs, while the bottom two thirds absorbed only 12% of costs. Interestingly, the proportion of the service use differ among the cost tertiles, with a higher use of MH-PDD services by patients in the top tertile. A recent US study, focused on high-cost patients with mental illness or substance use disorder, found that these patients had a more frequent use of non-MH-PDD services compared to patients with other mental disorders or without any mental illness<sup>32</sup>.

The presence of an integrated system in Italy, where non-hospital services play a key role to manage patients with mental disorders, may explain in part why even more complex patients, such as the high-cost group,

are treated more in MH-PDD than non-MH-PDD facilities, with a subsequent reduction in costs. About a half of costs were borne by the MH-PDD, with a predominance of initial and follow-up assessment visits and psychiatric treatment. One third of costs were due to hospitalizations in psychiatric or non-psychiatric wards, with median hospitalization costs higher in non-psychiatric than in psychiatric wards (3,818€ vs 2,521€). Patients with at least 7 years of contact with MHS were more costly<sup>25</sup>. This is consistent with Jones et al.<sup>33</sup> who showed that previous psychiatric utilization (and therefore a longer contact with the services) can be an important predictor of costs. Our cost analysis highlighted a high variability across psychiatric diagnoses, with median costs ranging from 205€/year in patients with intellectual disabilities, adjustment reactions and other miscellaneous disorders and 2,085€/year in patients with dementia. Curran et al.<sup>34</sup> found that patients with substance abuse or dependence and dementia are particularly at increased risk of ED accesses, with a subsequent high increase in costs.

Studies from other countries describe a wide range of organizational models, showing that, unlike Italy, patients with DD are often not treated by the same organization. Trocchio et al.<sup>35</sup> report that in Sweden, the substance use treatment system is provided and paid for by municipal social services agencies and the mental health system is delivered through county-specific health care



Note: costs are reported in euro. The diagnostic category "Other mental health conditions" (ICD-9-CM codes 302.xx, 306.xx-310.xx, 312.xx, 316-319) includes intellectual disabilities, adjustment reactions and other miscellaneous disorders.

**FIGURE 3.** Overall median costs by diagnosis.

systems. In the UK drug dependences are treated by Drugs Action Teams or Drug and Alcohol Teams (DATs), while mental health systems provide treatment for patients with psychiatric disorders<sup>36,37</sup>.

Recently, a new classification system has been developed for mental health with a primary focus on patient need and severity, in order to introduce a prospective provider payment system. Among the 21 clusters defined, the cluster of patients with DD costs 3.6 times more than that including patients with common mental health problems<sup>38</sup>.

In the United States the treatment system for drug dependence and mental health problems is very fragmented and only 12% of people with coexisting mental health and substance use problems receive interventions for both<sup>39</sup>. In conclusion, our results underscore that 'dual diagnosis' is a label used to denote a highly heterogeneous group of patients and that separate approaches should be taken when drug dependence co-occurs with severe mental disorders rather than with common mental disorders, because interventions for these subgroups of patients have different goals, outcomes and costs.

This study has several limitations. First, the study sample is representative of patients with substance abuse who were seen at least once by community mental health services. Patients who sought treatment only at the PDD are not captured by the SISM database and could not be included in the present sample. Second, it is possible that some psychiatric diagnoses are underreported when the predominant problem is alcohol or substance abuse or dependence. This would potentially lead to an underestimation of costs for patients with co-occurring mental health disorders. However, it is unlikely that di-

agnoses for patients with severe mental illness are not recorded, thereby mitigating this possible bias. Third, the administrative databases used for the present study did not include outcome measures. Although efforts are currently ongoing in Emilia-Romagna region to encourage the collection of the Health of the Nation Outcomes Scales (HoNOS) for specific programs, the use of this outcome for cost-benefits analyses is yet to come. An alternative specific outcome measure for patients with dual diagnosis could be the Addiction Severity Index (ASI)<sup>40</sup>. This structured clinical research interview consisting of relevant problem areas (Medical, Employment/Support Status, Alcohol, Drug, Legal, Family/Social, and Psychiatric) has been successfully used in a US nationwide evaluation of the process and outcomes of care for VA patients<sup>18</sup>. In Sweden, ASI it is the key instrument for baseline assessments of individuals presenting with addiction related problems<sup>41</sup>. Still, criticism has been raised about its reliability and validity<sup>42</sup>.

## Conclusions

Our results indicate that an integrated healthcare system based predominantly on outpatient management of patients with substance abuse/dependence generates lower costs than in other countries with different healthcare systems and healthcare resources are mostly devoted to patients with complex needs. However, in the absence of outcome data, cost-effectiveness studies are warranted.

## Conflict of Interest

The authors have no conflict of interests.

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