Frequent Users of Emergency Departments: Analysis of the Characteristics and Geographical Distribution in a Local Health Authority in Rome, Italy

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Article

Frequent Users of Emergency Departments: Analysis of the Characteristics and Geographical Distribution in a Local Health Authority in Rome, Italy

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Abstract

Background/Objectives: Frequent users (FUs) are defined as patients who repeatedly attend the Emergency Department (ED). This study aims to identify the clinical and social characteristics of FUs in a Local Health Authority in Rome and to quantify and compare the amount of variation in the probability of being FU attributable to General Practitioners (GPs) and Local Health Districts (LHDs). **Methods** The Healthcare Emergency Information System and an automated database of Lazio region residents were used for the collection of data on the patients' socioeconomic level, GPs, LHD and information about any chronic diseases. Different FU classes (visits ≥4, 5, 7 or 10) were considered in the descriptive analysis. Univariate logistic analysis and a logistic multilevel model were performed for inferential analyses. **Results**: A total of 89,036 individuals visited at least one of the 13 EDs included in the study. A total of 2.6% of the no FU group had mental illnesses, compared to 7.6% in the FU≥4 group. The OR for becoming an FU increased with the patient's clinical complexity. GP can play an important role in determining FU behavior, while no significant effect was found on the LHD level. **Conclusions**: This study allows the identification of potential predictive risk factors for disproportionate use of the ED and helps policymakers face the FU phenomenon.

Keywords: frequent user; emergency department; Local Health Authority; Rome; health geography; socioeconomic level

1. Introduction

The Italian population, like the rest of the OECD Countries, has experienced an increase in chronic illness over the last few decades, with population aging being one of its primary causes [1]; despite significant improvements in the emergency care system, the increase in the number of fragile patients and their assistance needs have led to a rise in Emergency Department (ED) attendance [2,3]. In hospitals with insufficient inpatient bed availability, a rise in ED visits and the number of

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emergency patients requiring admission may increase the length of stay in the ED, leading to overcrowding and compromised ED performance. Reduced ED utilization has become a primary goal for new healthcare delivery models [4–6]. However, the predictors of ED attendance are complex and involve multiple components [7].

There is not a single FU definition, and it depends on the length of observation time. Frequent Users (FUs) are defined as patients who repeatedly attend the EDs, at least four times in a year [8–13]. Furthermore, FUs account for 4.5% to 8% of the ED population but comprise up to 28% of ED visits [10,14]. The overuse of EDs causes two major issues: the first is associated with extra ED activity expenditures, the weight of which is constantly out of the government's budget limits in the public sector, particularly since the end of the COVID-19 pandemic emergency [15–17]. The second is the risk of compromising the quality of the ED services to patients with real acute issues and appropriate ED attendance. Furthermore, it increases the risk of overcrowding, raising the risk of human errors [8,9,18].

Previous research has highlighted how FUs are more likely to suffer from chronic diseases (particularly renal failure, cardiovascular disease, diabetes and chronic pulmonary disease), mental illnesses or substance use disorders [19,20]. The prevalence of chronic conditions is higher in FUs than in the rest of the population, and timely interventions in primary care could help avoid ED visits or hospitalization [21,22]. A growing body of evidence reveals that FUs have a high level of healthcare use (other than the ED), a connection with low socioeconomic level, and an association between the characteristics of their residence and health outcomes [19,21–27].

Like other countries, Italy has recently focused on improving care coordination and reducing ED attendance and hospital admissions by encouraging more appropriate use of community-based services [28]. Compared with other European contexts, a relatively high proportion of Italians report that they have unmet medical needs, and access to care is particularly difficult for Italians with lower socioeconomic level [29].

Analyzing the socioeconomic profile and the geographic variation in ED use may be a critical first step to drive local policies in reducing avoidable emergency department visits in Italy [30].

According to the literature, the prevalence of health problems is essential in ED attendance frequency. Nevertheless, other factors have also been associated with high levels of ED attendance [31–34], especially in the city outskirts or in inner city areas, such as in Rome, such as housing problems and employment status, loneliness and urban marginalization, low levels of social support, proximity to the ED, and poor access to primary care [35–37].

Shifting the frame of reference from macro areas to a more granular unit of analysis, i.e., census tracts, improves the identification of local hotspots with high healthcare use and shifts the focus to factors found among local populations and communities, providing insight into how to geographically target interventions for the improvement of healthcare delivery [38].

This study was carried out in Local Health Authority (LHA) Roma 1 (see Appendix), one of the three LHAs in the urban municipality of Rome, in the Lazio Region. It consists of 6 Local Health Districts (LHD 1, LHD 2, LHD 3, LHD 13, LHD 14, LHD 15) and 805 General Practitioners (GPs), has approximately 1 million residents and is one of the most populous areas in Italy, with 13 EDs (out of the 22 in the Rome metropolitan area), an aging index (the number of people in age group 65+ divided by the population age 0-14, per 100) of 202 in 2024 (the Lazio Region mean is 189,0) and an old age dependency ratio (the ratio of the number of people in age group 65+ divided by the population in the working age 15-64) of 38,1 in 2024 [39].

This study aims to identify the clinical and social characteristics of FUs and to quantify and compare amount of variation in the probability of being FU attributable to GPs and LHDs.

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2. Materials and Methods

2.1. Study Design

This is a retrospective cohort study that included all ED visits from January 1, 2021, to December 31, 2021, in all 13 Emergency Departments within LHA Roma 1. All patients assisted by a GP from the same LHA were enrolled in the cohort. Patients younger than 18 years and those who attended single-specialism EDs (ophthalmology, pediatrics) and attendances for obstetric or gynecological problems were excluded since they represent a population with specific needs and peculiarities that is worthy of specific focus and not comparable with the general population.

FUs were defined using a cut-off of ≥4 visits per patient per year. Because of the absence of a universal definition of FUs, different cut-offs (visits ≥5, 7 or 10) were also considered in the descriptive analysis.

For each patient in the cohort the following risk factors potentially associated with the study outcome were considered: gender, age, socioeconomic level (high, middle-high, medium, middle-low, low) and the presence of chronic or multiple-chronic conditions [40,41]. The socioeconomic level was calculated at the census tract level, based on the methodology developed by Nicola Caranci and colleagues [42]. This index integrates multiple socio-economic indicators derived from national census data, including educational attainment, employment status, home ownership versus rental, household overcrowding, and family structure. It provides a composite measure of socio-economic disadvantage within small geographic areas. Among the multiple-chronic conditions group of patients, high clinical complexity was identified as a five-year mortality risk higher than 10%, based on the number and type of chronic diseases they suffer from [43].

Data related to ED visits were also compared to identify differences between FUs and no FUs. In particular, triage score, principal diagnosis group in the ED, and reported symptoms at the time of arrival were considered.

2.2. Data Sources

The cohort was enrolled from the Healthcare Emergency Information System, which collects all visits to emergency services, patient demographic data, visit and discharge dates and hours, ICD-9-CM diagnosis, reported symptoms on attendance, triage score (from no urgent to emergency), and status at discharge (e.g., dead, hospitalized, or discharged at home).

The cohort was linked to the automated system of databases of residents who receive NHS assistance in the Lazio Region, thus allowing researchers to obtain information related to chronic or multiple chronic diseases, GP and LHD of each patient, and socioeconomic level based on the residence address [42,44,45]. A deterministic record linkage procedure with anonymous identification codes was used to merge the data from different information systems. To preserve privacy, each individual identification code was subsequently and automatically deidentified, and the conversion table was deleted, giving researchers the access to only fully anonymized data.

2.3. Geographical Analysis

The administrative-territorial division of the LHA Roma 1 was used to analyze the association between the percentage of FUs and urban settings, as already performed elsewhere [46]. Each of the six LHDs of LHA Roma 1 is divided into Geographical Units (GUs, in Italy called “Zone Urbanistiche”), as defined by the Municipality of Rome. It is the smallest territorial level for which population data are available in Italy and many other countries [47,48].

2.4. Statistical Analysis

The response variable is binary (FU>=4 vs no FU). Frequency distributions of FUs (visits ≥4, 5, 7 and 10) by triage, principal diagnosis and declared symptoms at ED arrival were compared to no FU. A descriptive analysis was performed reporting absolute frequencies among patient groups and

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characteristics of ED attendances. Univariate logistic analysis was used to identify candidate predictor variables among those collected in the dataset. A logistic multilevel model (patient < GP< District) was performed to quantify the variability in ED FU behavior attributable to LHDs and primary care physicians and to identify the role of social and clinical determinants (gender, age, socioeconomic level and presence of chronic or multiple-chronic conditions).

Age was considered as a continuous variable, the Box-Tidwell test was used to check for linearity between the "predictor" and the logit. The role of individual variables was expressed as Odds Ratios (OR); the variance components - estimated by multilevel models - were expressed in terms of Median Odds Ratios (MORs). The MOR quantifies the variation between clusters by comparing two persons from two randomly chosen, different clusters. Consider two persons with the same covariates, chosen randomly from two different clusters. The MOR is the median odds ratio between the person of higher propensity and the person of lower propensity. This measure is always greater than or equal to 1.00. If the MOR is 1.00, there is no variation between clusters. If there is considerable between-cluster variation, the MOR will be large[50]. The MORs were estimated for the "empty" model, which only includes a random intercept, and the complete model, which includes all patient risk factors. SAS (SAS Institute Inc., North Carolina) software was used for statistical analyses.

3. Results

3.1. Descriptive Analysis

In 2021, 89,036 people attended at least once in any one of the 13 EDs within the LHA Roma 1. The characteristics of patients and ED attendances are summarized in Tables 1 and 2. A total of 72,781 patients had a GP in the LHA Roma 1. Patients cumulatively had 99.811 attendances. FUs represented a tiny fraction of the overall population (2.7%) but were responsible for a large portion of attendances (11.3%). Among no FUs, females accounted for 51.9%, while males were more frequent among FUs (between 51.9%, for FU>=5, and 57.7%, for >=10) than among no FUs (48.1%). The age class 50-59 was the most frequent among no FUs (18.4%) and FU≥4 (17.5%) and rose with the growth of FU attendances. The socioeconomic level was low among most of the FUs (from 25.3% of FU≥4 to 24.6% of FU≥10), while high and medium-high levels were found in the no FU class. Multiple chronic conditions were present in 29.4% of FU≥4 patients, while 47.6% of FU≥4 patients did not have chronic disorders registered.

Table 1. Characteristics of FU and no-FU patients in 2021.

		PATIENTS		NO FU		FU≥4		FU≥5		FU≥7		FU≥10	
		N	%	N	%	N	%	N	%	N	%	N	%
Total		72,781	100.0	70,743	100.0	2,038	100.0	977	100.0	349	100.0	130	100.0
Gender	Male	35,123	48.3	34,054	48.1	1,069	52.5	507	51.9	187	53.6	75	57.7
	Female	37,658	51.7	36,689	51.9	969	47.5	470	48.1	162	46.4	55	42.3
Age	18-29	10,104	13.9	9,885	14.0	219	10.7	99	10.1	35	10.0	14	10.8
	30-39	7,484	10.3	7,285	10.3	199	9.8	96	9.8	42	12.0	18	13.8
	40-49	10,512	14.4	10,243	14.5	269	13.2	133	13.6	55	15.8	21	16.2
	50-59	13,381	18.4	13,024	18.4	357	17.5	181	18.5	70	20.1	34	26.2
	60-69	10,235	14.1	9,933	14.0	302	14.8	147	15.0	57	16.3	21	16.2
	70-79	10,066	13.8	9,739	13.8	327	16.0	147	15.0	42	12.0	10	7.7
	80+	10,999	15.1	10,634	15.0	365	17.9	174	17.8	48	13.8	12	9.2
Socio-economic level	High	16,680	22.9	16,297	23.0	383	18.8	177	18.1	66	18.9	26	20.0
	Medium-high	17,916	24.6	17,473	24.7	443	21.7	206	21.1	73	20.9	28	21.5
	Medium	13,398	18.4	13,051	18.4	347	17.0	161	16.5	52	14.9	20	15.4
	Medium-low	11,695	16.1	11,346	16.0	349	17.1	165	16.9	53	15.2	24	18.5
	Low	13,092	18.0	12,576	17.8	516	25.3	268	27.4	105	30.1	32	24.6

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Chronic conditions	No chronic conditions	43,531	59.8	42,561	60.2	970	47.6	451	46.2	156	44.7	59	45.4
	One chronic condition	15,718	21.6	15,249	21.6	469	23.0	226	23.1	83	23.8	40	30.8
	Multiple chronic conditions (low-mid clinical complexity)	9,345	12.8	9,035	12.8	310	15.2	144	14.7	45	12.9	9	6.9
	Multiple chronic conditions (high clinical complexity)	4,187	5.8	3,898	5.5	289	14.2	156	16.0	65	18.6	22	16.9

Table 2 was realized after having first classified the patients based on the number of visits to the emergency room. Emergency and urgency triage codes decreased from 24.9% in the FU≥4 group to 20.9% in the FU≥10 group. In contrast, non-urgency codes increased from 8.1% in the FU≥4 group to 14.4% in the FU≥10 group. The main diagnoses among all the patients belonged to the specific symptoms and signs group. Mental disorders were registered in 2.6% of the NO FU group but increased from 7.6% in the FU≥4 group to 15.9% in the FU≥10 group. Cardiovascular diseases were similar in the no FU and FU≥4 groups (8.6% and 8.2%, respectively). Excluding nonspecific and missing diagnoses, many acute symptoms registered as the main issue (e.g., trauma, abdominal and chest pain, dyspnea) decreased from the no FU group to the FU≥10 group. In contrast, psychomotor agitation increased from 5.1% in the FU≥4 group to 11.2% in the FU≥10 group. Social issues are present in 0.4% of diagnoses in the FU≥4 group to 0.9% in the FU≥10 group, while it is not registered in the no FU group.

Table 2. Characteristics of ED attendances of FU and no-FU patients in 2021.

		ATTENDANCES		**NO FU**		**FU≥4**		**FU≥5**		**FU≥7**		**FU≥10**	
		N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Total		99,811	100.0	88,514	100.0	11,297	100.0	7,053	100.0	3,721	100.0	2,046	100.0
Triage admission code	Emergency	5,150	5.2	4,528	5.1	622	5.5	345	4.9	175	4.7	95	4.6
	Urgency	19,176	19.2	16,986	19.2	2,190	19.4	1,327	18.8	651	17.5	334	16.3
	Deferrable Urgency	35,505	35.6	31,605	35.7	3,900	34.5	2,269	32.2	1,157	31.1	610	29.8
	Minor urgency	36,530	36.6	32,861	37.1	3,669	32.5	2,389	33.9	1,208	32.5	712	34.8
	Non urgency	3,450	3.5	2,534	2.9	916	8.1	723	10.3	530	14.2	295	14.4
ICD-9-CM Diagnosis group on discharge	Infectious and parasitic diseases	1,625	1.6	1,469	1.7	156	1.4	92	1.3	40	1.1	21	1.0
	Neoplasms	675	0.7	532	0.6	143	1.3	86	1.2	39	1.0	20	1.0
	Endocrine, nutritional and metabolic diseases, and immunity disorders	686	0.7	580	0.7	106	0.9	63	0.9	29	0.8	11	0.5
	Diseases of the blood and blood-forming organs	1,150	1.2	894	1.0	256	2.3	184	2.6	96	2.6	54	2.6

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	Mental disorders	3,173	3.2	2,315	2.6	858	7.6	656	9.3	444	11.9	325	15.9
	Diseases of nervous system and sense organs	3,596	3.6	3,165	3.6	431	3.8	268	3.8	139	3.7	66	3.2
	Disease of the circulatory system	8,514	8.5	7,592	8.6	922	8.2	478	6.8	197	5.3	92	4.5
	Diseases of the respiratory system	4,136	4.1	3,740	4.2	396	3.5	215	3.0	107	2.9	28	1.4
	Diseases of the digestive system	6,866	6.9	6,110	6.9	756	6.7	443	6.3	192	5.2	85	4.2
	Diseases of the genitourinary system	2,905	2.9	2,450	2.8	455	4.0	291	4.1	98	2.6	38	1.9
	Complications of pregnancy, childbirth and puerperium	675	0.7	622	0.7	53	0.5	34	0.5	5	0.1	3	0.1
	Diseases of the skin and subcutaneous tissue	961	1.0	876	1.0	85	0.8	39	0.6	19	0.5	6	0.3
	Diseases of the musculoskeletal system and connective tissue	6,153	6.2	5,651	6.4	502	4.4	262	3.7	127	3.4	63	3.1
	Congenital anomalies	566	0.6	495	0.6	71	0.6	47	0.7	20	0.5	12	0.6
	Certain conditions originating in the perinatal period	46	0.0	41	0.0	5	0.0	2	0.0	2	0.1	2	0.1
	Symptoms, signs and ill-defined conditions	21,504	21.5	18,781	21.2	2,723	24.1	1,713	24.3	856	23.0	425	20.8
	Injury and poisoning	27,269	27.3	25,818	29.2	1451	12.8	745	10.6	340	9.1	192	9.4
	External causes of injury and supplemental classification	2,601	2.6	1,770	2.0	831	7.4	669	9.5	485	13.0	258	12.6
	Missing	6,710	6.7	5,613	6.3	1,097	9.7	766	10.9	486	13.1	345	16.9
Main issue on admission	Coma	13	0.0	10	0.0	3	0.0	1	0.0	1	0.0	1	0.0
	Shock	12	0.0	12	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Dyspnea	3,626	3.6	3,222	3.6	404	3.6	221	3.1	107	2.9	40	2.0
	Abdominal Pain	8,087	8.1	7,053	8.0	1,034	9.2	674	9.6	347	9.3	190	9.3
	Neck Pain	164	0.2	145	0.2	19	0.2	9	0.1	1	0.0	0	0.0
	Chest Pain	5,362	5.4	4,784	5.4	578	5.1	319	4.5	168	4.5	84	4.1
	Non-traumatic bleeding	1,093	1.1	953	1.1	140	1.2	81	1.1	33	0.9	8	0.4
	Fever	3,206	3.2	2,895	3.3	311	2.8	186	2.6	62	1.7	23	1.1
	Intoxication	288	0.3	214	0.2	74	0.7	52	0.7	35	0.9	32	1.6
	Hypertension	1,122	1.1	996	1.1	126	1.1	75	1.1	37	1.0	18	0.9
	Rhythm alteration	1,829	1.8	1,642	1.9	187	1.7	102	1.4	32	0.9	14	0.7
	Acute neurological syndrome	871	0.9	799	0.9	72	0.6	42	0.6	16	0.4	8	0.4
	Other nervous system symptoms	2,236	2.2	2,010	2.3	226	2.0	133	1.9	77	2.1	43	2.1
	Social issues	51	0.1	20	0.0	31	0.3	27	0.4	22	0.6	18	0.9
	Medico-legal checks	53	0.1	38	0.0	15	0.1	11	0.2	9	0.2	7	0.3
	Allergic reaction	450	0.5	419	0.5	31	0.3	13	0.2	7	0.2	4	0.2

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Trauma or burn	28,670	28.7	27,344	30.9	1,326	11.7	680	9.6	298	8.0	167	8.2
Dermatological disorders	313	0.3	286	0.3	27	0.2	12	0.2	7	0.2	4	0.2
Eye symptoms or disorders	726	0.7	541	0.6	185	1.6	130	1.8	78	2.1	37	1.8
Dental disorders	2,024	2.0	1,795	2.0	229	2.0	115	1.6	44	1.2	13	0.6
ENT symptoms or disorders	1,108	1.1	980	1.1	128	1.1	70	1.0	28	0.8	10	0.5
Urological symptoms or disorders	1,860	1.9	1,452	1.6	408	3.6	256	3.6	96	2.6	42	2.1
Psychomotor agitation	1,594	1.6	1,021	1.2	573	5.1	438	6.2	294	7.9	229	11.2
Other	35,048	35.1	29,879	33.8	5,169	45.8	3,406	48.3	1,922	51.7	1,054	51.5

3.2. Geographical Distribution

The geographical classification comprises two levels: GUs and LHDs. Five classes were identified for each level according to the relative percentage of FUs in the area. The geographical distribution represented in Figure 1 shows that some areas of LHA Roma 1 have a significantly higher percentage of FUs, mostly in LHD 1, LHD 14 and LHD 15.

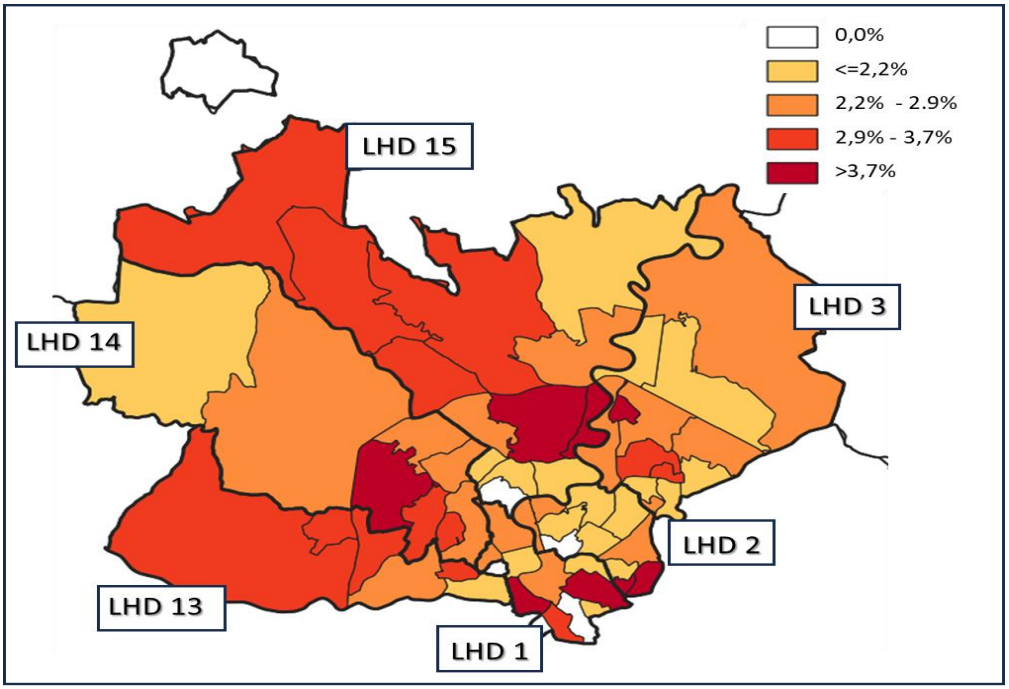

Figure 1. Geographical distribution of FUs. The colors represent the 5-cut-off percentage groups of FUs on the Geographical Unit population level. The bold black line separates the six LHDs, the narrow black line separates the Geographical Units.

Legend: the colors represent the 5-cut-off percentage of FUs on the geographical unit population level. The bold black line separates the six LHDs, the narrow black line separates the GUs.

3.3. Inferential Analysis

Multilevel analysis results are reported in Table 3. Among candidate predictor variables identified in the descriptive and geographical analysis, the most prominent effect was related to the presence of multiple chronic conditions: the higher the patient's clinical complexity, the higher the

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OR for being a FU. OR increases with decreasing socioeconomic level, with an effect that is more evident for low and medium-low levels and less clear for higher levels. The GP role does not consistently suggest an essential role in determining FU behavior (MOR 1.18, Wald p = 0.061), and no significant effect was found on the LHD level (MOR 1.05, Wald p = 0.127).

Table 3. Multilevel logistic regression model predicting ED frequent usage.

Predictor Variable		OR	95% Confidence Limits		p Value
Age (years)		1.00	1.00	1.00	0.794
Gender	Male	reference	-	-	-
	Female	0,87	0,79	0,95	0.002
Chronic conditions	No chronic conditions	reference	-	-	-
	One chronic condition	1.37	1.20	1.56	<0.001
	Multiple chronic conditions (low-mid clinical complexity)	1.54	1.32	1.80	<0.001
	Multiple chronic conditions (high clinical complexity)	3.18	2.70	3.76	<0.001
Socio-economic level	High	reference	-	-	-
	Medium-high	1.07	0.92	1.25	0.335
	Medium	1.12	0.95	1.31	0.166
	Medium-low	1.29	1.09	1.51	0.004
	Low	1.70	1.46	1.97	<0.001
Multilevel parameters					
Intercept-only model		**MOR**			**p (wald)**
LHD*		1.08			0.127
GP*		1.24			0.008
Full model		**MOR**			**p (wald)**
LHD		1.05			0.207
GP		1.18			0.061

*LHD: Local Health District; GP: General Practitioner.

4. Discussion

FUs represented 2.7% of the overall population but were responsible for 11.3% of attendances registered during 2021, in line with the literature [46], mostly in the age class 50-59. The risk of being FU increases with the patient's clinical complexity and for low and medium-low socioeconomic level. Generally, patients with higher socioeconomic levels were less likely to go to the ED. This is in line with another study in Milan, where the odds of avoidable hospital admissions were higher among low socioeconomic levels of patients compared with the other classes [49]. Prior studies suggest that patients with low socioeconomic level perceive ED assistance to be cheaper and more accessible than ambulatory care and are often more likely to use EDs for nonurgent conditions [50–52].

In this study, non-urgent triage codes were more frequent in FUs (from 8.1% in the FU≥4 group to 14.4% in the FU≥10 group), and mental disorders were present in a large proportion of FUs (to 15.9% in the FU≥10 group). Psychomotor agitation and social issues are important diagnoses associated with FUs, but the results of "symptoms, signs and ill-defined conditions" and "external causes of injury and supplemental classification" diagnosis groups, as well as the main issues on admission, such as fever, chest pain or dyspnea, may suffer the influence of the COVID-19 pandemic, which may have also affected the results of time-dependent illnesses such as stroke or cardiac complaints, possibly due to concerns about COVID-19 acquisition in the hospital [53,54]. The increase

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of physical and mental morbidities, especially with socioeconomic deprivation, is associated with the attendance rate at EDs, supporting previous evidence of increased emergency attendance among people with chronic illnesses and psychiatric disorders who are more likely to visit EDs [19,55]; this also holds true for people with low socioeconomic level [56,57]. Across the EU, admissions connected to chronic diseases and psychiatric disorders are estimated to be potentially avoidable through better prevention and disease management to decrease their dependence on the ED [58,59]. Some authors have investigated the importance of social support in the ED for older adults, even if in a systematic review there was no significant association between ED attendance and social support [60].

Regarding the geographical analysis shown in Figure 1, this study characterizes variation using a more granular geographic unit of analysis. This may be considered the first step to setting up a specific public health strategy aimed at improving adequate healthcare attendance for specific populations and communities, as decided in Paris by the Ile-de-France Health Regional Agency. [46] In other studies on geographic variation in healthcare, healthcare utilization and outcomes were quantified by using geographic macro areas, but it was impossible to distinguish a single neighborhood characterized by different socioeconomic and demographic characteristics [30,49,61,62]. Further studies may help to analyze the association among FUs, population density, income and medical services or GP offices in the same area.

The multilevel analysis shows that GP does not consistently suggest an important role in avoiding FU behaviors (MOR 1.18, Wald p=0.061), similar to the territorial level. In some studies, the reduction in demand for ED seems to be achieved via the availability of at-home GP visits or improved public transport [63]. Other authors have demonstrated that frequent ED users actually have high rates of general practitioner consultations and outpatient care utilization in addition to ED use. Thus, efforts to only increase primary care access or visiting hours (on weekdays and weekends) may not necessarily result in decreased ED utilization [64].

Primary prevention of the FU phenomenon is not much discussed in the literature. These subpopulations of FU may represent different targets for action plans, such as specific and individual interventions [65,66]. The individual plans on FUs are often based on the principle of secondary prevention because they are triggered after an ED visit, followed by an intervention or a treatment by a case-management team [67].

The high rates of FUs in ED attendances could thus indicate poverty in metropolitan areas and highlight social inequalities in access to health. As stated in the New Urban Agenda, The United Nations Sustainable Development Goals focus on health promotion through several interconnected health-related targets, achievable through multisectoral approaches [68]. Thus, the decrease of FU rate and the increase of general population's health status may be realized through joint policies with other partners (such as school or transportation actors) [69,70].

Limitations and Strengths

This study is the most comprehensive examination in a single metropolitan area in Italy that considers all FU attendances in one year and their different health statuses, socioeconomic determinants and geographical data. Although these findings are not generalizable to the entire population, they will be relevant to many urban areas with similar levels of social deprivation. Thus, it seems possible for institutions or health care providers to identify territories where residents are at higher risk of developing FU patterns and to suggest primary prevention actions. Access to regional data flows allowed to avoid missing records or information. Additionally, residents who may be living in extremely disadvantaged circumstances were probably captured by our data because of the fictitious address LHA assigned to them.

This study has some limitations. The retrospective nature of the study allowed investigation of the predictors of ED attendance at one point in time and only in LHA residents, excluding homeless without residency, foreigners or people resident in LHA Roma 1 but whose health services should be delivered from the other LHAs in Rome. Only the main diagnosis was considered, and inaccuracies in the clinical dataset may have under recorded some morbidities. The proximity of the ED and

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general practitioner or primary care services as predictors of ED attendance was not investigated. Other variables would be necessary to quantify COVID-19-specific attendance to better understand the influence on the data.

5. Conclusions

Frequent ED use is a major challenge in health facility management. The analysis of ED attendances and the socioeconomic and geographical factors of the FUs highlights the need for new approaches to address important issues such as socioeconomic inequalities, increasing better housing conditions and employment, and structural issues such as strategic placement of primary care services and better transport.

This study allows the identification of potential risk factors predictive of disproportionate use of the ED and helps policymakers anticipate the needs of specific categories of patients. Further studies are necessary to analyse the presence of FUs and the geographical position of hospitals, residents' income and primary care services in the entire Lazio region. It would be useful to investigate the efficacy of territorial interventions, according to the new directives of the National Recovery and Resilience Plan on chronic conditions management at the territorial level.

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Informed Consent Statement: Not applicable.

Data Availability Statement: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Italian National Health Service

Italian National Health Service (NHS) is structured on three different levels: the first concerns the Central Government and Ministry of Health, the second concerns the twenty Regional Governments and the third the Local Health Authority (LHA) together with the Independent hospitals. NHS is mainly funded by public taxes and guided by the principles of universal coverage, solidarity, human dignity. LHA consist of at least one not independent hospital and one or more Local Health Districts (LHDs), which provides primary care services (vaccination and screening, specialist consultations, counselling for family planning, home care) and coordinates General Practitioners (GPs) and Primary Care Paediatricians (PCPs). The primary care physicians can work in solo or in operational and multidisciplinary forms of associations to guarantee full access to the public, 24 hours a day, 7 days a week.

Abbreviations

The following abbreviations are used in this manuscript:

ED	Emergency Department
FU	Frequent User
LHD	Local Health District

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NHS	National Health Service;
LHA	Local Health Authority
GP	General Practitioner
GU	Geographical Unit
OR	Odds Ratios
MOR	Median Odds Ratios

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