

# Avoidable hospitalizations and access to primary care: comparisons among Italians, resident immigrants and undocumented immigrants in administrative hospital discharge records

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## Summary

**Background** Immigrants face multiple barriers in accessing healthcare; however, empirical assessment of access presents serious methodological issues, and evidence on undocumented immigrants is scant and based mainly on non-representative samples. We examine avoidable hospitalization (AH) as an indicator of poor access to primary care (PC) in Italy, where a universal healthcare system guarantees access but fails to assign general practitioners to undocumented immigrants.

**Methods** Using anonymized national hospital discharge records in 2019, undocumented immigrants were identified through an administrative financing code. Potential effects of poor access to PC were measured by focusing on the incidence of AH, differentiated among chronic, acute and vaccine-preventable conditions, comparing Italian citizens, documented (foreign nationals with residence permits) and undocumented immigrants. We estimated odd ratios (ORs) through logistic regression models, controlling for individual and contextual confounders.

**Findings** Compared with Italians, undocumented and documented immigrants adjusted odd ratios (OR) for the risk of AH were 1.422 (95% CI 1.322-1.528) and 1.243 (95% CI 1.201-1.287), respectively. Documented immigrants showed ORs not significantly greater than 1 for AH due to chronic diseases compared with Italians, while undocumented immigrants registered higher adjusted OR for all AH categories – chronic (OR 1.187; 95% CI 1.064-1.325), acute (OR 1.645; 95% CI 1.500-1.803) and vaccine-preventable (OR 2.170; 95% CI 1.285-3.664).

**Interpretation** Documented and undocumented immigrants face considerably higher risk of AH compared to Italians. Considering the burden of AHs, access to PC (including preventive and ambulatory care) should be provided to undocumented immigrants, and additional barriers to care for all immigrants should be further explored.

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## Introduction

Extensive literature documents inequalities in access to healthcare services for immigrants,<sup>1</sup> with particularly severe underutilization observed for undocumented individuals.<sup>2</sup> Barriers to access comprise numerous

social, cultural, economic, and legal factors, which makes it difficult to identify the sources of inequalities and to design proper policy interventions to improve immigrant health.<sup>3,4</sup>

Existing studies on immigrant access to healthcare can present considerable methodological limitations, such as evidence based on survey data that often exhibits inadequate sample size, poor outcome measures, and selection bias in recruitment.<sup>4</sup> These limitations are particularly severe when addressing undocumented

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### Research in context

#### *Evidence before this study*

We searched Scopus and PubMed on March 2, 2020, for papers without publication date restrictions. The search terms used were “undocumented” OR “illegal” OR “immigrants” OR “migrants” AND “primary healthcare” OR “avoidable hospitalization”. From the literature, several systematic reviews showed the presence of barriers to access to health care for migrants, evidence on the undocumented being quite limited. Several studies used avoidable hospitalizations (AHs) to measure access to primary health care, showing differential hospitalization rates by race, ethnicity, and country of origin. Much of the research used small surveys or administrative health data in limited geographical areas to assess undocumented immigrants’ access to healthcare and AHs. One study showed higher AHs rates for undocumented immigrants compared to resident immigrants in one Italian region, but no evidence at the national level was found.

#### *Added value of this study*

Using a nationwide administrative hospital discharge database, the study provides novel evidence on barriers to access to primary health care for documented and undocumented immigrants, showing that both groups exhibit considerably higher risk of AHs compared to Italians, with large differences depending on the legal and insurance status and type of disease: chronic, acute and vaccine-preventable.

#### *Implications of all of the available evidence*

Finding that all immigrants have considerably higher risk of AHs, compared to Italians, implies the existence of obstacles to access to primary health, likely caused by informational and administrative barriers. Moreover, the higher risk of AHs experienced by undocumented immigrants and uninsured New EU citizens implies that they face additional barriers to access appropriate levels of care when denied the gatekeeping and preventive care roles carried out by general practitioners. Our results imply the need to promote primary care services and to provide access to primary care to all immigrants, regardless of their legal status, as an essential measure to guarantee the universal right to health.

immigrants, as survey data generally fail to identify such populations, except for small, non-representative samples.<sup>5</sup> Conversely, administrative data on healthcare usage include only those patients who have received health services, which compromises efforts to study immigrants’ barriers to access.<sup>6</sup> In addition, to compute reliable access rates for immigrants requires estimates of the underlying population, which are largely unreliable; moreover, administrative health data seldom allows the identification of undocumented

immigrants.<sup>6</sup> Studies based on administrative data mainly focus on limited geographical areas.<sup>7,8</sup>

The present paper aims to overcome many of the above methodological issues by focusing on lack of access to primary healthcare services, as captured by the incidence of avoidable hospitalization (AH) rates in the Italian national hospital discharges (HDR) database (Italian Ministry of Health, Planning Department, *schede di dimissione ospedaliere*, SDO), using data from 2019 and comparing Italians and immigrants according to legal status. AHs are hospitalizations due to ambulatory care sensitive conditions (ACSC), i.e., medical conditions for which hospitalization is not needed when primary care is timely and effective.<sup>9</sup> The incidence of AHs and ACSCs has been extensively used to proxy for quality of, and access to, preventive health services within and across countries<sup>9–12</sup> and to detect inequalities related to race and ethnicity,<sup>13,14</sup> socioeconomic conditions,<sup>15–17</sup> and immigrant status.<sup>13,18,19</sup> In the European context, evidence on immigrants’ AH rates is relatively recent<sup>18</sup> and in general shows that immigrants experience a higher risk of AHs, although results differ by country, reason to migrate and illness.<sup>20–22</sup>

Analysis of AHs in one Italian region (Sicily) from 2003 to 2013<sup>7</sup> showed that undocumented migrants have a higher risk of AHs than documented migrants, controlling for gender, age group and geographical origin. The present study extends the analysis to all Italian regions, compares documented and undocumented adult immigrant groups with Italians, controlling for a larger set of individual characteristics and local health authorities (LHAs) fixed effect, to flexibly capture geographic differences across areas, and excluding hospitalizations for pregnancy and childbirth-related conditions.

The Italian context makes an interesting case study since Italy has witnessed sustained flows of immigration from 1989 onwards that is characterized by a significant proportion of undocumented immigrants. At the beginning of 2019, according to the Italian national statistics institute (ISTAT, *Istituto Nazionale di Statistica*, <http://stra-dati.istat.it>), foreign-born residents (4,996,158) accounted for 8.4% of the Italian resident population, with undocumented immigrants estimated to be 562,000 (Fondazione Ismu, [www.ismu.org](http://www.ismu.org)). A second important feature is that the Italian constitution safeguards health as a fundamental right of the individual and equitable access to health care is a core objective of the Italian National Health Service (SSN, *Servizio Sanitario Nazionale*). Specifically, documented immigrants, those who hold a valid residence permit, must enroll in the SSN and can access healthcare services in public and private accredited facilities through an official SSN registration code, as Italian citizens do. Women are entitled to a temporary residence permit during pregnancy and up to 6 months after delivery and are always granted pre- and post-natal care. Undocumented immigrants are guaranteed emergency and

first aid care, essential treatments (all pathologies not immediately dangerous, but which could worsen in the future), pediatrics and geriatrics. However, they are not entitled to an official SSN registration code and access the SSN through an anonymous code (STP for *straniero temporaneamente presente*, or foreigner temporarily present), that expires after 6 months. Moreover, they cannot access General Practitioners (GPs), who are contracted by the SSN to provide primary care, preventive care and gatekeeping referrals to specialized care for all legal residents; in general undocumented immigrants access the SSN through emergency departments, although differences exist across regions,<sup>3</sup> a phenomenon also observed in other countries.<sup>20,21</sup> The distinctions introduced by the Italian government between immigrants' legal status and the type of access to treatments allows for identifying undocumented immigrants in the anonymized HDR using an administrative financing code.

Finally, although citizens of countries that joined the European Union from the 2004 EU enlargement onward (New EU) are entitled to legally reside in Italy, they often experience difficulties in access to the SSN, either because they lack the European Health Insurance Card (EHIC) needed to receive health care, or because LHAs do not accept it as proof of comprehensive insurance.<sup>23</sup> We therefore performed a separate analysis to examine New EU country immigration for similarities or differences between undocumented immigrants and uninsured New EU citizens residing in Italy.

## Methods

### Data

The present study uses the most recently available data (2019) from Italian HDRs, using 2016 for comparison. For each hospital episode, the data provide up to six medical diagnoses and procedures, codified according to the International Classification of Diseases, Ninth Revision (ICD-9-CM), plus contextual variables (region, province, and LHA), demographic characteristics of the patient (age, sex, country of citizenship), and socio-economic variables (marital status, educational level, health insurance status). Data were obtained from the anonymized hospital discharge database of the Italian Health Ministry.

Our retrospective observational study fulfills the Italian regulations of ethics committees, which require only standard written informed consent at the time of hospital admission.

### Definition of variables

The outcome variables of the study are the overall proportion of AHs (as defined by ACSC), over the number of hospitalizations, and three subcategories: AHs determined by worsening of chronic conditions, acute

conditions and vaccine preventable conditions, as observed in 7. AH conditions were selected following the classification proposed in Pirani et al. (2006),<sup>24</sup> which adapts previous classifications present in the literature<sup>16</sup> to the Italian context (see Appendix Table A 1), as the definition of ACSC can be context dependent.<sup>25</sup> We also replicate all analyses using two alternative definitions for coding ACSC as a robustness check.<sup>14,26</sup>

We define immigrants as those individuals lacking Italian citizenship. We distinguish between documented and undocumented immigrants using an administrative financing code for hospitalizations (ODG, *onere della degenza*, or financing source), e.g., financed through the SSN, out-of-pocket, etc. The latter allows for identifying undocumented immigrants since their STP codes are uniquely associated with specific ODG codes. Because STP codes expire after six months, HDRs do not allow for consistently identifying individuals in the sample; therefore, hospitalizations are the unit of analysis.

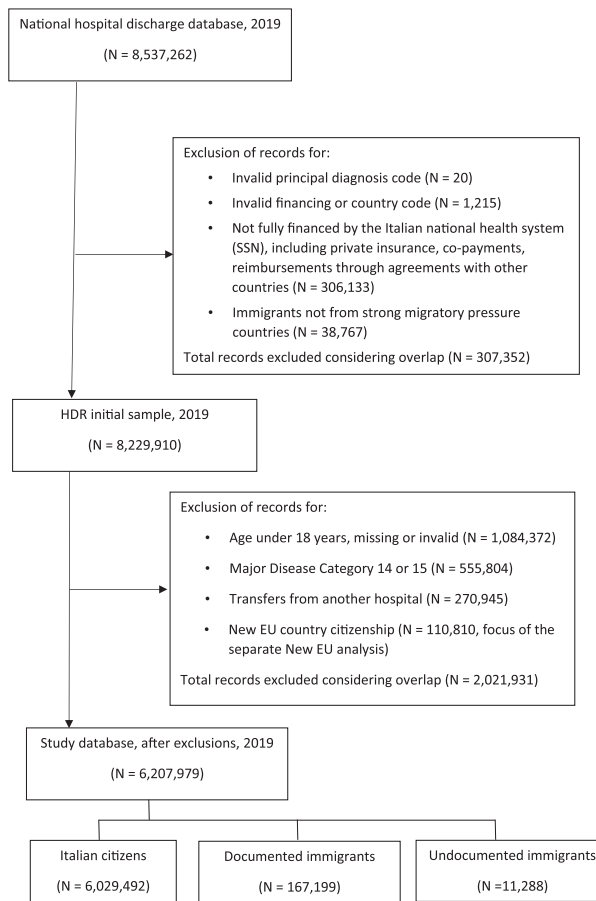
### Study population

From the national hospital discharge database, we dropped records with incomplete information on citizenship and principal diagnosis. The analysis is restricted to Italian citizens and immigrants from a strong migratory pressure countries (SMPC), as defined by ISTAT, including Africa, Asia (excluding Israel and Japan), Central and South America. We further focused on the more homogeneous sample of HDRs fully financed by the SSN ("HDR initial sample"), excluding in particular those financed partially or fully out-of-pocket or through private insurance as these are highly correlated with income and other socio-economic unobservables; hospitalizations can occur in public or private, accredited facilities. We also excluded hospitalizations for pregnancies, childbirth and puerperium (Major Diagnostic Category (MDC) 14), newborns and neonates (MDC 15), and minors (patients younger than 18) since these categories are provided with official registration codes, given that they are entitled to temporary residence permits and full access to healthcare. Transfers from other hospitals were excluded to avoid double counting.<sup>24</sup>

Finally, note that SMPCs also include New EU countries, but New EU citizens have been excluded from the main analysis since they cannot be undocumented. However, the latter might fail to access the SSN through an official registration code and be hospitalized through an STP code.<sup>23</sup> We have therefore replicated the analysis for New EU citizens, distinguishing between insured (SSN code) and uninsured (STP code). Figure 1 provides the flow chart of the study sample.

### Statistical analysis and reporting

We estimate logistic regression models for the probability of AHs of any type, or one of the three AH



**Figure 1. Flow chart of the study population construction for examining Avoidable Hospitalizations.** Administrative health records in Italy, 2019.

subcategories: chronic, acute and vaccine-preventable. The main independent variable of interest is an indicator that distinguishes among Italians (reference category), documented immigrants, and undocumented immigrants. Additional individual controls include age class, sex, Charlson Comorbidity Index (CCI),<sup>27</sup> macro area of origin, marital status and educational level. An additional “missing” category has been included for marital status and education to account for high levels of missing values. Models also include area of hospitalization fixed effect (101 LHAs in 2019), to control for all possible area-specific characteristics, such as hospital-based primary care centers for undocumented immigrants, which are inconsistent across LHAs and not well documented, or non-governmental organization-based primary care centers (also not well-documented), as well as average socioeconomic conditions of the area.

Data preparation and statistical analysis was performed using Stata 17. We report adjusted odd ratios (ORs) and 95% confidence intervals (CIs) in tables and use log scale in figures.

### Role of the funding source

The authors received no specific funding for this research. HB had full access to all the data in the study and did the data management. CD, HB and CA made the decision to submit for publication.

### Results

The 2019 HDR includes information regarding 8,537,262 hospitalizations. After exclusions for unreliable primary diagnosis and country of citizenship codes, and out-of-pocket or private insurance-funded hospitalizations, 8,229,910 records remained in the initial sample. After study exclusions (for New EU citizenship, minors, maternal-infant admissions and transfers), the 2019 regression sample included 6,207,979 HDRs (or 72.8% of the initial dataset), made up of 6,029,492 (97.12%) Italian citizens, 167,199 (2.69%) documented immigrants and 11,288 (0.18%) undocumented immigrants. The share of immigrants in the sample markedly decreases after excluding for

age and maternal/neonatal health, which is consistent with the demographic characteristics of the three populations<sup>1</sup>.

The share of AHs is highest among the undocumented population (8.5%) and lowest among the documented population (6.74%) (Table 1). AHs due to

HDR initial sample (N, row %)	Italian citizens		Documented Immigrants		Undocumented Imm.	
	7,740,876	94.06	468,488	5.69	20,546	0.25
Avoidable hospitalizations, (N, %) (note: % of HDRs per category)	563,377	7.28	22,870	4.88	1,343	6.54
<i>Exclusions (some categories overlap), N. % of total HDRs</i>						
New EU citizens	0	0.00	108,806	98.19	2,004	1.81
Patients <18 years or age missing	988,810	89.23	116,667	10.53	2,704	0.24
MDC 14 and MDC 15	822,915	82.44	169,958	17.03	5,334	0.53
Transfers from other hospitals	279,245	96.10	10,556	3.63	776	0.27
Total exclusions	1,711,384	84.64	301,289	14.90	9,258	0.46
<b>Study database, after exclusions</b>	<b>6,029,492</b>	<b>97.12</b>	<b>167,199</b>	<b>2.69</b>	<b>11,288</b>	<b>0.18</b>
Avoidable hospitalizations, (N, % of category), of which:	474,956	7.88	11,262	6.74	959	8.50
Chronic	263,115	4.36	4,099	2.45	380	3.37
Acute	210,356	3.49	6,994	4.18	559	4.95
Vaccine-preventable	1,485	0.02	169	0.10	20	0.18
Female (N, row %)	2,958,769	49.07	89,408	53.47	4,806	42.58
Age class (N, column (col) %)						
18-24	173,355	2.88	12,642	7.57	1,148	10.17
25-44	708,837	11.76	63,851	38.19	4,855	43.01
45-64	1,746,313	28.96	64,588	38.63	4,066	36.02
65-74	1,317,705	21.85	16,621	9.94	863	7.65
75 or older	2,083,282	34.55	9,487	5.67	356	3.15
Education (N, col %)						
None, elementary	1,673,454	27.75	38,101	22.79	3,126	27.69
Lower secondary	1,360,875	22.57	43,924	26.27	2,158	19.12
Upper secondary	1,160,421	19.25	31,298	18.72	1,005	8.90
University	415,261	6.89	11,044	6.61	449	3.98
Missing	1,419,481	23.54	42,832	25.62	4,550	40.31
Marital status (N, %)						
Married	2,593,763	43.02	61,368	36.70	2,248	19.91
Missing	1,951,057	32.36	66,341	39.68	5,912	52.37
Citizenship, by geographic area (N, col%)						
Europe	6,029,492	100	57,735	34.53	4,475	39.64
North Africa			49,325	29.50	3,586	31.77
Sub-Saharan Africa			1,531	0.92	84	0.74
West Asia			2,566	1.53	377	3.34
Other Asia			29,785	17.81	1,341	11.88
Central-South America			22,336	13.36	1,392	12.33
Stateless			3,921	2.35	33	0.29
Charlson Comorbidity Index (CCI) (N, col %)						
CCI = 0 (no CCI comorbidities)	3,673,574	60.93	120,852	72.28	6,768	59.96
CCI = 1	919,916	15.26	17,920	10.72	1,590	14.09
CCI = 2	1,436,002	23.82	28,427	17.00	2,930	25.96
Mean (standard deviation, sd) weighted sum of CCI comorbidities (wcharlsum)						
wcharlsum for Total (mean, sd)	0.86	1.44	0.64	1.36	1.09	1.85
wcharlsum for AHs (mean, sd)	1.28	1.24	0.81	1.12	0.93	1.31

**Table 1: Frequency of hospital discharge records (HDR) database: Avoidable Hospitalizations and patient characteristics, Italy, 2019**

chronic conditions are most common in the Italian population, while AHs due to acute conditions are most common among immigrants. Females make up a lower proportion of undocumented immigrants (42.6%), in keeping with selection criteria (i.e., exclusion of MDC 14 and 15). Immigrants tend to be younger than Italians, with a median age of 68, 46, and 43 for Italians, documented immigrants and undocumented immigrants, respectively. Undocumented immigrants exhibit lower educational levels and fewer are married, however there are high numbers of missing values among the undocumented. Nearly three-quarters of documented immigrants showed no comorbidities (CCI=0), and mean weighted Charlson scores (wcharlsum) for documented immigrants were lower than both Italians and undocumented immigrants for all study hospitalizations as well as for the proportion of AHs (Table 1). Undocumented immigrants, by contrast, more closely mirror the proportions exhibited by Italian citizens, with an overall wcharlsum higher than Italians and documented immigrants (1.09, 0.86 and 0.64, respectively), though lower than Italians for AHs (0.93 vs. 1.28, respectively). Appendix Table A 2 shows the prevalence of the 17 CCI disease categories for total and avoidable hospitalizations. With few exceptions (e.g., liver disease, peptic ulcer, AIDS/HIV and cancer for undocumented immigrants), the prevalence of the CCI categories was higher for Italians compared to both immigrant groups. For Italians and immigrants, several categories were noted in much higher proportions of patients in the AH share compared to total HDRs: congestive heart failure, chronic pulmonary disease, diabetes (with and without complications), and renal disease.

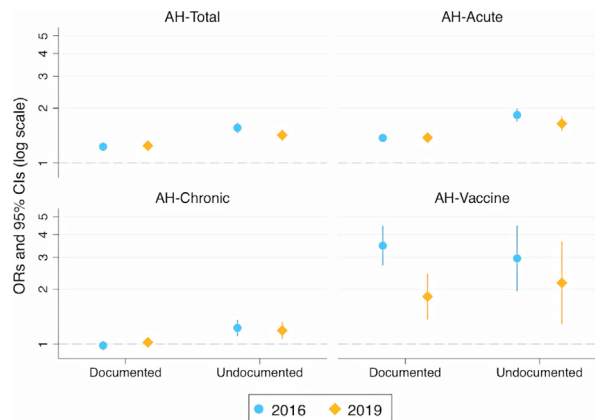
Appendix Table A 3 provides descriptive statistics from 2016 HDRs for comparison. A notable difference between 2019 and 2016 is the decline in the total number of hospitalizations, dropping by more than 6%, a

trend that has been registered in Italy since at least 2010, a result of directed health policy interventions to promote non-hospital care, where appropriate.

Figure 2 summarizes the main results of the logistic multivariable analyses, for AHs in general and by subcategories, for 2019 and 2016. Table 2 provides complete estimation results for 2019 (see appendix Table A 4 for 2016). Figure 2 shows that immigrant status is associated with a higher probability of AH, both for documented and undocumented populations compared to Italians, with adjusted ORs of 1.243 (95% CI 1.201-1.287) and 1.422 (95% CI 1.322-1.528), respectively. Higher AH rates due to chronic conditions were observed for undocumented immigrants (OR 1.187; 95% CI 1.064-1.325) but not for documented immigrants. Both documented and undocumented immigrants show higher adjusted ORs for AH due to acute conditions (OR 1.377; 95% CI 1.320-1.437 and OR 1.645; 95% CI 1.500-1.803 respectively). Vaccine-preventable AHs register the largest differences between Italians and the two immigrant groups (OR 1.824; 95% CI 1.364-2.440 and OR 2.170; 95% CI 1.285-3.664 for documented and undocumented immigrants, respectively), though CIs are large and the difference between documented and undocumented immigrants is not statistically different from zero.

Figure 2 shows consistent results for 2019 and comparison year 2016. Moreover, they are robust to the use of alternative definitions of AHs that account for possible selection into hospitalization due by either individual's<sup>26</sup> or doctor's<sup>14</sup> behavior (see Appendix Figure A 1 and Table A 5).

As a sensitivity check, we replicated the logistic multivariable analyses, for AHs in general and by subcategories, for 2019, without including socioeconomic variables, as captured by individuals' characteristics (i.e., marital status and educational level) and the LHAs



**Figure 2. Avoidable Hospitalizations (AHs) of documented and undocumented immigrants.** Adjusted odd ratios and 95% confidence intervals for the likelihood of Avoidable Hospitalizations (AHs) of documented and undocumented immigrants (vs. Italians), Italy, 2019 and 2016, controlling for age class, sex, Charlson Comorbidity Index, macro area of origin, marital status, educational level, and area of hospitalization.

	AH-Total	AH-Chronic	AH-Acute	AH-Vaccine
Documented	1.243*** (1.201 - 1.287)	1.021 (0.966 - 1.079)	1.377*** (1.320 - 1.437)	1.824*** (1.364 - 2.440)
Undocumented	1.422*** (1.322 - 1.528)	1.187*** (1.064 - 1.325)	1.645*** (1.500 - 1.803)	2.170*** (1.285 - 3.664)
Female	0.949*** (0.944 - 0.955)	0.943*** (0.935 - 0.951)	0.969*** (0.961 - 0.978)	0.659*** (0.596 - 0.728)
Undefined sex	28.056*** (19.150 - 41.104)	9.263*** (6.635 - 12.933)	9.721*** (6.827 - 13.842)	
Age 18-24	1.341*** (1.309 - 1.375)	0.555*** (0.523 - 0.589)	1.789*** (1.739 - 1.839)	2.196*** (1.793 - 2.689)
Age 25-44	1.080*** (1.064 - 1.096)	0.609*** (0.593 - 0.627)	1.389*** (1.365 - 1.414)	2.602*** (2.309 - 2.933)
Age 65-74	1.285*** (1.272 - 1.298)	1.319*** (1.301 - 1.337)	1.209*** (1.190 - 1.228)	0.393*** (0.331 - 0.466)
Age 75+	2.384*** (2.363 - 2.405)	2.103*** (2.078 - 2.128)	2.538*** (2.505 - 2.571)	0.213*** (0.177 - 0.255)
No/elementary	1.491*** (1.474 - 1.507)	1.380*** (1.359 - 1.400)	1.542*** (1.518 - 1.566)	1.117 (0.948 - 1.315)
Lower secondary	1.184*** (1.171 - 1.198)	1.170*** (1.152 - 1.189)	1.176*** (1.157 - 1.195)	1.025 (0.887 - 1.185)
University	0.898*** (0.882 - 0.914)	0.874*** (0.853 - 0.897)	0.921*** (0.898 - 0.945)	1.061 (0.873 - 1.290)
Missing education	1.423*** (1.406 - 1.441)	1.264*** (1.243 - 1.285)	1.561*** (1.534 - 1.588)	1.761*** (1.497 - 2.071)
Married	0.895*** (0.888 - 0.903)	0.904*** (0.894 - 0.914)	0.891*** (0.880 - 0.901)	0.824*** (0.724 - 0.938)
Missing marital status	1.009* (0.999 - 1.018)	0.900*** (0.889 - 0.911)	1.139*** (1.124 - 1.154)	1.062 (0.926 - 1.217)
Cci score=1	4.958*** (4.919 - 4.996)	17.026*** (16.790 - 17.265)	1.600*** (1.583 - 1.618)	3.109*** (2.750 - 3.514)
Cci score=2+	2.649*** (2.629 - 2.669)	9.667*** (9.535 - 9.801)	0.884*** (0.874 - 0.894)	0.656*** (0.556 - 0.774)
Constant	0.025*** (0.025 - 0.026)	0.006*** (0.006 - 0.006)	0.016*** (0.015 - 0.016)	0.000*** (0.000 - 0.000)
Observations	6,207,979	6,207,979	6,207,979	6,125,469

**Table 2: Logistic regression results (ORs) for the likelihood of Avoidable Hospitalizations (AHs), Italy, 2019.**

Italian citizenship is the reference category. All models also include the individual's macro area of origin and the area of hospitalization (LHAs). \*\*\*, \*\* and \* denote P values smaller than 0.01, 0.05 and 0.1, respectively. 95% CI in parenthesis.

fixed effect (see Appendix Table A 6). As expected, point estimates are slightly larger, pointing to the role of socioeconomic conditions as a mediator of the relationship between immigrant status and AHs.

Replication of the main analysis comparing Italians and the 110,810 citizens from New EU countries, categorized according to insurance status, for 2019, is shown in Table 3 along with documented and

	Documented	Undocumented	New EU	New EU uninsured
Odds Ratios	1.243***	1.422**	1.205***	1.694***
95 CI	(1.201 - 1.287)	(1.322 - 1.528)	(1.161 - 1.252)	(1.390 - 2.064)
Observations	6,207,979	6,207,979	6,089,838	6,089,838

**Table 3: Logistic regression results (ORs) for the likelihood of Avoidable Hospitalizations (AHs): comparison of main model (Table 2) with citizens of countries that joined the European Union from the 2004 EU enlargement onward (New EU), 2019**

Italian citizenship is the reference category. The main model (from Table 2) results are reported in columns 1 and 2. The New EU model (columns 3 and 4) also controls for the area of hospitalization (LHAs), age class, sex, Charlson Comorbidity Index, marital status and educational level. \*\*\*, \*\* and \* denote P values smaller than 0.01, 0.05 and 0.1, respectively. 95% CI in parenthesis.

undocumented immigrant results from the main analysis. Results for insured and uninsured New EU citizens (OR 1.205 95% CI 1.161 - 1.252 and OR 1.694, 95% CI 1.390 - 2.064 respectively) are very close to those of documented and undocumented immigrants. Appendix Table A 7 reports the New EU results for 2016.

## Discussion

This study investigates barriers in access to primary health care services for immigrants by examining AHs in 2019 HDR data from Italy. We address several limitations in the literature by innovatively identifying legal status of SMPC immigrants from anonymized administrative data using information on financing sources for hospitalizations, and by focusing on the incidence of AHs, a set of hospitalizations that should be avoided through timely and effective primary care.<sup>25,26</sup> We estimate ORs through logistic regression models for the probability of AH, controlling for age, sex, education, marital status, comorbidities (CCI), macro geographic area of origin and contextual dummies.

Among 8,229,910 HDRs (excluding unreliable citizenship and diagnosis codes and privately-funded admissions) from 2019 in Italy, approximately 7.1% were identified as AHs, slightly lower than the 8% observed in a 2013 study comparing AHs in Italy and Germany using national discharge records, but expected since that study noted decreases in both total hospitalizations and AHs over time.<sup>11</sup> Immigrants accounted for nearly 6% of the initial HDR sample. After exclusions, the proportion of immigrant patients in the study database dropped to 2.9% of the remaining 6,207,979 hospitalizations, 6.3% of all immigrants were undocumented, with similar proportions observed for comparison year 2016 (Appendix Table A 3). Such disproportionate representation of the immigrant population (estimated at roughly 8.4% of the total population in Italy) - along with the generally lower prevalence of CCI disease categories we observed for documented and undocumented immigrants compared to Italians (Appendix Table A 2) - appears consistent with findings in other studies that have observed self-selection of “healthier” (and younger) individuals into migration<sup>28</sup> and lower use of healthcare services by immigrants compared to native populations,<sup>1,2,8</sup> likely due to barriers in accessing healthcare services.<sup>3</sup>

Results show that, compared to Italians, undocumented and documented immigrants are at considerably higher risk for AH, with adjusted odds ratios of 1.422 (95% CI 1.322-1.528) and 1.243 (95% CI 1.201-1.287), respectively. This is in keeping with results from Sicily showing higher risk of AH for undocumented vs. documented immigrants<sup>7</sup> and with studies in other countries that found higher rates of AH for migrants compared to native born citizens.<sup>18</sup> Though other studies have found that race and ethnicity are associated

with higher rates of AH as well as socioeconomic status,<sup>13,14,17-19</sup> we believe that socioeconomic conditions are unlikely to have played a major role here. First, relative to previous research, we controlled for a larger set of individual confounders that capture, although imperfectly, socio-economic individual factors and a full set of LHA fixed effects to adjust for any area differences (e.g., economic conditions, differences in local management of health services in the decentralized Italian SSN, local initiatives for the immigrant population). Further, we focused on HDRs fully financed by the SSN, a more homogeneous sample in terms of socioeconomic characteristics. The inclusion of HDRs funded partially or fully out-of-pocket or through private insurance would reinforce our findings (as we found in early tests of the model for appropriate variable selection, not reported), as AHs correlate with socioeconomic conditions.<sup>15-17</sup> Regression results here for age, sex and educational level effects on total AH (Table 2) echo results recently observed using the HDR to measure AH for the metropolitan area of Milan, a study that also found declining rates of hospitalizations and age-adjusted and overall rates of AH over time (2005-2016).<sup>12</sup>

Second, we find no difference in the incidence of chronic AHs between Italians and documented immigrants, at least partially supported by an Italian study comparing AH for diabetes mellitus in immigrants and natives, which found significant differences in AH only for immigrant males.<sup>22</sup> We interpret the latter result as evidence that for those chronic conditions that last over time and require ongoing medical attention, informational barriers to access are less relevant, and the incidence of AHs does not differ between Italians and documented immigrants, who can fully access the SSN. In apparent support of this, a Canadian study where researchers were able to link a national community health survey with demographic and risk factor information with hospital discharge records to determine times to AHs for chronic conditions, found that immigrant status lowered the risk of AHs and stressed the importance of prevention in combating AH for chronic conditions.<sup>19</sup> However, for acute and vaccine preventable ASCS, documented immigrants with infrequent contact with the SSN may lack familiarity with the SSN and fail to access non-hospital health care services. Indeed, other studies have found that documented immigrants show higher use of emergency services and AHs for acute and vaccine preventable conditions compared to natives in Italy and elsewhere.<sup>3,20,21</sup>

Notably, undocumented immigrants experience higher incidence for all AH categories (chronic, acute and vaccine preventable). Considerable debate in the research community addresses the importance of primary care in preventing AH, as well as hospital rates often used to measure healthcare system performance. Results here support the likelihood that AH is



exacerbated by the lack of access to GPs in Italy for undocumented immigrants, adding to other (informational, linguistic, socioeconomic) barriers experienced by all immigrants, by limiting preventive care and gate-keeping to ambulatory care; in addition, GPs would also presumably complete a full history on each assigned patient, uncovering any gaps in childhood vaccinations. In support of this, regression results here for uninsured New EU immigrants closely mirror those observed for undocumented immigrants, since uninsured New EU also lack GPs as they do not register with the SSN. Because New EU immigrants may legally reside in Italy, this result also weakens the likelihood of alternative explanations that undocumented immigrants avoid seeking medical care for fear of authorities and deportation.

This study has shown how unmet health disparities, as measured by AHs rates, are pervasive for all immigrants in Italy, particularly for the undocumented. The Ministry of the Interior instituted Territorial Councils for Immigration (*Consigli territoriali per l'immigrazione*) in 1999 to examine issues related to the immigrant community and promote integration, monitor problems and coordinate solutions. Family counseling centers (*Consultori familiari*), run by LHAs, provide services to women immigrants, including undocumented, particularly regarding maternal-infant health. Additionally, Italy has made considerable effort to provide cultural mediation services in hospital, ambulatory care and primary care settings, and several universities now offer a three-year degree in linguistic and cultural mediation. However, at present in Italy services for the largely male undocumented immigrant population are still scarce, with access to primary care notably absent or unevenly provided by a few larger public hospitals in urban centers (anecdotal evidence) or through non-governmental organizations.<sup>29</sup> Primary care centers for undocumented immigrants coordinated by LHAs or regional health authorities are still lacking.

Several limitations affected the study, including completeness and accuracy of diagnostic coding in administrative health records, limited individual characteristics (e.g. occupational position and health behaviors that may affect health needs and barriers to health care)<sup>30</sup> the lack of individual identity codes to account for repeated hospitalizations, to follow patients over time and link records to other demographic (individual socioeconomic status) and health records (e.g., emergency, ambulatory care), scarce information on undocumented immigrant populations in Italy and elsewhere (including information on the length of a patient's permanence in Italy). We cannot rule out the possibility that missing information on citizenship is non-random, although, as the flow chart shows, the number of exclusions was contained.

The main strength of our study was the ability to identify undocumented immigrants in the Italian

anonymized HDR, a national administrative dataset increasingly used in research and policy analysis, whose quality and reliability has steadily improved over the last decade.<sup>31</sup> Additionally, we take advantage of the Italian legal framework, where publicly-provided primary care differs according to legal status (documented and undocumented) and insurance status (insured and uninsured immigrants from New EU countries) to explore possible mechanisms underlying the higher incidence of AHs among documented and undocumented immigrants. CCI analysis revealed differences in comorbidity prevalence for undocumented immigrants, e.g., lower for conditions related to age (heart failure, dementia), higher for conditions likely related to stress or riskier behavior (ulcers, AIDS/HIV, liver disease). Further research should address these aspects, trauma/emergency hospitalizations, the pediatric immigrant population, and costs associated with AH.

We conclude that providing access to primary care to all immigrants, regardless of their legal status, may considerably decrease the risk of AHs among the undocumented. Additionally, other types of barriers should be addressed to reduce AHs due to acute and vaccine-preventable diseases among documented immigrants and to strengthen available resources to cover health needs for all immigrants in Italy, regardless of legal status.

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#### Contributors

CD conceived the study. HB had full access to all the data in the study and did the data management. All authors did the statistical analysis, table preparation, final write-up and revision of the manuscript, and had final responsibility for the decision to submit for publication.

#### Data sharing statement

Data were obtained from the hospital discharge database of the Italian Health Ministry. Data may be obtained by a third party only by request from the Italian Ministry of Health, as they are not publicly available. Statistical code will be made available upon request.

#### Declaration of interests

All authors declare no competing interests.

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## Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.eclinm.2022.101345.

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