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EDITED BY

Fabio Perocco,
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REVIEWED BY

Nicola Costalunga,
University of Turin, Italy
Benedetta Lana,
Institut Pasteur de Lille, France

*CORRESPONDENCE

Carlo Devillanova
✉ carlo.devillanova@unibocconi.it

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Labor and health of undocumented migrant women: evidence from a large primary care outpatient clinic in Milan, Italy

Carlo Devillanova^{1*} and Anna Spada²

¹Department of Social and Political Science, Bocconi University, Milan, Italy, ²On Behalf of Naga, Organizzazione di Volontariato per l'Assistenza Socio-Sanitaria e per i Diritti di Cittadini Stranieri, Rome\Sinti, Italy

Background: Undocumented migrant women face compounded risk exposure stemming from precarious living and working conditions, legal exclusion, and barriers to healthcare access. Empirical evidence linking their sociodemographic status and health trajectories remains scarce, particularly in Italy and Europe.

Methods: We conducted a retrospective observational study of 3,000 women aged ≥ 18 who attended Naga—a nonprofit primary-care clinic for undocumented migrants in Milan—between January 1, 2022 and February 20, 2025. Integrated records combine first-visit sociodemographic data with ICD-10—coded diagnoses at each consultation (7,463 total visits). We summarize ICD-10 chapter distributions across all consultations to characterize the clinic's diagnostic profile; describe sociodemographic characteristics using the single-visit cohort and the first-visit subsample (where clinical and demographic data are temporally aligned); trace diagnostic trajectories among returning patients; and employ multivariate logistic regression on the first-visit group to assess the extent to which age, education, and occupation correlate with diagnosis at entry.

Results: Nearly two-thirds of women had arrived within 12 months and 55% were unemployed, despite over 60% having $\geq$ upper-secondary education. Preventive and reproductive care (ICD-10 Chapter XXI) accounted for $\sim 16\%$ of visits, followed by musculoskeletal (11%) and genitourinary (10%) disorders. Chronic conditions (endocrine, circulatory, chronic respiratory/genitourinary) comprised 15.7% of visits, and 14.6% of women received a chronic diagnosis over follow-up. Compared with the full sample, first visits concentrate more on preventive/reproductive care—Z30 34.6% vs. 31.8%; Z03 18.1% vs. 13.4%—and show fewer chronic and mental-health diagnoses (Chapter V 2.8% vs. 4.2%). Age emerged as the dominant predictor: older women exhibited sharply higher odds of chronic-disease chapters (e.g., OR 6.1 for endocrine; OR 30.7 for circulatory in those ≥ 65).

Conclusions: This large clinic-based cohort reveals how undocumented migrant women initially seek reproductive and acute care, and over subsequent contacts they are more likely to receive chronic and mental-health diagnoses, in a context of precarity. Extending primary-care enrolment (GP access) could lessen structural disadvantages and strengthen continuity of care. Future research should assess whether, and to what extent, labor-market trajectories are associated with health outcomes, to inform comprehensive policy responses.

KEYWORDS

longitudinal health trajectories, primary care, undocumented migrant women, Italy, socioeconomic precarity, chronic morbidity, gender vulnerabilities

1 Introduction

As of mid-2024, there were an estimated 304 million international migrants globally—nearly half were women—with approximately 15%–20% (around 45–60 million) being undocumented—defined here as lacking legal status due to, e.g., overstayed visas, rejected asylum claims, or unauthorized entry (IOM, 2025). However, robust information on undocumented migrants remains sparse, particularly regarding their sociodemographic profiles and health outcomes, and the association between the two.

Evidence reveals that undocumented migrants often face a dual disadvantage: they endure precarious, often exploitative living and working conditions and encounter barriers in accessing healthcare with documented consequences, including underdiagnosed and untreated chronic conditions, heightened mental-health burden, and greater reliance on emergency care (Jackson et al., 2018; El Arab et al., 2023; Gondek and Bernardi, 2023). Scholarship highlights that legal exclusion alone imposes a substantial, adverse effect on migrants' health (Castañeda, 2009; Gea-Sánchez et al., 2017; Refle et al., 2023). Moreover, undocumented immigrants frequently face anti-immigrant policies and hostile rhetoric—forms of structural stigma that operate as social determinants of health (Morey, 2018). Labor market studies consistently show that undocumented migrants are disproportionately concentrated in informal “3D” jobs—dirty, dangerous, and degrading—with almost no legal safeguards (De villanova et al., 2024; Hagose et al., 2023; Lenko et al., 2025). Simultaneously, structural and legal barriers curb access to health care: undocumented migrants are commonly denied full enrolment with the public health system, face high administrative hurdles, and report pervasive fear of exposure to migration authorities when seeking care (El Arab et al., 2023; Woodward et al., 2014; Winters et al., 2018). The combination of exploitative labor conditions and limited health coverage translates into higher rates of untreated chronic illness, mental-health disorders, and dependence on emergency services (Allegri et al., 2022; Hagose et al., 2023; Gondek and Bernardi, 2023; Tenorio-Mucha et al., 2024).

Crucially, recent research underscores that these dynamics are gendered. Women are over-represented in informal domestic, caregiving, and cleaning roles, sectors marked by low pay, isolation in private households, and weak labor inspection (Mucci et al., 2019). Barriers to healthcare are likewise gendered. Undocumented women require reproductive, prenatal, and post-natal services that are time-sensitive. Even where undocumented women are legally entitled to free prenatal and delivery care—as is the case in Italy—antenatal care uptake is often suboptimal, not because of a lack of need but due to structural barriers and de facto exclusion, including administrative hurdles, limited information about entitlements, language obstacles, fear of detection, unstable work schedules, and occasional gatekeeping or denial of services (De villanova, 2008; Devillanova and Frattini, 2016; Jackson et al., 2018; Lebano et al., 2020). Consistent with this, antenatal utilization remains low and undocumented women experience unfavorable pregnancy outcomes, relative to documented migrants and registered citizens (Osuide et al., 2024; de Jong et al., 2017; Wolff et al., 2008). For example, in Lombardy—the region in which

this study is situated—undocumented mothers have a preterm-birth rate of 9.3% vs. 5.3% for Italian citizens, and inadequate prenatal attendance explains more than half of this gap (Cantarutti, 2024). Women's exposure to precarious employment and housing insecurity, combined with restricted access to gender-specific health services, thus generates compounded risk exposure that standard migrant-health frameworks often overlook.

Despite growing recognition of these issues, large-scale, individual-level datasets that integrate sociodemographic and clinical dimensions for undocumented women are rare in Europe (Arici et al., 2019; Devillanova et al., 2024). Most quantitative evidence relies either on hospital discharges—rich in ICD-10 codes but sparse on socioeconomic information—or on labor surveys that include only self-reported health indicators (Lenko et al., 2025). The few studies that merge the two domains are rarely gender-specific (De villanova et al., 2024; Hagose et al., 2023).

The present study offers new evidence by analyzing a unique integrated database from Naga, a long-standing NGO in Milan that provides free primary care to individuals excluded from routine enrollment in the Italian National Health Service (INHS), predominantly undocumented migrants (in our sample, fewer than 5% of patients were citizens of newer EU member states who, while lawfully present in Italy, were not fully integrated into the INHS—see Section 2.1). Naga's electronic records combine detailed sociodemographic information—collected at first contact—with ICD-10-coded diagnoses entered at every subsequent visit. By exploring both cross-sectional associations (labor conditions and health at first visit) and longitudinal health trajectories (evolution of diagnoses over repeat visits), this paper addresses a critical empirical gap and illuminates the intersectional vulnerabilities shaped by gender, undocumented status, and precarious labor and living conditions. At a policy level, the findings speak directly to debates about extending primary-care enrolment to all the people, undocumented migrants included, and designing labor-market interventions that mitigate the health costs of informal employment.

2 Materials and methods

2.1 Study setting

This is a retrospective observational study that draws on records from Naga, a non-governmental organization established in Milan in 1987. Naga offers free outpatient primary care to undocumented migrants and, since 2004, to migrants otherwise excluded from full enrolment in the INHS.

Italian law (Legislative Decree 286/1998, Article 35) safeguards health as a fundamental right and mandates that undocumented migrants receive urgent and essential medical care—care for conditions that, while not immediately life-threatening, could worsen over time if untreated. Instead of an INHS registration, undocumented patients access the health system using an anonymous temporary code (STP—*Straniero Temporaneamente Presente*, or “foreigner temporarily present”), which enables undocumented individuals to receive those urgent and essential services to which they are entitled. However, Italian legislation

bars undocumented migrants from registering with a general practitioner (GP) in the public system. Notably, in Italy's primary-care model, GPs serve as the gatekeepers for preventive and continuous care. It follows that, without GP enrollment, undocumented migrants lack continuous primary care and can obtain specialist care only by first presenting to a hospital emergency department or to a hospital-based clinic, where present.

Migrants from new EU member states (countries that joined the EU from 2004 onward) occupy a unique position. They are lawfully present in Italy under EU free-movement rights, but to register with the INHE, Italian authorities require these individuals to present a European Health Insurance Card (EHIC) from their home country. In practice, many unemployed EU immigrants lack an EHIC. This leaves economically vulnerable EU citizens (e.g., job-seekers from new member states) in a coverage gap similar to that of undocumented migrants (Devillanova et al., 2020). To fill this gap, Italy introduced a temporary code [ENI—*Europeo Non Iscritto*, or “European Not Registered (with INHS)”. Much like the STP, the ENI code does not grant full enrolment with the INHS and therefore does not entitle adult holders to register with a GP.

Crucially, the Italian legal framework ensures maternal and child health: undocumented pregnant women are entitled to care throughout pregnancy and up to 6 months after delivery under the same conditions as Italian citizens, including all pre- and post-natal services. Likewise, minors (children under 18) are guaranteed medical protection (e.g. pediatric care, vaccinations, and infectious disease treatment) on par with other resident minors.

In sum, the law ensures that pregnant women and minors are fully allowed in the public system, regardless of legal status, just like any Italian citizens. Undocumented non-EU migrants, and uninsured EU citizens, all have pathways to obtain essential and urgent health care in the INHS. However, they miss a GP in the public system and obtain primary care mainly through charity-run clinics. Within Italy there is variation in how regions implement access for migrants. Lombardy, Italy's most populous region (capital: Milan), follows the national framework closely and does not assign GPs to undocumented non-EU migrants, and uninsured EU citizens.

Naga therefore operates as a nonprofit primary-care clinic serving patients excluded from routine INHS enrollment. Naga is based in the city of Milan, in the Lombardy region of northern Italy. It handles about 6,000 consultations a year, the vast majority involving undocumented migrants, while uninsured citizens from the post-2004 “new-EU” countries represent only a small residual share of its caseload. Whenever patients are found to be eligible for the Italian National Health Service (INHS)—including minors and pregnant women—they are referred back to the public system, in line with Naga's stance on the “humanitarianism–equity dilemma”: namely, that its activities should not displace the Italian state's long-term responsibility to provide these essential services (Piccoli and Perna, 2024). The organization operates under the principle of unconditional access, encouraging self-declaration of legal status—an approach widely used in the field and found to yield credible data (Young and Madrigal, 2017). Moreover, the consistent intake procedures and coding practices ensure comparability across visits and patients.

Since January 2020, Naga has adopted an integrated electronic patient record, that combines both clinical information and sociodemographic data for each patient. Specifically, at the patient's first visit trained volunteers collect sociodemographic data that include: age, sex, country of origin, education, year of arrival in Italy, marital and status, employment status, housing conditions, and other relevant background characteristics, such as language skills. These variables are recorded once and are not updated in subsequent visits. At each visit, physicians enter patients' medical information into the same system, using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), the World Health Organization's standard for coding diseases, symptoms, and other health conditions. ICD-10 is hierarchical: conditions are grouped into broad chapters (e.g., endocrine, circulatory, respiratory), and some chapters capture factors influencing health care use rather than diseases *per se* (e.g., Chapter XXI). Naga's electronic records allow for the tracking of health trajectories over time—a rare feature in research on undocumented populations.

The study uses a fully anonymized version of the data and was approved by the Ethics Committee of Bocconi University (Approval #FA000093).

2.2 Study population

The study sample includes all women aged 18 years or older who visited the Naga outpatient clinic between January 1, 2022, and February 20, 2025, the date on which the data were retrieved. Data from 2020 and 2021 were excluded because COVID-19 lockdowns sharply reduced patient volume and yielded a highly selected caseload (Devillanova et al., 2020). Records prior to 2020 were compiled with different procedures and are not fully comparable. In particular, the questionnaire used to collect sociodemographic information has changed in 2020, creating a discontinuity in the definition of variables. Furthermore, prior to 2020 medical diagnoses were recorded on paper by volunteer physicians during consultations and they were retrospectively transcribed and digitized by trained personnel for years 2017 and 2018 only (Devillanova et al., 2024).

The sample comprises both first-time visits and returning patients. We conduct the empirical analysis looking both at visits—all medical consultations during the observation window, allowing to characterize the volume and distribution of medical diagnoses across all users of Naga's services—and individuals—to trace the respondent's sociodemographic profiles. For the latter, we also restrict the analysis to the subsample of first visits that comprises only women whose first-ever visit to Naga occurred within the study window. Because their sociodemographic information and ICD-10 diagnoses are captured at the same visit, these women provide a uniquely synchronous snapshot that allows for cross-sectional analyses of the association between sociodemographic factors and health status. Finally, owing to the longitudinal design of the clinical database we can focus on women who presented to the clinic at least twice during the study window, allowing us to

trace their diagnostic trajectories and assess how health conditions evolved over time—an analytical advantage rarely attainable in research on undocumented and similarly hard-to-reach groups.

Together, the combination of a comprehensive visits sample, an individual-level cohort, a cross-sectional first-visit subsample, and a longitudinal returning-patient cohort provides a robust framework for capturing service volume, elucidating sociodemographic determinants of health, and tracing the evolution of medical conditions over time.

2.3 Variables and statistical analysis

The analysis is structured into four steps. First, we present descriptive tables of patients' sociodemographic characteristics for both the full cohort of women and for the sub sample of first visits. Age at visit and permanence in Italy are computed as the difference between the date of the consultation and the date of birth and arrival, respectively, recorded at first intake. All other variables are measured at the date of the first visit. Age has been classified into five categories—18–24, 25–34, 35–44, 45–64, and 65 years or older. Length of stay in Italy has been discretized as well, with all durations exceeding 5 years grouped into a single category. Countries of origin have been grouped into five macro-regions (Istat, 2024), with citizens of new EU member states classified separately from other European countries. An indicator variable, “Italian,” was created and coded as 1 for patients who reported knowing at least some Italian. For each variable, we show the number and percentage of individuals in each category, and we treat missing responses as a distinct category to ensure transparency in our reporting.

Second, we present descriptive statistics of the clinical data—the primary diagnosis assessed by the Naga medical staff—detailing the distribution of principal ICD-10 diagnostic chapters across all visits, and, for each diagnostic chapter, the three most common two-digit ICD-10 diagnoses. ICD-10 chapters accounting for fewer than 3 percent of observations have been collapsed into a residual category. We also provide the same information for the subsample of first visits. Although it must be acknowledged that the assessment of chronic conditions is controversial (Ho et al., 2021; Yao et al., 2025), we further classified a consultation as chronic when the principal diagnosis belonged to an ICD-10 chapter that principally comprises long-term conditions—namely “Endocrine, nutritional and metabolic diseases” (E00–E90), “Diseases of the circulatory system” (I00–I99) and the chronic segments the “Diseases of the respiratory system” (J40–J47) and “Diseases of the genitourinary system” (N17–N19).

Third, leveraging the longitudinal structure of our clinical database, we examine how women's clinical profiles evolve over time. In this context, a woman was said to have received a chronic diagnosis if, during follow-up, her first recorded principal code lay outside those chronic strata but at a later visit fell inside them. Unfortunately, we cannot determine whether changes in diagnoses across consultations reflect confirmation after initial triage, delayed detection, or true disease progression. To gauge this, we examine inter-visit intervals and classify an incident chronic diagnosis when the first recorded principal diagnosis lies outside the chronic ICD-10 strata and a subsequent visit ≥ 30 days later

carries a chronic principal diagnosis. The ≥ 30 -day threshold is intended to filter out short-interval follow-ups in which chronic conditions are confirmed after initial work-up; longer intervals are more consistent with delayed recognition or progression. As sensitivity checks, we replicate all analyses using 60- and 90-day thresholds, with qualitatively similar results.

Finally, we explore the association between diagnoses and sociodemographic characteristics. To do so, we estimate multivariate logistic regression models on the restricted sample of first visits, for which demographic and clinical data are temporally aligned. The dependent variable is an indicator equal to 1 if the principal diagnosis at first visit falls in the ICD-10 diagnostic chapter i and zero otherwise, where i denote any diagnostic chapter with more than 3 percent of observations. Models adjust for age (with 18–24 as the reference category), education (dichotomized as at least upper-secondary vs. lower attainment), and employment status—comparing domestic helpers/cleaners and other occupations against unemployment as the omitted category. Results are reported as adjusted odds ratios (OR) with 95% confidence intervals.

All analyses are performed using Stata 19. Standard errors are robust to heteroskedasticity.

3 Results

During the study period, 3,000 women attended the Naga outpatient clinic. Of these, 522 had received care at Naga before 2020. For these women, the date of their first visit—when sociodemographic characteristics were collected—is unknown. For the remaining 2,448 patients, who had their first-ever at Naga during the study window, sociodemographic and clinical data were recorded contemporaneously. Approximately half of the women (1,489) returned for multiple consultations, bringing the total number of visits to 7,463.

3.1 Sociodemographic characteristics

Table 1 summarizes the sociodemographic characteristics of the 3,000 women that attended the Naga outpatient clinic within the observation window. It also provides the same information for the subset of 2,448 first-time visitors.

The outpatient cohort is young-to-middle-aged, with nearly half between 25 and 44 years and only 7.5% aged 65 or older. Country of origin is highly concentrated: two thirds come from America, specifically from Central and South America, while every other geographic area represents less than 15% each. Peru is the most common country of origin, accounting for 47.23% of the sample. Educational attainment is relatively high for a marginalized population: almost half completed upper-secondary schooling and a further 11% hold a university degree. Yet more than 50% of them say they have no knowledge of Italian. Migration is recent: 61% arrived in Italy within the past year. Still, one fifth have been in the country for 5 years or more. More than half of women are either married, separated or widowed and one third of them have at least one child in Italy. Housing is largely informal: half live with relatives or friends and just over one third are tenants, while

TABLE 1 Sociodemographic characteristics.

Characteristics	All women		First-visits	
	No.	%	No.	%
Age at visit				
18–24	311	10.37%	270	11.03%
25–34	734	24.47%	629	25.69%
35–44	707	23.57%	574	23.45%
45–64	1,023	34.10%	797	32.56%
65+	225	7.50%	178	7.27%
Area of origin				
Africa	310	10.33%	245	10.01%
America	1,977	65.90%	1,658	67.73%
Asia	405	13.50%	344	14.05%
Europe	188	6.27%	131	5.35%
European Union	120	4.00%	70	2.86%
Education				
Illiterate	88	2.93%	67	2.74%
Primary	291	9.70%	234	9.56%
Lower secondary	759	25.30%	613	25.04%
Upper secondary	1,483	49.43%	1,224	50.00%
University	339	11.30%	280	11.44%
Unknown	40	1.33%	30	1.23%
Knowledge of Italian				
No	1,532	51.07	1,339	54.70
Yes	1,457	48.57%	1,104	45.10%
Unknown	11	0.37%	5	0.20%
Years since migration				
1	1,845	61.50%	1,761	71.94%
2	218	7.27%	159	6.50%
3	172	5.73%	106	4.33%
4	137	4.57%	83	3.39%
5+	628	20.93%	339	13.85%
Marital status				
Married	1,034	34.47%	853	34.84%
Unmarried	1,276	42.53%	1,055	43.10%
Separated	415	13.83%	332	13.56%
Widowed	175	5.83%	143	5.84%
Cohabiting	66	2.20%	39	1.59%
Unknown	34	1.13%	26	1.06%
Children in Italy				
No	2,016	67.20	1,624	66.34
Yes	984	32.80%	824	33.66%

(Continued)

TABLE 1 (Continued)

Characteristics	All women		First-visits	
	No.	%	No.	%
Housing conditions				
Tenant	1,087	36.23%	892	36.44%
Relatives/friends	1,508	50.27%	1,258	51.39%
Employer	122	4.07%	96	3.92%
Reception center	37	1.23%	25	1.02%
Community/shelter facility	48	1.60%	38	1.55%
Informal settlement	29	0.97%	14	0.57%
Homeless	35	1.17%	25	1.02%
Unknown	134	4.47%	100	4.08%
Labor market status				
Unemployed	1,643	54.77%	1,371	56.00%
Domestic helpers and cleaners	745	24.83%	572	23.37%
Helpers and cleaners not domestic	194	6.47%	167	6.82%
Manufacturing laborers	21	0.70%	15	0.61%
Other personal service	12	0.40%	11	0.45%
Farm worker	1	0.03%	1	0.04%
Food processing, waiters and related	40	1.33%	36	1.47%
Other/unknown	135	4.50%	114	4.66%
Residence permit				
No	2,560	85.33%	2,128	86.93%
No, expired	219	7.30%	156	6.37%
Yes	149	4.97%	121	4.94%
Unknown	72	2.40%	43	1.76%
Health insurance				
No, undocumented	2,621	87.37%	2,155	88.03%
No, administrative/personal difficulties	40	1.33%	18	0.74%
No, other reasons	129	4.30%	117	4.78%
Unknown	210	7.00%	158	6.45%
Total	3,000	100.00%	2,448	100.00%

The first column comprises all the 3,000 women who attended at Naga outpatient clinic, Milan, Italy, during the study window. The second column is restricted to those 2,448 women whose first-ever visit to Naga occurred within the same period.

homelessness and informal settlements remain below 2%. Labor-market integration is weak—55% report being unemployed and 25% working as domestic helpers or cleaners, leaving fewer than one worker in five in other occupations. Legal and administrative precarity is pronounced. More than 92% lack a valid residence permit—expired for 219 women. Those 149 women holding a residence permit encompasses the 120 migrants from the post-2004

“new-EU” countries, plus few asylum seekers. As expected, given Naga’s admission policy, none of the patients is registered with the INHS. These figures depict a population that is relatively well educated but locked into low-status or no employment, recently arrived.

The outpatient cohort of new patients exhibits broad similarity across most measured dimensions, but with notable shorter length of stay in Italy: among new patients, 72% arrived within the past year, compared to 61% in the full sample. Conversely, only 14% of new patients have been in Italy for 5 years or more, compared to 20% in the full sample. Knowledge of Italian shows a slight difference: 54.7% vs. 51% in the full sample. Notably, there’s a slight uptick in immigrants from the Americas (+1.8 pp), underscoring an even stronger American predominance among new patients.

3.2 Clinical data

Table 2 displays the primary diagnoses assigned by Naga’s medical staff for all 7,463 patient visits, as well as for the subset of 2,448 first visits. The information is categorized by ICD-10 diagnostic chapters, sorted in descending order of frequency in the sample of all medical consultations. Chapters representing fewer than 3% of visits in either cohort are combined into a residual category. Within each ICD-10 chapter, the table also shows the three most frequent diagnoses (2-digit ICD-10 codes) that might differ in the two samples.

The diagnostic profile across the full sample of 7,463 medical consultations reveals a dual burden of care: a mix of preventive/reproductive health needs and chronic or stress-related morbidities. Among all recorded ICD-10 diagnoses, the most common diagnostic chapter is XXI (“Factors influencing health status and contact with health services”), which accounts for approximately 16% of total diagnoses. Within this chapter, the leading reasons for medical encounters are contraceptive management (Z30) and other preventive examinations (Z01), together representing over 60% of the diagnoses in this group. These figures underscore the central role of the clinic in delivering reproductive and preventive health services to undocumented women. The second most frequent chapter is XIII (“Diseases of the musculoskeletal system and connective tissue”), comprising nearly 11% of all diagnoses. The most common condition within this group is dorsalgia (M54), which alone accounts for more than one-third of musculoskeletal diagnoses. This finding points to a high burden of back pain, which may be driven by difficult living conditions—such as inadequate housing, and the physical strain of daily survival tasks—as well occupational exposures associated with informal, physically demanding work. Genitourinary issues (XIV) also feature prominently (10.3%): mainly cystitis (N30) and vaginal inflammation (N76), which may signal poor housing conditions, limited access to sanitation, or lack of preventive care. Symptoms and signs not elsewhere classified (XVIII) appear in 9.3% of visits, including pain, abdominal discomfort, and headaches—often non-specific symptoms that may reflect psychosomatic stress or unmet clinical needs. Respiratory (X), digestive (XI), circulatory (IX), and endocrine (IV) conditions follow, each representing between 7 and 9% of visits. Notably, hypertension (I10), other specified diabetes (E13) and type 2 diabetes (E11) are common.

Mental and behavioral disorders (V) account for 4.2% of all consultations, mostly for anxiety (F41). These patterns highlight the dual role of the clinic in providing both preventive/reproductive services and addressing chronic health conditions in a structurally disadvantaged population.

While the overall distribution remains similar, the first-visit subsample—where clinical and sociodemographic data are recorded contemporaneously—shows several meaningful differences. Among the 2,448 new patients, reproductive and preventive care is even more concentrated: chapter XXI diagnoses drop slightly (15.1% vs. 16%) but contraceptive management (Z30) rises to 34.6% of those encounters (vs. 31.8% in full sample); medical evaluation for suspected conditions (Z03) is also more common (18.1% vs. 13.4%), likely because first visits serve as diagnostic triage points. Chronic diagnoses are slightly less frequent: circulatory (IX) and endocrine (IV) diagnoses are slightly lower (6.7 and 6.2%, respectively) than in the full sample (7.3 and 7.0%). This supports the idea that chronic morbidity tends to emerge over time, rather than at initial contact. Notably, Chapter V (“Mental and behavioral disorders”) is absent from the first-visit column, as it accounts for less than 3% of cases (2.8%) and has therefore been grouped into the residual category. In fact, although 38 women received a diagnosis of F41 (“Other anxiety disorders”)—reported in the “other” chapters—, its incidence at first visit is markedly lower—1.5% compared to 2.3% in the full sample. This may reflect a deterioration in mental health over time, although underreporting at initial contact cannot be ruled out.

According to the identification criterion adopted here, chronic conditions represent 15.7% of all visits—we also applied other measures that, as expected, deliver slightly different results: e.g., 21.24% (Koller et al., 2014). This indicates that a significant but not dominant burden of chronic morbidity in this population that presented with ongoing health needs requiring medium- to long-term care. The prevalence of infectious and communicable conditions is low.

As discussed in Section 2.1, Italy ensures access to all pre- and post-natal services. Coherently, out of a total of 7,463 recorded diagnoses, only 35 (0.47%) fell within the ICD-10 chapter for pregnancy (codes O00–O84), and just 4 (0.05%) corresponded to postpartum complications (codes O85–O92). Thus, fewer than 1% of all visits were directly coded to obstetric or puerperal chapters, indicating that the vast majority of consultations at Naga address non-pregnancy-related health needs.

3.3 Evolution of diagnoses over time

For the women with multiple visits, the average number of medical consultations was 4 (median = 3) and mean interval, in months, between to subsequent medical consultations was 2.5 (median 0.7). Analysis of returning patients reveals a highly dynamic morbidity profile. Of 1,489 returning patients, 63.2% (941 women) ended the observation period with a principal diagnosis in a different ICD-10 chapter from that recorded at their first visit, indicating considerable diagnostic turnover and suggesting that initial consultations often address preventive or acute conditions while subsequent encounters uncover new or evolving morbidities.

TABLE 2 Prevalence of medical diagnoses by ICD-10 chapters.

ICD-10 diagnostic group	All Naga visits		First visits	
	No.	%	No.	%
of which				
XXI Factors influencing health status and contact with health services	1,193	15.99	370	15.11
Z30 Contraceptive management	379	31.77	128	34.59
Z01 Other special examinations and investigations of persons without complaint or reported diagnosis	370	31.01	105	28.38
Z03 Medical observation and evaluation for suspected diseases and conditions, ruled out	160	13.41	67	18.11
XIII Diseases of the musculoskeletal system and connective tissue	813	10.89	280	11.44
M54 Dorsalgia	273	33.58	96	34.29
M75 Shoulder lesions	64	7.87		
M25 Other joint disorders, not elsewhere classified	63	7.75	29	10.36
M19 Other arthrosis			20	7.14
XIV Diseases of the genitourinary system	771	10.33	238	9.72
N30 Cystitis	179	23.22	60	25.21
N76 Other inflammation of vagina and vulva	125	16.21	32	13.45
N95 Menopausal and other perimenopausal disorders	52	6.74		
N64 Other disorders of breast			16	6.72
XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	690	9.25	271	11.07
R52 Pain, not elsewhere classified	213	30.87	85	31.37
R10 Abdominal and pelvic pain	96	13.91	43	15.87
R51 Headache	91	13.19	45	16.61
X Diseases of the respiratory system	689	9.23	241	9.84
J02 Acute pharyngitis	180	26.12	66	27.39
J11 Influenza, virus not identified	88	12.77	34	14.11
J45 Asthma	79	11.47	24	9.96
XI Diseases of the digestive system	595	7.97	210	8.58
K29 Gastritis and duodenitis	150	25.21	73	34.76
K59 Other functional intestinal disorders	65	10.92	22	10.48
K52 Other noninfective gastroenteritis and colitis	63	10.59	18	8.57
IX Diseases of the circulatory system	546	7.32	165	6.74
I10 Essential (primary) hypertension	373	68.32	102	61.82
I51 Complications and ill-defined descriptions of heart disease	22	4.03		
I83 Varicose veins of lower extremities			8	4.85
I95 Hypotension	19	3.48	6	3.64
IV Endocrine, nutritional and metabolic diseases	520	6.97	151	6.17
E13 Other specified diabetes mellitus	134	25.77	51	33.77
E03 Other hypothyroidism	97	18.65	25	16.56
E11 Type 2 diabetes mellitus	54	10.38	18	11.92
XII Diseases of the skin and subcutaneous tissue	383	5.13	113	4.62
L30 Other dermatitis	67	17.49	27	23.89
L72 Follicular cysts of skin and subcutaneous tissue	36	9.40		

(Continued)

TABLE 2 (Continued)

ICD-10 diagnostic group	All Naga visits		First visits	
	No.	%	No.	%
L70 Acne	32	8.36		
L29 Pruritus			9	7.96
L40 Psoriasis			7	6.19
V Mental and behavioral disorders	314	4.21		
F41 Other anxiety disorders	172	54.78		
F31 Bipolar affective disorder	28	8.92		
F22 Persistent delusional disorders	20	6.37		
Others	949	12.72	409	16.71
G40 Epilepsy	46	4.85	12	2.93
D25 Leiomyoma of uterus	46	4.85	15	3.67
D50 Iron deficiency anemia	32	3.37		
F41 Other anxiety disorders			38	9.29

The first column comprises the 7,463 medical consultations during the observation window. The second column is restricted to those 2,448 women whose first-ever visit to Naga occurred within the same period. The ICD-10 diagnostic chapters are arranged in descending order of frequency in the sample of all consultations. Diagnostic chapters with limited occurrences (<3%) are not shown and have been consolidated into a residual category. For each ICD-10 chapter, the table displays the three most frequent diagnoses (2-digit ICD-10 codes).

At first contact, factors influencing health status (14.9%) and acute-respiratory (9.0%) dominated. By the last visit, endocrine, nutritional and metabolic diseases rose from 6.9 to 7.7% of principal diagnoses, while acute-respiratory fell to 7.8%. There is an increase in the incidence of endocrine and circulatory cases. Indeed, 14.6% (218 women) entered with no chronic-chapter code yet received one over time, with no notable differences between those women returning within <30 days and those returning ≥30 days, consistent with early diagnostic consolidation after initial triage rather than true disease progression, although the latter cannot be ruled out. Within this incident-chronic group the most common new conditions were essential hypertension—I10 (nine cases; 4.1% of acquisitions), type 2 diabetes—E11 (four cases; 1.8%), and chronic asthma/bronchitis—J45/J42 (5 cases; 2.3%).

Naga’s records make it possible to trace each patient’s diagnostic trajectory over time. The case of Maria (all patient names are fictitious), a mother of three children—two of whom lived in Italy—illustrates the accumulation of multimorbidity: she was first seen in March 2022 and presented with essential hypertension (I10), later developed acute respiratory infections (J04, J18) and musculoskeletal pain (M79), and ultimately stabilized with chronic bronchitis (J42) alongside recurrent episodes of hypertension—an archetypal trajectory of unmanaged chronic illness marked by periodic exacerbations. Ana and Cecilia provide two examples of emergent chronicity: Ana, progressed from preventive counseling (Z30), to recurrent cystitis (N30) over three consultations, while Cecilia transitioned from a health-status encounter (Z00) to influenza-related pneumonia (J11) and, later, chronic respiratory complaints. A smaller subset (≈4%) displayed sharp diagnostic escalation within two or three visits—for example, one patient shifted from routine assessment (Z03) to otosclerosis-related hearing loss (H80) and then to severe vertigo, suggesting either late presentation or rapid disease progression.

Collectively these patterns underscore three points. First, preventive or administrative visits (ICD-10 chapter XXI) often precede clinically significant diagnoses, highlighting the value of sustained follow-up in primary-care settings that serve patients excluded from routine INHS enrollment. Second, the emergence of endocrine, circulatory, and chronic respiratory conditions during repeated contacts might indicate under-diagnosis at entry and the need for systematic screening of undocumented women. Third, a small but meaningful minority experience abrupt health decline, reinforcing the importance of continuity of care—which remains compromised because patients can access specialist services only through emergency-department referral.

3.4 Regression results

The results of the multivariate logistic regression models (Supplementary Table A1), confirm expected patterns of health stratification by age: older age is strongly associated with a higher likelihood of receiving diagnoses related to chronic and degenerative conditions, such as endocrine, nutritional and metabolic disorders (Chapter IV), circulatory diseases (Chapter IX), and musculoskeletal conditions (Chapter XIII). The odds ratios increase progressively with age, with patients aged 65 and over showing significantly elevated risks—e.g., OR = 6.09 for endocrine diseases, OR = 30.71 for circulatory disorders, both $p < 0.01$. Conversely, older women are significantly less likely to receive diagnoses from Chapter XXI (factors influencing health status), with the odds declining sharply from age 45 and older (OR = 0.21, $p < 0.01$ for ages 45–64; OR = 0.09, $p < 0.01$ for 65+). This suggests a lower probability of presenting for preventive or reproductive care with increasing age. Women aged 45–64 and 65+ are also significantly less likely to be diagnosed with genitourinary

conditions (Chapter XIV) compared to the youngest group, with ORs of 0.58 ($p < 0.01$) and 0.26 ($p < 0.01$), respectively.

The associations with the other controls are barely significant and have no straightforward interpretation. In particular, compared with the reference group, domestic helpers/cleaners show no significant variation in odds for most chapters, the only marginal finding being a slight increase in “Factors influencing health status” (Chapter XXI) with OR = 1.265 (0.962–1.663, $p < 0.1$).

In sum, age is the dominant predictor—especially for cardiovascular and musculoskeletal chapters—while education and profession show selective associations that merit further exploration.

4 Discussion

This study leverages an unusually large clinic-based dataset to describe the sociodemographic and health conditions of undocumented—and otherwise uninsured—immigrant women in Milan between 2022 and early-2025. The records consist of 7,463 outpatient consultations from 3,000 migrant women, of which 2,779 were undocumented.

Three results are salient. First, socioeconomic precarity is widespread: nearly two-thirds of patients had been in Italy for less than 12 months, and almost 55% were unemployed. Despite relatively high educational attainment—over 60% had completed at least upper secondary school—paid employment, when available, was largely limited to informal domestic and cleaning work. Second, morbidity is largely driven by conditions that are either preventable or plausibly linked to precarious living and working conditions. Factors-influencing-health (ICD-10 Chapter XXI) diagnoses—chiefly contraceptive management and routine gynecological examinations—account for roughly 16% of all encounters, underscoring the clinic’s gate-keeping role for women’s reproductive care. Musculoskeletal disorders (Chapter XIII) form the second most common category ($\approx 11\%$), dominated by dorsalgia, likely reflecting physically demanding living and working conditions. Chronic conditions—classified as endocrine, circulatory, and chronic respiratory or genitourinary illnesses—represent roughly one in six consultations, while 14.6% of initially non-chronic patients received a chronic code during follow-up. Diagnostic turnover is high: 63% of returning patients ended with a principal diagnosis in a different ICD-10 chapter than at entry. Multivariate models reveal a predictable pattern of stratification by age, with older women showing significantly higher odds of endocrine, circulatory, and musculoskeletal diagnoses. Yet, we could not identify a clear association with other sociodemographic characteristics. We tried with different model specifications and different outcomes, but sparse cell counts within most diagnostic categories, combined with substantial multicollinearity among the covariates, produced imprecise estimates. Additional factors may also help explain this finding: all women in our sample endure highly stressful living conditions, regardless of their education or employment status, in line with the observation that undocumented status is a social determinant of health (Castañeda, 2009; Gea-Sánchez et al., 2017). Moreover, most mechanisms linking socioeconomic conditions to health outcomes depend on the duration of exposure and unfold gradually over time (Devillanova et al., 2019). In our sample, however, most women

are recent arrivals, and their labor market status is observed only once—at the time of their first visit—limiting our ability to capture longer-term effects. Taken together, the evidence portrays a group that arrives relatively young and healthy yet accumulates health risks in a context of legal and occupational exclusion (Hagose et al., 2023; Lebano et al., 2020; Lenko et al., 2025; Tenorio-Mucha et al., 2024).

Overall, these findings align to evidence underscoring that undocumented migrants often face delayed or interrupted care, and their health conditions tend to reflect chronic stress, poor living conditions, and limited access to preventive services (El Arab et al., 2023; Gondek and Bernardi, 2023; Jackson et al., 2018). In Italy, despite a universal healthcare system, barriers like lack of primary care access and irregular follow-up lead to more emergency care and preventable complications in undocumented patients (Allegri et al., 2022; Listorti et al., 2023; Mipatrini et al., 2017) and worst pregnancy outcomes (Cantarutti, 2024).

The study advances two strands of scholarship. First, it delivers a large quantitative portrait of undocumented women’s health in Italy, combining ICD-10 diagnoses with detailed sociodemographic, speaking to work on socioeconomic determinants of health among undocumented migrants (Devillanova et al., 2024; Hagose et al., 2023; Tenorio-Mucha et al., 2024). Second, by exploiting repeated visits the study adds a temporal dimension largely missing from prior clinic-based investigations on undocumented migrants: even over short follow-up (median ≈ 0.7 months; mean ≈ 2.6 months), new chronic and mental-health diagnoses are recorded, underscoring the need for continuous primary care.

Several caveats apply. The clinic-based design excludes undocumented women who never seek care at Naga; selection may bias prevalence estimates in unknown directions. Baseline socioeconomic data are not updated, preventing analysis of how job changes or housing moves influence health. Longitudinal inference is restricted to diagnostic trajectories because explanatory variables are static, and return visits may over-represent women with unresolved illness. Finally, the single-center setting limits external validity beyond similar welfare contexts.

Findings suggest that extending unconditional registration with a general practitioner to undocumented resident women would shift care from episodic volunteer clinics to continuous primary care, facilitating early management of chronic disease. From a research standpoint, future studies should follow cohorts over time to assess whether labor market trajectories affect health outcomes for migrant women.

Data availability statement

The datasets presented in this article are not readily available due to confidentiality agreements. Requests to access the datasets should be directed to Naga (www.naga.it).

Ethics statement

The studies involving humans were approved by Ethics Committee of Bocconi University (Approval #FA000093). The studies were conducted in accordance with the local legislation

and institutional requirements. The ethics committee/institutional review board waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because informed consent is not required for secondary use of fully anonymized records under Italian law.

Author contributions

CD: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. AS: Conceptualization, Data curation, Methodology, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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