Research paper

Is the use of emergency care appropriate? Comparing native and migrant infants in the Italian NHS☆

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ABSTRACT

We study the differences in utilization patterns of Emergency Room (ER) services by infants – babies between 0-1 years of age – comparing natives and migrants. We use administrative data relative to the Metropolitan area of Milan (Italy), involving more than 45,000 babies and covering the years 2015–2016. The main findings point to a higher propensity to use ER services by migrants, who are also associated with a higher risk of inappropriate admissions. This also holds after controlling for selection effects and excluding trauma episodes. When we explore the potential mechanisms driving these results, we find that linguistic and cultural distance between natives and migrants is a key factor in explaining the higher and inappropriate use of emergency care. Conversely, supply-side factors do not seem to play a relevant role. These findings suggest that integration policies aimed for instance at increasing the language proficiency of immigrants would help improve the appropriate use of emergency care.

1. Introduction

In this paper we explore the use of appropriate care services by infants,[4] looking at the differences between natives and migrants in the Metropolitan area of Milan, a large urban area in Northern Italy characterized by intense migration flows.

Appropriate care is a necessary condition for good health during early childhood; and child health as a valuable form of human capital is crucial for the future of a country, since it affects adult health and productivity beyond its impact on education (Currie, 2020).

Good quality services in the early years have long-lasting effects on health and other outcomes, especially for children from disadvantaged backgrounds (Marmot et al., 2020). Poor health in childhood may be a significant predictor of socioeconomic disparity in adulthood, thus prevention and better, more appropriate, care for newborns and infants with early health problems could significantly improve children's prospects (Currie et al., 2010; Reis, 2014).

The first year of life is crucial for children's development: developmental milestones include taking the first step and smiling for the first time. As emphasized by the CDC, "In the first year, babies learn to focus their vision, reach out, explore, and learn about the things around them. Cognitive, or brain development means the learning process of memory, language, thinking, and reasoning".[5] Unfortunately, as discussed in Marmot et al. (2020), socioeconomic inequalities in children's development are already identifiable in the second year of life. They impact children when entering school and they persist and deepen during school years.

To consider appropriate care, we focus our attention on the use of Emergency Room (ER) services. There is a large and convincing evidence of the inappropriate use of ER services by patients of all ages (OECD, 2017). While appropriate use of ER services concerns life-threatening and urgent cases, use of emergency care is defined as *inappropriate* for patients with minor conditions, that could have been addressed effectively by the family doctor.

Within the Italian healthcare system, pediatricians act as family doctors for children: they are clinical experts who steer their young patients to proper services and act as gatekeepers to specialist services. Especially for very young babies, an ongoing and steady relationship between the child and his/her pediatrician is fundamental to set the ground for a solid knowledge of the child's health and a more efficient prescribing behavior, which in turn leads to proper prevention and better health. In this context, it is clear that the inappropriate use of emergency care by infants, besides the implications recorded in the literature – inefficient allocation of resources, high costs of care, and the risk of congestion of emergency departments –, might be also thought of as a threat to children's health.

Differences in the use of emergency care between native and migrant infants are important as a distinctive feature of inequalities across socioeconomic groups. The existing literature on the disparities in the use of healthcare services between natives and migrants shows that migrant families in the US (i) sometimes forgo critical preventive, diagnostic, and treatment services for their children (Perreira and Ornelas, 2011), (ii) are less likely to access routine care (Ye et al., 2012) and that (iii) non-citizens and their children are less likely to be insured and to have a regular source of care (Pitkin Derose et al., 2009).

Healthcare disparities among immigrants have also been documented in Europe, with considerable variation within and between immigrant groups, as well as across different services (Norredam, 2011; Graetz et al., 2017; Tzogiou et al., 2021). In particular, no meaningful differences have been found in the use of primary care (i.e., family doctors' visits) between migrants and natives, while the former appears more likely to use emergency care and are more often hospitalized compared to natives. Moreover, there is evidence of inequitable use of preventive health services by migrants, as natives are associated with wider use of screening services and specialized care. Similar results are also available for Italy (Devillanova and Frattini, 2016).

The ability of immigrant parents to use appropriate care for their babies might be constrained both by financial and non-financial barriers. As for financial barriers, the literature has identified (i) out-of-pocket costs of services and prescriptions (particularly relevant within the US context), (ii) the lack of paid sick leave, (iii) the inability to leave work to take their children to appointments during standard office hours. Non-financial barriers include (i) unfamiliarity with the healthcare systems, (ii) difficulties in accessing primary care, as well as (iii) difficulties in using a foreign language, which is also crucial for correctly understanding instructions on medication usage by clinicians. A low level of health literacy is also likely to hinder migrant parents' ability to use healthcare services effectively and to act as advocates for their children when receiving care. The importance of both financial and non-financial barriers is also confirmed by surveys among primary care pediatricians in Europe (Carrasco-Sanz et al., 2018).

In this context, migrants might be more likely to shift to less appropriate modes of primary care, resorting to ER services for their children even if inappropriate, with profound consequences both on health outcomes and on the provision of healthcare services. However, little evidence is available on migrants' use of emergency care (Yang and Hwang, 2016; Credé et al., 2018; Tzogiou et al., 2021), and there are even fewer studies focusing on migrant children (Markkula et al., 2018; Ballotari et al., 2013; Grassino et al., 2009). Moreover, contrasting evidence is found across different models of healthcare systems: evidence from the US suggests that migrants are less likely to use preventable emergency care visits compared to natives, mostly explained by limited access to health insurance, anti-immigrant healthcare policies, and fear of deportation (Tarraf et al., 2014; Yang and Hwang, 2016). On the contrary, a recent review of the available literature on the topic in Europe reveals higher utilization rates of emergency care among migrants, which are likely to be driven by barriers to access primary health care (Credé et al., 2018; Trappolini et al., 2020).

Our empirical analysis of the use of emergency care by native and migrant infants is based on a population-based analysis concerning more than 45,000 babies living in the Metropolitan area of Milan, the second-largest Italian city. The final dataset is obtained by linking different administrative archives providing detailed information on emergency and outpatient care access, as well as on patients' and family doctors' characteristics. Our findings show that migrant babies are characterized by a higher probability of using ER services; in addition, they use the service more inappropriately compared to natives. These findings are robust to alternative specifications, sub-samples of the population, as well as to potential selection bias. We also explore different mechanisms that could drive the above results. We find that linguistic and cultural distance between natives and migrants can explain the higher use of ER services and inappropriateness. On the contrary, supply-side factors, like the availability of a healthcare facility with an ER close to their residence, do not seem to play any relevant role.

The paper is linked to at least two strands of literature. First, we contribute to the literature on the differences between native and migrant children in the use of healthcare services. There are several papers on the impact of immigration on health and healthcare access (e.g., Giuntella et al., 2018), but very few papers focus on migrant children. Markkula et al. (2018) review observational studies published between 2006 and 2016 that reported the use of formal health services by migrant children (defined as those aged 0–18 years), including first and second-generation immigrants. The patterns of use of healthcare services of international

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[5] See footnote 4.

migrant children appear to be different from those characterizing native children in most studies. One of the striking differences is related to the use of hospital services and the use of ER services, which are higher for migrant children compared to natives. Several studies appear to indicate delayed care or problems in accessing routine treatments by migrant children, rather than overuse. We contribute to this literature by providing evidence on the use of ER services by infants in a country granting free access to services even to irregular migrants. Somewhat contrary to the literature, we find evidence of a higher use of ER services by migrant babies.

Second, we contribute to the literature on the inappropriate use of ER services. Also in this case, there is a large literature on the inappropriate use of ER services and the impact of primary care visits (e.g., Bradley et al., 2018), but very few papers focus on the differences between migrants and natives. Lippi Bruni et al. (2018) consider appropriate and inappropriate ER admissions for a sample of adult patients in Emilia Romagna – an Italian region bordering Lombardy, where the city of Milan is located – finding that migrants have a significantly higher probability of attending emergency departments, with a large variability according to the area of origin of the migrant. Ballotari et al. (2013) focus on the effect of immigrant status on ER utilization by children under age one. Looking at Emilia Romagna, they find that ER services are accessed more by immigrant children and, to a lesser extent, by children of low-educated Italian mothers. As for migrants, the excess use is mostly due to non-urgent visits and, to a very minor extent, to high acute conditions. Comparable results are also found by Grassino et al. (2009), who analyze access to pediatric ER in ten Italian hospitals. The authors find that most of the approximately 5,000 foreign and Italian patients enrolled in the study are assigned with green (72.5% among foreign and 88% among natives) or white (25% and 10%, respectively) triage codes. From these numbers, it emerges a higher percentage of non-urgent cases among immigrants. The causes of attendance are typically respiratory and gastrointestinal problems, as well as injuries or wounds. Our contribution confirms the excess use of ER services by migrant children, but we also provide fresh evidence on the mechanisms that might explain observed differences. In particular, we explore the role of linguistic and cultural barriers as well as the role of supply-side factors.

The remainder of the paper is structured as follows. Section 2 provides essential background information on the care for children provided by the National Health Service in Italy. Section 3 describes the data, while Section 4 lays down the empirical strategy. Results are presented in Section 5, along with additional findings on the potential mechanisms that might shift the demand for emergency care and different robustness checks. Section 6 concludes.

2. Institutional background

The Italian National Health Service (NHS) is a public (tax-funded) insurance scheme, that provides universal coverage to all Italian citizens, but also to regular as well as irregular migrants, largely free of charge.[6] Coverage is granted especially for maternal care to all pregnant women and all newborns in the execution of the United Nations Convention on the Rights of the Child (UNCRC).

Constitutional rules assign to the central government the definition of framework legislation (including the definition of a set of "Essential Levels of Care" to be granted across the country to guarantee equality in access to services) and financing while leaving to the regional governments the management and the provision of services through their Regional Healthcare Systems. National taxes and, to a minor extent, regional taxes are supplemented by a small share of co-payments for pharmaceuticals, outpatient care, and specialist visits up to a ceiling.

According to national legislation, each individual must choose a General Practitioner (GP, or "family doctor"), who provides primary care visits free of charge, acts as a gatekeeper to higher levels of care, and prescribes pharmaceuticals. Individuals can freely choose and change their GP at any time. Still, the actual assignment to a specific physician is conditional on the area of residence and availability, since each GP can have a maximum of 1500 patients enrolled in her list. In practice, turnover rates are very low and mostly due to changes of residence of the patient or retirement of GPs, rather than of any dissatisfaction (Ministero della Salute, 2010). All children under the age of 6 are required to register with a family doctor, typically a pediatrician; children between 6 and 14 years old can choose between a pediatrician and a family doctor. The choice of the pediatrician for infants has to be made by parents within the first 15 days after birth, as a requirement for the registration with NHS and the regular planning of mandatory check-ups (i.e. *Bilancio di Salute*). Such provisions are also extended to the children of irregular immigrants.

All newborns are offered free of charge several clinical tests for congenital anomalies[7] and a hip ultrasound to detect developmental dysplasia of the hip (DDH), to be taken within the first 45 to 60 days. In this context, a substitution mechanism between regular visits to the pediatrician and the use of emergency care visits might have a significant detrimental effect on children's health, particularly during early childhood. Regular contact with the pediatrician promotes the proper course of mandatory check-ups, to ensure early diagnosis and in-time intervention.[8]

Family doctors' (and pediatricians') practice is open five days a week, preferably Monday to Friday. Opening hours should include morning sessions and afternoon sessions during the week to ease access. When the practice is closed, a Continuity Assistance Service is active from 8 pm to 8 am on the following day during the week and during the weekends.

An alternative to both the family doctor and the Continuity Assistance Service is the emergency care provided by Emergency Departments operating within hospitals. The use of ER services should be limited to really urgent cases, but many patients of all ages resort to these services even when their conditions make their use inappropriate. While inappropriate use of ER services is recognized as a clear source of waste in modern health-care systems (OECD, 2017), it might also have potentially negative implications for

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[6] The relevant legislation for migrants is defined by the D.Lgs. 286/1998, art. 35, and by the Law 40/1998, art. 33.

[7] These include three compulsory tests that need to be taken within the first year of life: the hearing screening test and the visual screening test for hearing and visual impairments, and the heel prick test (or blood spot test) to check for up to nine rare but serious conditions (like cystic fibrosis and metabolic diseases).

[8] Unfortunately, the fact that these clinical exams are offered free of charge and are compulsory does not mean that all infants take them.

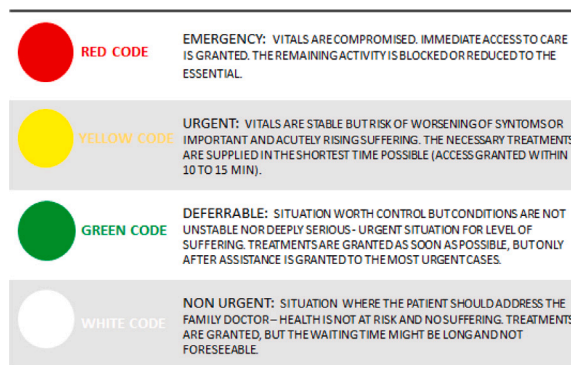| RED CODE | EMERGENCY: VITALS ARE COMPROMISED. IMMEDIATE ACCESS TO CARE IS GRANTED. THE REMAINING ACTIVITY IS BLOCKED OR REDUCED TO THE ESSENTIAL. |
YELLOW CODE	URGENT: VITALS ARE STABLE BUT RISK OF WORSENING OF SYNTOMS OR IMPORTANT AND ACUTELY RISING SUFFERING. THE NECESSARY TREATMENTS ARE SUPPLIED IN THE SHORTEST TIME POSSIBLE (ACCESS GRANTED WITHIN 10 TO 15 MIN).
GREEN CODE	DEFERRABLE: SITUATION WORTH CONTROL BUT CONDITIONS ARE NOT UNSTABLE NOR DEEPLY SERIOUS - URGENT SITUATION FOR LEVEL OF SUFFERING. TREATMENTS ARE GRANTED AS SOON AS POSSIBLE, BUT ONLY AFTER ASSISTANCE IS GRANTED TO THE MOST URGENT CASES.
WHITE CODE	NON URGENT: SITUATION WHERE THE PATIENT SHOULD ADDRESS THE FAMILY DOCTOR – HEALTH IS NOT AT RISK AND NO SUFFERING. TREATMENTS ARE GRANTED, BUT THE WAITING TIME MIGHT BE LONG AND NOT FORESEEABLE.

Fig. 1. Triage color codes. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

individuals' health, especially when it implies a lack of continuous assistance by the pediatrician (which is crucial during the first year of life). The use of emergency care is conditional on triage, which is an evaluation of the severity of a patient's condition to determine the priority of treatments. This assessment is generally performed by a nurse as soon as the patient enters the emergency department of a hospital. Each patient is classified with a "*color code*" reflecting the urgency of needed care. The codes go from "*red*" to "*white*", with red identifying the most urgent cases and white the non-urgent cases (Fig. 1).

Once the patient has been treated, a reassessment of incoming conditions is made, typically by a different staff member like a doctor, and a second triage code is assigned at discharge. According to national guidelines, a 25-euro co-payment applies to non-urgent adult patients who receive ER treatments classified as "white codes", while children under the age of 14 are totally exempted from such payment. Current regional legislation in Lombardy allows all children under the age of 14 to freely access all the services provided by the Regional Healthcare System. Hospital services are free of charge for all, and children under the age of 14 are also exempted from the co-payments related to pharmaceuticals and outpatient visits.

3. Data

We use administrative monthly data over the period January 2015-December 2016 from the Health Information System of the *Agenzia di Tutela della Salute della Città Metropolitana di Milano* (ATS Milano, literally, the Agency for Health Protection of the Metropolitan Area of Milan), that stores information on all inpatient and outpatient services supplied to the entire population of the metropolitan area of Milan. The ATS Milano is a public body within the Regional Healthcare System in Lombardy, the largest Italian region hosting more than 10 million citizens. It was created with the Regional Law n. 23/2015, which reformed the Regional Healthcare System creating 8 new Agencies and 27 new Hospitals, operating within agencies' boundaries. The geographical area managed by the ATS Milano, the largest in Lombardy, includes the city of Milan, the municipalities belonging to the province of Milan, and those belonging to the province of Lodi, for a total of 3.5 million citizens.

We focus on all infants aged 0–11 months, a period when parents often first encounter their babies' illnesses, which may lead to inappropriate use of the ER. Monitoring infants' health during this first year is particularly important. These babies are included in the administrative archive as long as they underwent at least one outpatient treatment within the first year of age within the regional boundaries.[9] We perform a population-based analysis on an unbalanced panel of 45,684 children, for a total of 146,122 observations.

We use a unique anonymous personal identifier to match each infant across different records adding information on ER services, health status, demographic characteristics, and characteristics of the pediatrician. More specifically, from the *Emergency Care Access Record* we draw information on the date and time of admission for each access to ER services, date and time of discharge, triage codes assigned both at arrival and at discharge, diagnosis, and interventions, which we exploit to investigate the appropriateness of ER services use. From the individual-level archive (*Regional Roster*) we extract information on gender, presence of any diagnosed chronic disease (such as cardiovascular diseases, Chronic Obstructive Pulmonary Disease (COPD), diabetes, chronic kidney diseases, cancer, neurological diseases, gastric diseases, immune system or endocrine system diseases), area of residence (zip code), and citizenship (country of birth, used to distinguish migrants from natives[10]), while from the *Outpatients Record* we draw data on the volumes of outpatient treatments. Through the family doctor identifier available in the individual archive, we further match these data with the *Family Doctor Regional Rosters* to include information on the years of practice of the pediatrician and the number of children attending the practice. Unfortunately, as we are not able to link the child to her parents, we do not have additional background information beyond citizenship that might help us understand the choice of using ER services instead of GP visits.

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[9] As long as some tests for newborns are compulsory or highly recommended, we include all children that were actively followed by the Regional Health System.

[10] A child is an Italian citizen if at least one of the parents is Italian (*jus soli* applies only to children of unknown parents, stateless individuals, or foreigners who, according to the laws of their country, cannot transmit their citizenship). Therefore, migrants are only children of two parents with foreign citizenship.

Table 1
Sample descriptive statistics.

	Whole sample		Natives		Migrants	
	Mean	(Sd)	Mean	(Sd)	Mean	(Sd)
Migrant	0.232	(0.422)				
Girl	0.479	(0.5)	0.479	(0.5)	0.477	(0.499)
Area of residence						
City of Milan	0.415		0.391		0.495	
Province of Milan and Lodi	0.585		0.609		0.505	
Presence of chronic conditions	0.047	(0.212)	0.047	(0.211)	0.047	(0.212)
N. outpatient treatments	1.529	(2.818)	1.528	(2.777)	1.533	(2.949)
>2 outpatient treatments per month	0.149	(0.356)	0.147	(0.355)	0.153	(0.36)
N. outpatient treatments per year	4.900	(7.795)	4.858	(7.642)	5.045	(8.299)
Admission to ER	0.16	(0.367)	0.146	(0.353)	0.207	(0.405)
of which[a]						
White code	0.096		0.085		0.121	
Green code	0.817		0.819		0.812	
Yellow code	0.084		0.093		0.065	
Red code	0.0025		0.0029		0.0016	
More than one admission to ER per month	0.020	(0.141)	0.017	(0.131)	0.0299	(0.170)
More than one admission to ER per year	0.135	(0.342)	0.118	(0.323)	0.194	(0.395)
Observations	146,122		112,218		33,904	

[a] Incoming triage codes.

To explore possible mechanisms behind the excess or unnecessary use of ER services by migrants we also rely on external data sources. First, we investigate the role of "linguistic distance", between Italian and foreign languages, as a driver of the inappropriate use of ER services. To do this, we rely on linguistic research by the Automated Similarity Judgment Program (ASJP). The measure of linguistic distance used in the empirical analysis is based on the phonetic dissimilarity between pairs of languages (in our case between Italian and each language spoken in the country of origin of the migrant), and it is built as a continuous indicator (Isphording and Otten, 2014).

Second, using an online tool developed by Muthukrishna et al. (2018)[11] and based on information collected in a large survey of cultural values covering over 80 countries around the world (World Value Survey), we construct a measure of "cultural distance" between each country and Italy.[12] In particular, Muthukrishna et al. (2018) build an indicator of cultural distance using techniques borrowed from population genetics and based on the fixation index (F_{ST}): a measure of population differentiation linked with genetic structures, – i.e., the ratio of the between- and within-group variance of alleles (such as gene variants for blue or brown eyes) at a particular locus (such as the DNA location for the main eye color gene) in the genomes of individuals in two populations (Cavalli-Sforza et al., 1994). The Cultural F_{ST} (CF_{ST}) is calculated in the same manner as F_{ST}, where the World Value Survey is used as a *genome* of cultural traits, with questions treated as loci and answers treated as alleles. In contrast to many other measures of cultural differences, CF_{ST} is a flexible tool that can handle continuous, binary, or categorical traits, compares distributions instead of group means, and allows for heterogeneity in groups.[13]

Third, we rely on additional administrative data from the ATS Milano to analyze the role played by supply-side factors in shifting the demand for ER services. In particular, we identify within each zip code the number of hospitals with an ER and/or with a specialized pediatric ER.

Table 1 reports descriptive statistics. Looking at the whole sample of children, 23% are migrants, 47.9% are girls, and 41.5% live in the city of Milan. Comparing natives and migrants, there are no gender differences, while a larger share of migrants lives in the city compared to natives (about 50% vs 40%). In terms of health conditions and utilization of outpatient services, no meaningful differences can be observed between native and migrant infants. Overall, the average baby takes around 5 outpatient treatments per year (15% of the sample has been prescribed with more than 2 treatments per month) and less than 5% of the sample has been diagnosed with a chronic disease. However, when it comes to the use of emergency care, clear differences emerge between natives and migrants: 14.6% of native children use ER services compared to 20.7% of migrants; just 1.7% (11.8%) of natives access ER more than once per month (year) compared to 3% (19.4%) of migrants; white codes are more common among migrants than among natives.

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[11] Data are freely available at www.culturaldistance.com.

[12] Muthukrishna et al. (2018) use the information on values, beliefs, and behaviors that are considered culturally transmissible, drawn from the two most recent waves of the World Values Survey (2005–2009 and 2010–2014).

[13] Details on the methodology used can be found in Muthukrishna et al. (2018), along with comparisons with other common approaches used to measure cultural distance.

4. Empirical strategy

We analyze differences in the use of ER services between native and migrant infants by considering a simple Linear Probability Model:

$$Y_{it} = \alpha + \beta Migrant_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \tag{1}$$

where Y_{it} is a binary outcome measuring "use" of ER services[14] for each infant i in month-year $t = 1, \ldots, 24$; $Migrant_i$ is a dummy for migrant status, defined according to the citizenship of each baby i; X'_{it} is a vector of individual characteristics including gender, presence of chronic conditions (dummy equal to 1 for babies with at least one flag on chronic diseases) and a binary indicator for intensive use of outpatient services (dummy equal to 1 for babies in the last quartile of the distribution of outpatient treatments). Finally, ψ_z, δ_t and ϕ_j are, respectively, zip code, time (month-year) and family doctor fixed effects, while ϵ_{it} is the error term.[15] Throughout the paper, standard errors are clustered at the individual level.

To better understand the differences between migrants and natives, we also estimate Eq. (1) splitting the dummy $Migrant_i$ into six binary indicators for the five most common countries of origin (that account for 50% of the migrant sample) and a residual category:

$$Y_{it} = \alpha + \sum \beta Country_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \tag{2}$$

After exploring the use of ER services, we focus only on infants using emergency care (those for whom Y_{it} equals 1) to study the "inappropriate use" of ER services. To assess inappropriateness, we rely on triage codes assigned to each infant at the time of admission. We define the binary variable W_{it} equal to 1 for all *white codes* at admission: as *white codes* identify non-urgent cases, ER attendance is considered inappropriate since these cases are better treated with primary care services. The two additional models we estimate are defined as follows:

$$W_{1,it} = \alpha + \beta Migrant_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \tag{3}$$

$$W_{1,it} = \alpha + \sum \beta Country_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \tag{4}$$

We further investigate inappropriateness by exploiting additional information on: (i) the timing of admission, distinguishing between periods during the day and the week when the pediatrician practices are open and periods when they are not; (ii) the triage codes assigned at discharge, to investigate whether there is any systematic difference between triage codes assigned upon admission and discharge by different members of the medical staff; (iii) the length of stay at the ER, to understand if there is any systematic bias between natives and migrants by the medical staff. For all these three cases, we define three new dependent variables (W_2, W_3, and W_4) and re-estimate equations (3) and (4).

One potential threat to the identification of our parameter of interest concerning the inappropriate use of ER services by migrants, (β) in Eqs. (3) and (4), comes from the fact that the outcome is estimated on ER attendees only. If some unobserved children's characteristics drive both the selection process and the inappropriate use of ER services, a selection bias arises as a special case of endogeneity bias. However, it should be noted that in the present framework, the selection process is driven by *parents' decisions*, while inappropriate access to the ER is related to *infants' characteristics*. In other words, differently from other studies in the literature where the inappropriate use of emergency care depends on the patient's (own) characteristics, here the use of ER services is necessarily related to parents' characteristics, which may not be perfectly correlated with their babies health status, thus making the selection bias less severe.

Still, natives' and migrants' parents may systematically differ in their ability to assess the severity of their baby's symptoms, such that the less capable group will be more likely to resort to ER services and get a white code for their children for non-urgent symptoms. To account for the potential bias arising from self-selection on the inappropriate use of ER services, we then also estimate a Heckman Selection Model based on a two-step control function approach:

$$Pr(Y_{it} = 1) = \Phi(\alpha + \beta Migrant_i + X'_{it}\gamma + Z'_{it}\eta + \psi_z + \delta_t + \phi_j) \tag{5a}$$

$$(W_{1,it}|Y_{it} = 1) = \alpha + \beta Migrant_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \tag{5b}$$

where Eq. (5a) is the selection equation and Eq. (5b) is the outcome equation modeling inappropriateness conditional on selection. To achieve identification, we impose exclusion restrictions to the selection Eq. (5a) - i.e., variables in Z that influence the choice of resorting to ER services but have no direct effect on inappropriate use of emergency care. In particular, we consider the share of females[16] and the share of migrant children for each pediatrician, which are likely to influence the demand for emergency care

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[14] Baseline estimates refer to the universe of ER admissions. In alternative specifications we exclude from the data all admissions related to traumatic injuries, to reduce possible noise in the estimation of inappropriate use of emergency care. Results are presented in Section 5.3.

[15] As a robustness check, we also estimate a more parsimonious specification of Eq. (1) – without fixed effects for the family doctor – using a probit model. Results are virtually unchanged.

[16] Descriptive evidence in the medical and epidemiological literature suggests the existence of a "male disadvantage" in infant mortality and health outcomes over the first two years of life (Neubauer et al., 2012), especially regarding respiratory diseases and traumas (Tandoi and Agosti, 2012). In this context, a higher fraction of female patients in the pediatrician's list might result in lower congestion and better care for children.

(through a substitution effect), without any direct effect on the probability of being assigned with a white code for non-urgent cases.[17]

Finally, we also investigate potential mechanisms shifting the demand for emergency care between native and migrant children. First, we explore whether cultural or linguistic barriers negatively influence the relationship between migrant parents and the family doctor, resulting in an increased use of unnecessary emergency care. To this end, we re-estimate Eqs. (1) and (3) substituting the *migrant* dummy with (i) a continuous indicator for the linguistic distance between Italian and the language spoken in the country of origin of each migrant child and (ii) a continuous indicator for the cultural distance between Italy and each country of origin.

Second, focusing on the supply side of the market, we look at whether the presence of healthcare facilities with an emergency department in the area of residence (zip code) might be a pull factor for the demand for emergency care. In practice, we estimate Eqs. (1) and (3) by adding a binary indicator for the presence of an ER (or pediatric ER) in the surroundings.[18] Finally, we discuss the role of pediatricians. Unfortunately, we have access neither to information relative to the practice opening hours nor to the "ability" and the "practicing style" of each pediatrician. Both pieces of information are absorbed in our analysis by family doctors' fixed effects. However, to better understand whether some doctors are less effective than others in steering patients to proper services, thus leading parents to increase the use of (unnecessary) emergency care for their children, we proceed as follows: (i) retrieve family-doctor fixed effects from Eqs. (1) and (3); (ii) set the *efficiency benchmark* at the minimum; (iii) calculate an "inefficiency" score as the distance between each coefficient and the efficiency benchmark; and (iv) re-scale the scores to be in the [0,1] interval (Greene, 2004; Sørensen et al., 2009). We then consider the correlation between these "inefficiency" scores and the share of migrants on each pediatrician's list. The absence of any systematic correlation between the two variables will provide suggestive evidence that pediatricians do not play a significant role in explaining our results.

5. Results

5.1. The use of ER services

In Table 2 we present estimates of the use of ER services, where our main variable of interest is the migrant status in Panel A, substituted by dummies for specific countries in Panel B. The dependent variable is a dummy taking value 1 if the infant has used ER services at least once in period *t*, and 0 otherwise. The baseline specification, in column 1, includes only time-fixed effects, and it is gradually augmented with fixed effects for the family doctor (column 2), zip code (column 3) and with a vector of controls, capturing preexisting chronic conditions and the use of healthcare services (column 4).

In line with evidence from previous studies (e.g., Markkula et al., 2018), the migrant dummy shows a positive and statistically significant coefficient (Panel A), suggesting that migrant infants have a higher probability of using ER services compared to natives. The magnitude of the coefficient is also very similar across the different specifications, with a difference of about 6% between the two groups. When we split the migrant dummy into several dummies for specific countries (Panel B) we find a higher probability of resorting to emergency care for almost all groups of migrant babies (particularly so among Egyptians and Romanians), except for those from the Philippines, who appear to be less likely than natives to use ER services. Such heterogeneity across the countries of origin is likely to reflect differences across cultural traits and languages spoken, which we further investigate in Section 5.4.

As for other variables, we find a negative and statistically significant coefficient associated with the girl dummy, consistent across specifications. This result confirms findings in the medical literature, where boys represent the majority of ER visits and receive more inhalation medication during childhood, while girls increase access during adolescence and receive more diagnostic tests compared to boys (Zachariasse et al., 2020).

Unsurprisingly, the presence of preexisting chronic conditions is a significant predictor of emergency care use, while more than two outpatient treatments within a month are negatively associated with the outcome. There are two possible complementary explanations for this finding: first, closer monitoring of the child by parents might contribute to contain emergency care use; second, a continuous and stable relationship with a pediatrician might result in better care for children, thus reducing the demand for both needed and unnecessary emergency care.

5.2. The inappropriate use of ER services

In Table 3, we focus only on the sub-sample of users and investigate the inappropriate use of ER services by comparing migrants with natives. In column 1, relying on the *color code* assigned during the triage process at the time of admission to the ER, we consider as a dependent variable a binary indicator taking value 1 if the baby is assigned with a *white code* at admission, where white codes represent non-urgent cases that should have addressed the family doctor instead. Results in Panel A show that, compared to natives, migrant infants are more likely to receive a white code, suggesting a higher incidence of inappropriateness in the use of ER services among migrants. Results for the different countries of origin of the migrant sample in Panel B are consistent with those found for the baseline specification using the migrant dummy, showing that most migrant infants are more likely to make inappropriate use of ER services. Interestingly, inappropriateness does not significantly differ from natives when it comes to babies from Peru and Romania, which are the groups with the closest languages to Italian, pointing to linguistic distance as a possible driver of misuse

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[17] In this specification, zip code fixed effects are replaced by dummies for the provinces of Milan and Lodi (the city of Milan being the reference category).
[18] See footnote 17.

Table 2
Probability of using ER services (Linear probability model).

	(1)	(2)	(3)	(4)
Panel A				
Migrant	0.0603***	0.0567***	0.0563***	0.0564***
	(0.0028)	(0.0029)	(0.0029)	(0.0029)
Girl	−0.0152***	−0.0155***	−0.0157***	−0.0158***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Presence of chronic conditions				0.0415***
				(0.0055)
>2 outpatient treatments per month				−0.0392***
(p75)				(0.0026)
Time dummies	✓	✓	✓	✓
Family doctor FE		✓	✓	✓
Zip code FE			✓	✓
R^2	0.0263	0.0358	0.0374	0.0392
N	146,122	146,122	146,122	146,122
Panel B				
Egypt	0.0871***	0.0782***	0.0772***	0.0770***
	(0.0068)	(0.0069)	(0.0069)	(0.0069)
Romania	0.0880***	0.0794***	0.0799***	0.0804***
	(0.0079)	(0.0078)	(0.0077)	(0.0077)
China	0.0509***	0.0547***	0.0535***	0.0543***
	(0.0077)	(0.0078)	(0.0078)	(0.0078)
Philippines	−0.0253***	−0.0210***	−0.0222***	−0.0218***
	(0.0067)	(0.0069)	(0.0069)	(0.0068)
Peru	0.0712***	0.0715***	0.0707***	0.0710***
	(0.0090)	(0.0090)	(0.0090)	(0.0090)
residual_migrant	0.0584***	0.0542***	0.0541***	0.0539***
	(0.0038)	(0.0039)	(0.0039)	(0.0039)
Girl	−0.0151***	−0.0154***	−0.0156***	−0.0157***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Presence of chronic conditions				0.0415***
				(0.0055)
>2 outpatient treatments per month				−0.0392***
				(0.0026)
Time dummies	✓	✓	✓	✓
Family doctor FE		✓	✓	✓
Zip code FE			✓	✓
R^2	0.0277	0.0368	0.0385	0.0403
N	146,122	146,122	146,122	146,122

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses, clustered at the individual level.

of medical care. As for other variables, the girl dummy and the number of outpatient visits do not show statistically significant coefficients, while preexisting chronic conditions reduce the probability of being assigned a white code upon acceptance.

To provide a further characterization of the differential use of ER services by natives and migrants, as discussed in Section 4 we exploit additional information on the exact timing of admission to and discharge from the ER, as well as any observed difference in the evaluation by medical staff between admission and discharge. To explore possible substitution effects between primary care visits and emergency care visits, we consider whether infants have been admitted to the ER during family doctors' practice office hours or at a different time of the day. Accordingly, we define (i) night shifts (from 8 pm to 8 am) on weekdays, (ii) afternoon and night shifts on Saturdays, and (iii) all shifts on Sundays and holidays as "emergency hours". We also analyze whether incoming white codes among migrants are more frequently revised upwards upon discharge,[19] which might reflect communication difficulties at triage. If linguistic and communication barriers exist, one might expect migrant parents to be less effective in explaining their baby's symptoms, so that the initial assessment of the severity of the patient's conditions (which is essentially based on an interview with the parents) might be biased and revised at discharge, according with the physician's evaluation and treatment.

Finally, we examine the length of stay in the ER to explore potential discriminatory attitudes towards migrants. To this end, we re-estimate Eqs. (3) and (4) using alternative dependent variables aimed at shedding additional light on inappropriateness (Table 3). Namely, in column 2, the dependent variable takes value 1 if admission to the ER occurs outside family doctor's office hours (0 otherwise); in column 3, the dependent variable takes value 1 if the white code assigned at the time of admission is revised upward (green, yellow or red code) at discharge (0 otherwise); finally, in column 4, the dependent variable measures the length of stay in the ER, as the difference between the time of discharge and the time of admission (incoming triage code being equal).

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[19] Since we consider monthly data, this specification is estimated on babies that only access the ER once a month (98% of the total sample).

Table 3
Inappropriate use of ER services (Linear probability model).

	White code (1)	Emergency[a] hours (2)	Underestim.[b] severity (3)	Length of stay (4)
Panel A				
Migrant	0.0350***	−0.0255***	0.0042*	−0.0080
	(0.0053)	(0.0079)	(0.0021)	(0.0143)
Girl	−0.0001	0.0118*	0.0006	−0.0066
	(0.0043)	(0.0067)	(0.0017)	(0.0123)
Presence of chronic conditions	−0.0543***	−0.0109	−0.0074***	0.121***
	(0.0075)	(0.0149)	(0.0026)	(0.0289)
>2 outpatient treatments per month	−0.0098	−0.0255**	0.0011	0.0897***
	(0.0063)	(0.0102)	(0.0025)	(0.0190)
Time dummies	✓	✓	✓	✓
Family doctor FE	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓
R^2	0.0632	0.0385	0.0285	0.0898
N	23,431	23,431	20,465	21,992
Panel B				
Egypt	0.0310***	−0.0471***	−0.0001	−0.0188
	(0.0110)	(0.0166)	(0.0037)	(0.0302)
Romania	0.0158	0.0016	0.0040	−0.0261
	(0.0106)	(0.0167)	(0.0048)	(0.0293)
China	0.0993***	−0.0602***	0.0074	−0.00619
	(0.0165)	(0.0216)	(0.0063)	(0.0397)
Philippines	0.0625***	−0.111***	−0.0001	0.0977*
	(0.0239)	(0.0293)	(0.0063)	(0.0559)
Peru	0.0288*	0.0070	0.0090	−0.0214
	(0.0160)	(0.0233)	(0.0065)	(0.0422)
residual_migrant	0.0290***	−0.0184*	0.0045	−0.0067
	(0.0068)	(0.0101)	(0.0028)	(0.0184)
Girl	0.0001	0.0114*	0.0005	−0.00635
	(0.0043)	(0.0067)	(0.0017)	(0.0123)
Presence of chronic conditions	−0.0546***	−0.0097	−0.0073***	0.121***
	(0.0075)	(0.0149)	(0.0026)	(0.0289)
>2 outpatient treatments per month	−0.0097	−0.0254**	0.0011	0.0898***
	(0.0063)	(0.0102)	(0.0025)	(0.0190)
Time dummies	✓	✓	✓	✓
Family doctor FE	✓	✓	✓	✓
Zip code FE	✓	✓	✓	✓
R^2	0.0645	0.0393	0.0286	0.0900
N	23,431	23,431	20,465	21,992

[a] Binary indicator for ER admissions that occurred outside family doctor's office hours, i.e. 8 pm–8 am from Monday to Friday, 2 pm–8 am on Saturday, all Sundays and holidays.

[b] Binary indicator taking value 1 if the number of incoming white codes per child is larger than the number of discharge white codes, in a given month.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses, clustered at the individual level. Each model includes the full set of controls as in Model 4, Table 2.

The correlation between the migrant dummy and admission to the ER outside family doctor's office hours is negative and statistically significant (Panel A, column 2), suggesting that at least part of the positive differential found in inappropriate use of ER services between migrant and native children might be explained by a greater substitution between family doctors' visits and emergency care: migrants are found to be 2.5% less likely to access the ER during emergency hours. This result might be explained by linguistic and communication barriers and/or cultural differences. Linguistic and communication barriers make it harder for migrant parents to understand the proper functioning of the NHS and to identify the available alternatives to get medical care for their babies, thus leading them to resort to hospitals for (unnecessary) emergency care. Communication difficulties or cultural differences might also undermine the relationship between migrant parents and the (generally Italian) pediatrician. This interpretation is reinforced by results reported in Panel B, column 2: dummies for Egypt, China and the Philippines are all negative and statistically significant, while dummies for Peru and Romania are not statistically significant.

Second, we find evidence of an upward revision of white codes assigned to migrant babies at the time of admission. The coefficient on the migrant dummy is positive, albeit small in magnitude, and marginally statistically significant (Panel A, column 3). This finding suggests an underestimation of the severity of initial health conditions of migrant babies (less than 1%). Interestingly, when we substitute the migrant dummy with country dummies (Panel B, column 3), we do not find any evidence of a systematic underestimation for specific migrant communities. Hence, inappropriateness seems not to be driven by discrimination at arrival.

Finally, when we analyze the length of stay in the ER (for any given incoming triage code), we find no evidence of a statistically significant difference between migrants and natives. The migrant dummy in this case is negative but it is not statistically significant

Table 4
Inappropriateness conditional on use of ER services (Heckman selection model, ML).

	Outcome eq.	Selection eq.
Migrant	0.0389***	0.226***
	(0.0056)	(0.0126)
Girl	0.0010	−0.0665***
	(0.0043)	(0.0087)
Presence of chronic conditions	−0.0605***	0.164***
	(0.0074)	(0.0219)
>2 outpatient treatments per month	−0.0085	−0.170***
	(0.0066)	(0.0136)
% Migrants per family doctor		0.189***
		(0.0502)
% Females per family doctor		−0.0273
		(0.118)
Provincial dummies	✓	✓
Time dummies	✓	✓
Family doctor's characteristics[a]	✓	✓
atanh ρ	−0.0389**	
	(0.0163)	
lnσ	−1.135***	
	(0.0136)	
Wald test of indep. ($\rho = 0$)	$\chi^2(1) = 5.70$ p-val $= 0.0170$	
Selected obs.	23,431	
Nonselected obs.	122,691	
N	146,122	

[a] Family doctor's characteristics include years of practice (average is 18 and median 20) and number of patients (average is 1016 and median 1000). Reference category is living in the city of Milan.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses, clustered at the family doctor level.

at the usual confidence levels (Panel A, column 4). Substituting the migrant dummy with country dummies (Panel B, column 4) confirms this result: all the dummies are not statistically significant but for the Philippines (the coefficient is positive and statistically significant at the 10% level).

As an additional exercise, to address the possible endogeneity in the migrant dummy as a source of bias in the inappropriate use of services, we jointly model the selection equation and the outcome equation using a control function approach *à la* Heckman. In this setting, the selection equation models the probability of using ER services as a function of the full set of individual characteristics and pediatrician characteristics (years of practice and number of patients), while in the outcome equation, we estimate the probability of being assigned with a white code at the time of admission, conditional on using ER services.

Results from this exercise are reported in Table 4, along with the Wald test of independence of equations to assess the suitability of the model. Estimates of the selection equation confirm that migrant status is a significant predictor of access to emergency care, along with pre-existing medical conditions, while an intense use of outpatient services is negatively correlated with the utilization of ER services. We also confirm that girls access ER services less than boys during their childhood. The coefficients of the two exclusion restrictions suggest that a higher fraction of migrant patients is associated with an increase in the use of emergency care, while the share of female patients has no statistically significant effect on the probability of using ER services. More importantly, results for the outcome equation confirm the positive relation between migrant status and the inappropriate use of emergency care, even after controlling for sample selection.

Overall, the above evidence suggests that the use of emergency care visits is more frequent among migrant infants as compared to natives and that migrants are also more likely to make inappropriate use of ER services. In terms of the most important migrant communities, Filipinos appear to use less emergency care services, but to use these services more inappropriately. Egyptians, Romanians, Chinese, and Peruvians use emergency care more than natives, but Romanians and Peruvians make a more appropriate use of these services than migrants from other countries.

5.3. Sensitivity analysis

To test the robustness of our main findings, in this section we perform many sensitivity checks, experimenting with several changes related to the model specification, sub-samples of the population, and estimation methods. First, we replicate our analysis by excluding foreign-born infants.[20] One might argue that, if information regarding access to health care and free-of-charge screening tests for newborn babies becomes available to mothers mainly around the due date (or over the last months of pregnancy), the native/migrant differential in the use of (and the inappropriate use of) emergency care for the whole sample of infants might be overestimated. Migrant mothers who gave birth to their child in a different country, lacking the necessary information, might resort

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[20] Since we are considering infants, it is unsurprising that foreign-born babies represent a very small share (less than 1%) of our sample.

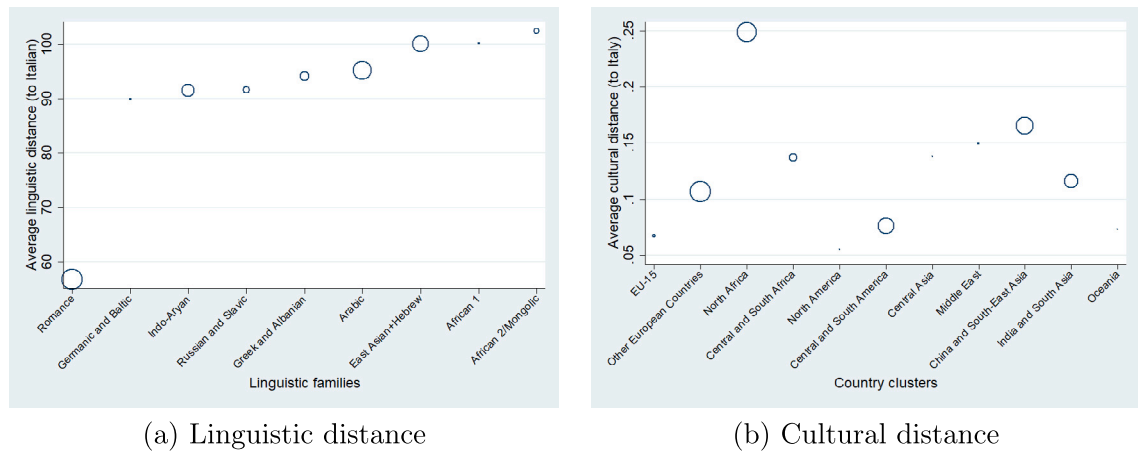(a) Linguistic distance

(b) Cultural distance

Fig. 2. Linguistic and cultural distances between Italy and the migrants' country of origin.

to emergency care for medical services that should be provided by family doctors. However, when we exclude foreign-born children, results are virtually unchanged compared to our baseline estimates, both considering the use of ER services and white codes (columns 1 and 2, Table A.1).

Second, to reduce possible noise in the estimation of inappropriate use of emergency care, we exclude from the sample all admissions related to traumatic injuries. Results from this exercise are consistent with baseline estimates, also in terms of magnitudes, both for the use of emergency care and appropriateness (column 3, Table A.1).

Third, column 4 of Table A.1 presents estimates of Eq. (1) without the inclusion of pediatricians' fixed effects. Also in this case results are largely consistent with our main findings.

5.4. Additional results and mechanisms

In this section, we discuss several mechanisms that might explain the more intense utilization of emergency care by migrants, along with a higher probability of seeking emergency care inappropriately. In particular, we explore cultural and linguistic barriers, as well as supply-side factors.

A thorough understanding of the healthcare system's operations, available opportunities, recommended procedures, and associated costs plays a pivotal role in making informed decisions about appropriate care choices. In the case of migrants, it is reasonable to expect that accessing and processing this information might be more difficult relative to natives (Norredam, 2011). For instance, most migrants are likely to acquire health-related information through familiar, personal, or neighborhood networks, rather than from institutional sources, which might be too problematic to be understood, because of linguistic difficulties (O'Donnell et al., 2008). In addition, cultural differences or parenting styles can drive the choice of inappropriate care: there might be the perception that ER services respond more rapidly than family doctors, and this might be more likely depending on cultural factors that push parents to recognize the hospital as the appropriate place where to seek care (Cobb-Clark et al., 2019).

To explore the role of linguistic barriers and cultural differences, we use (i) the Automated Similarity Judgment Program (ASJP) to build a measure of linguistic distance between Italian and the predominant language spoken in the country of origin (as our register data do not offer information on the mother tongue of the migrant), and (ii) the online tool developed by Muthukrishna et al. (2018) to measure cultural distance.[21]

Panel *(a)* of Fig. 2 shows the average linguistic distance to Italian for each linguistic family that is present in our dataset. The dimension of hollow circles (in both panels) reflects the numerosity of each group. The index varies between 0 and 103.78, 0 being Italian and 103.78 being the linguistic family that is most dissimilar from Italian. Romance languages display on average a value of around 50, while most of the other linguistic families are very far from Italian, with an index between 90 and 103.78. We expect that the ability to correctly process information is easier for migrants whose language is closer to Italian.

As for cultural distance, Panel *(b)* presents average figures for clusters of countries – where the continuous indicator is calculated as the ratio of the between-group variance and total variance –, showing that, compared with Italy, North-African and East-Asian countries are the most dissimilar concerning cultural traits, while American countries are the closest.

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[21] Information on both linguistic and cultural distance is not available for all countries. In particular, data on linguistic distance are available for almost all countries of origin except for North Korea, Timor Est, Taiwan, Afghanistan, Eritrea, and South Sudan, covering 99.7% of observations on migrants, while information on cultural distance is available only for 77% of the migrant sample (we mainly lose most central African countries, Albania - accounting for 7% of the migrant population -, Sri Lanka - 6% of the migrant population - and few south American countries). However, estimates of Eq. (1) on the countries for which information on linguistic and cultural distance is available are virtually unchanged relative to baseline estimates presented in Table 2. Results are available upon request.

Table 5
Role of cultural and linguistic barriers.

	Use of ER services	White code
Linguistic distance	0.0219***	0.0152***
	(0.0012)	(0.0023)
N	146,015	23,413
Cultural distance	0.0216***	0.0128***
	(0.0013)	(0.0022)
N	138,427	21,900

* p < 0.1, ** p < 0.05, *** p < 0.01; robust standard errors in parentheses, clustered at the individual level.
Each model includes the full set of controls as in Model 4, Table 2.

Table 6
Supply factors.

	Use of ER services			White code		
	Whole sample	Natives	Migrants	Whole sample	Natives	Migrants
ER facility	0.004	0.0062*	−0.005	0.016**	0.018**	0.016
	(0.0034)	(0.0036)	(0.0079)	(0.0072)	(0.0081)	(0.0147)
Pediatric ER facility	0.006	0.003	0.012	−0.001	0.004	−0.007
	(0.0041)	(0.0044)	(0.0102)	(0.0092)	(0.0105)	(0.0186)

* p < 0.1, ** p < 0.05, *** p < 0.01; robust standard errors in parentheses, clustered at the individual level.

Table 5 reports estimates of Eqs. (1) and (3) substituting the *migrant* dummy with the two measures of linguistic and cultural distance. In the empirical analysis, to ease interpretation, both indicators have been standardized to have zero mean and unitary variance. Results show that both the probability of using ER services and the probability of being assigned a white code (meaning an inappropriate use of ER services) are positively associated with the presence of either linguistic or cultural barriers. An increase of one standard deviation in the linguistic distance (36 points) or in cultural distance (0.7) results in a 2% higher probability of resorting to emergency care and 1.3–1.5% of being assigned a white code compared to natives.

Next, we turn to supply-side factors. First, we investigate whether proximity to healthcare facilities with an emergency department affects the use of ER services and whether it favors an inappropriate use of these services. Studies investigating the availability of healthcare services have found that proximity may play a significant role in the decision to seek care in a hospital ER or at a GP practice or other primary care providers (Phelps et al., 2000; Alexander et al., 2019). Overall, we do not find any statistically significant effect of having an ER in the same zip code on the probability of using ER services (see Table 6, column 1). Conversely, we do find that proximity to a healthcare facility with an ER increases the probability of being assigned a white code (see column 4), suggesting that, if anything, proximity influences inappropriate use of emergency care. Surprisingly, no statistically significant effect is found in the case of a nearby specialized pediatric ER, probably because they are very rare in the Metropolitan area of Milan (and, more generally, in Italy). However, when we split the sample according to migrant status, we find that supply factors influence natives' choice of resorting to emergency care as well as its inappropriate use, while the presence of an ER in the surroundings does not affect migrants' use of ER services. This evidence suggests that the higher probability of using emergency care by migrants and inappropriateness are not driven by a supply-side factor like the proximity to ER facilities.

Next, we consider the role of pediatricians, specialized family doctors who provide primary care to all children and act as gatekeepers to outpatient services. Accessibility of family doctor's practice (determined by office hours) and their ability and style in managing patients (for instance, whether they are available to visit children at their home), particularly migrants, are also supply-side factors that can have an impact on the choice of referring to pediatric practices or to use emergency care. While we do not have any direct information on practice office hours or doctor's ability and style, we can proxy their relative "efficiency" in assisting patients to get appropriate healthcare services by retrieving the estimated family-doctor fixed effects in Eqs. (1) and (3). In the two exercises, after setting the efficiency benchmark at the lowest value of the family doctor's estimated FE, we compute an "inefficiency" score for each doctor relative to this benchmark and then re-scale these parameters to be in the [0,1] interval.

Fig. 3 plots the inefficiency score against the share of migrants in each family doctor's list. We do not find any systematic correlation between inefficiency and the migrant's share. Results show (i) only a mild positive correlation (0.17, statistically significant) between the share of migrants in the pediatrician's list and the inefficiency score related to access to emergency care (left panel), and (ii) an even milder negative correlation (not statistically significant) when looking at incoming white codes for those children who received ER services (right panel). We interpret these findings as evidence that pediatricians' ability and style play a minor role, if any, in explaining the different patterns in the use of ER services between natives and migrants.

Taken together, our results suggest that the greater use of unnecessary ER services by migrant babies is most likely driven by linguistic barriers or other cultural factors, rather than by supply-side factors.

6. Conclusions

In this paper, we explore differences between natives and migrants in the use of emergency care by infants aged 0 to 11 months, and we discuss the appropriateness of using these services. The importance of appropriate care for babies is emphasized by literature
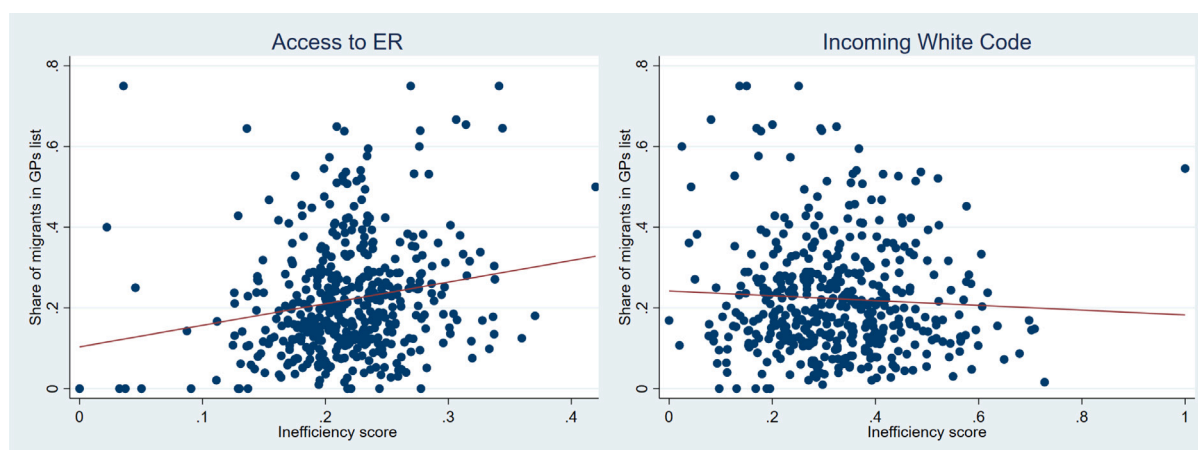
Fig. 3. Analysis of the inefficiency of family doctors.

suggesting that better care for young children is likely to have a large impact on future outcomes when adults (Currie et al., 2010). Unnecessary use of ER services, besides raising overall costs and possibly delaying treatments for patients needing urgent assistance, might translate into worse health prospects for infants, as it hinders an ongoing and solid relationship with the pediatrician. Such detrimental effects on health might be particularly pronounced among migrant infants, as they are more likely to resort to emergency care due to communication and cultural barriers that prevent their parents from the use of more effective healthcare services.

Our empirical analysis is based on a population-based analysis concerning more than 45,000 infants living in the Metropolitan area of Milan. Data are drawn from the Health Information System of the Agency for Health Protection and provide detailed information on emergency and outpatient care access, as well as on patients' and family doctors' characteristics.

We find that migrant infants are characterized by a higher probability of using ER services and that they are more likely to make inappropriate use of ER visits. Results are robust to several sensitivity checks, accounting for foreign-born babies, access to hospital ER for traumatic injuries, and pediatrician characteristics. Findings on inappropriateness are robust to selection bias in the access to emergency care. When we further characterize access to emergency care, we find indirect evidence of a substitution effect between visits to the pediatrician and the use of ER services, which might partly explain the increased unnecessary resort to ER services by migrants. Moreover, migrant babies are more likely to be subject to an upward revision of the incoming white code, suggesting a systematic underestimation of health conditions at admission, which might reflect communication difficulties.

We finally explore potential mechanisms driving these results. We find that linguistic and cultural distance between natives and migrants are the most likely candidates to explain the higher use of ER services and their inappropriate use. When we consider supply-side factors, proximity to healthcare facilities with an ER or a pediatric ER does not play any relevant role. In addition, after estimating the relative inefficiency of family doctors (a proxy for their unobserved ability and style), we do not find any systematic relationship between inefficiency and the share of migrants in each GP's list.

Since our findings are driven by linguistic and cultural barriers, despite being focused on infants, they are likely to extend to children in their first years of life, like toddlers (1–3 years old) and preschoolers (3–5 years old).[22] Early life years are critical for the health of children, and children's development requires appropriate care.

Our results carry important policy implications. In particular, governments should increase efforts towards the integration of migrants, assisting to facilitate the appropriate use of health care services. For instance, helping migrants improve their language skills (e.g., Isphording, 2015) is a policy that would allow a better understanding of doctors' directions and a better knowledge of the available set of services to protect the health of their children. Along the same lines, one can consider the presence of cultural mediators in both primary care and hospital care, together with information on service availability provided in different languages for those migrant families that still have problems in understanding the native language.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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[22] See, again, the classification proposed by the CDC at https://www.cdc.gov/child-development/positive-parenting-tips/index.html.

Table A.1
Robustness checks.

	Baseline	Born IT	Excluding Trauma	No GP FE
Admission to ER				
Migrant	0.0564***	0.0562***	0.0603***	0.0593***
	(0.0029)	(0.0029)	(0.0028)	(0.0028)
Girl	−0.0158***	−0.0156***	−0.0156***	−0.0160***
	(0.0021)	(0.0021)	(0.0020)	(0.0021)
Presence of chronic conditions	0.0415***	0.0414***	0.0433***	0.0406***
	(0.0055)	(0.0056)	(0.0055)	(0.0056)
>2 outpatient treatments per month	−0.0392***	−0.0390***	−0.0313***	−0.0398***
	(0.0026)	(0.0026)	(0.0025)	(0.0026)
Time dummies	✓	✓	✓	✓
Family doctor FE	✓	✓	✓	
Zip code FE	✓	✓	✓	✓
N	146,122	145,921	146,122	146,122
White code				
Migrant	0.035***	0.035***	0.031***	0.036***
	(0.0053)	(0.0053)	(0.0055)	(0.0051)
Girl	−0.0001	−0.0001	0.0010	0.0009
	(0.0043)	(0.0043)	(0.0046)	(0.0043)
Presence of chronic conditions	−0.054***	−0.054***	−0.062***	−0.053***
	(0.0075)	(0.0075)	(0.0076)	(0.0076)
>2 outpatient treatments per month	−0.010	−0.010	−0.014**	−0.0010
	(0.0063)	(0.0063)	(0.0065)	(0.0062)
Time dummies	✓	✓	✓	✓
Family doctor FE	✓	✓	✓	
Zip code FE	✓	✓	✓	✓
N	23,431	23,394	21,556	23,394

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses, clustered at the individual level. Each model includes the full set of controls as in Model 4, Table 2.

Appendix

See Table A.1.

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