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## Children use of emergency care: Differences between natives and migrants in Italy

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Between Natives and Migrants in Italy**

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# Children Use of Emergency Care: Differences Between Natives and Migrants in Italy

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## Abstract<sup>1</sup>

In this paper we study the differences between natives and migrants in the appropriate use of emergency care. We focus on children under one year of age using a sample of more than 45,000 children living in the Metropolitan area of Milan. Consistently with the literature, our findings show that migrants' children are characterized both by a higher probability to use emergency care and by a higher likelihood of an inappropriate use of this service. These findings are robust to the inclusion of additional controls, family doctor's characteristics, as well as potential selection bias. We also explore potential mechanisms driving these results. We find that linguistic and cultural distance between natives and migrants explain the higher use of emergency services and the inappropriate use of these services. Conversely supply side factors do not seem to play any relevant role. These findings suggest that integration policies aimed at increasing language proficiency of immigrants would be helpful in improving the appropriate use of emergency care.

**JEL classification: I10, I14, J15.**

**Keywords: emergency care, children, migrants, inappropriate care.**

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# 1 Introduction

Child health as a valuable form of human capital is crucial for the future of a country. It affects adult health and productivity beyond its impact on education, making it imperative to better understand how it can be improved (Currie, 2020). While a large literature explored the fetal period, establishing clear links with future outcomes, only few papers examined the early childhood period. Poor health in childhood may be a significant source of socioeconomic disparity in adulthood. As a consequence prevention and better care for children with early health problems could significantly improve children's prospects (see Currie et al. (2010) and Reis (2014)).

In this paper we explore how an appropriate use of emergency care (ER), by very young children, can improve the provision of the service and ultimately their health. We focus attention on infants of less than one year of age and on differences between socioeconomic groups. We argue that the appropriate use of emergency care is of fundamental importance for children's health, since parents cannot build long-term relationships with providers when using this type of care. In particular, we investigate differences between natives and migrants as a distinctive feature of inequalities across socioeconomic groups, as extensively reported in the literature investigating access to health-care services. For instance, migrant families in the US sometimes forgo critical preventive, diagnostic and treatment services for their children (Perreira and Ornelas, 2011). Similar results are available for Italy (Devillanova and Frattini, 2016). Both financial and non-financial barriers constrain the ability of immigrant parents to obtain access to appropriate care. As for financial barriers, the literature has identified out-of-pocket costs of services and prescriptions, the lack of paid sick leave, the inability to leave work to take their children to appointments during standard office hours. Non-financial barriers include prominently difficulties in using a foreign language and low levels of health literacy. Language is crucial also to understand instructions on medication usage by clinicians. Health literacy likely limits migrant parents' ability to use services effectively and to act as advocates for their children when receiving care. The importance of both financial and non-financial barriers are confirmed by surveys among primary care pediatricians in Europe (Carrasco-Sanz et al., 2018).

Our empirical analysis on the use of emergency room services is based on a sample of more than 45,000 children living in the Metropolitan area of Milan, the second largest Italian city. The sample 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. Consistently with the literature, our findings show that migrants' children are characterized by a higher probability to use emergency services. We also find evidence of a more inappropriate use of this service by migrant children, all of which suggests that the latter likely have worst care compared to native children.

These findings are robust to alternative specifications, additional controls such as the inclusion of family doctor characteristics, 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 are able to explain the higher use of ER services and the inappropriate use of these services. On the contrary, supply side factors, like the availability of Emergency Department (ED) in hospitals close to the place of 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 health-care services. Markkula et al. (2018) review observational studies published between 2006 and 2016 that reported use of formal health services by migrant children (defined as those aged 0–18 years), including first and second generation migrants. The patterns of use of health services of international 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 access to ER services, which are higher for migrant children with respect to natives. Several studies appear to indicate delayed care or problems in accessing routine treatment by migrant children, rather than overuse. We contribute to this literature by providing evidence on the use of ER services by very young children in a country granting free access to services even to irregular migrants. Somewhat contrary to the literature, we find evidence of inappropriateness in the higher use of ER services by migrants.

Second, we contribute to the literature on the inappropriate use of ER services. Credé et al. (2018) provide a survey of papers comparing migrants and natives' use of ER services in European countries. Our main findings suggest that migrants use emergency care more frequently and differently compared to native population. The higher use for low-acuity conditions and in hours of the day when alternatives are likely available further imply that barriers to primary health-care may be driving the higher use of these emergency services. Lippi Bruni et al. (2018) classify appropriate and inappropriate ED admissions for a sample of patients in Emilia Romagna, an Italian region bordering Lombardy (where the city of Milan is located). They find that migrants have a significantly higher probability of attending ER services, with a large variability according to the area of origin of the migrant. Similar to our work, 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 only slightly to high acute conditions. Our contribution confirms the excess use of ER services by migrant children, but we also provide fresh evidence on linguistic and cultural differences as well as on the role of family doctors and pediatrician in explaining the inappropriate use of emergency care.

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. Baseline results are presented in section 5, along with additional findings on the potential mechanisms that might shift the demand for emergency care and a number of robustness checks. Section 6 concludes.

## 2 Institutional background

The Italian National Health Service (NHS) is a public (tax funded) insurance scheme, which provides universal coverage to all Italian citizens, but also to regular as well as irregular migrants (D.Lgs. 286/98 art. 35, Legge 6 marzo 1998, n. 40, art. 33), largely free of charge. Coverage is guaranteed especially for maternal care to all pregnant women and to all newborns (in 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 and financing (including the definition of the set of Essential Levels of Care to be granted across the country), while leaving to the regional governments the management and the provision of services. National and 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 is assigned to a General Practitioner (or family doctor), who provides primary care free of charge and acts as a gatekeeper to higher levels of care and pharmaceuticals. All children under the age of 6 are required to register with a family doctor, typically a Pediatrician<sup>2</sup>. Such provisions are also extended to the children of irregular immigrants. Family doctors' practice is open five days a week, preferably Monday to Friday. Opening hours should include morning sessions and afternoon sessions during the week. 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 Department operating within hospitals. The use of these services should be limited to really urgent cases, but many patients resort to these services even when their conditions make their use inappropriate. Inappropriate use of ER services is recognized as a clear source of waste in modern health-care systems (OECD, 2017). Use of emergency care is conditional on triage, that is an evaluation

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<sup>2</sup>The choice of the pediatrician 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*).

of the severity of patient’s conditions to determine the priority of treatments, generally assessed by a nurse as soon as the patient enters the ED. Each patient is then classified with a “color code” reflecting the urgency of needed care (Figure 1).

Figure 1 Triage color codes

 <b>RED CODE</b>	EMERGENCY: VITALS ARE COMPROMISED. IMMEDIATE ACCESS TO CARE IS GRANTED. THE REMAINING ACTIVITY IS BLOCKED OR REDUCED TO THE ESSENTIAL.
 <b>YELLOW CODE</b>	URGENT: VITALS ARE STABLE BUT RISK OF WORSENING OF SYMPTOMS OR IMPORTANT AND ACUTELY RISING SUFFERING. THE NECESSARY TREATMENTS ARE SUPPLIED IN THE SHORTEST TIME POSSIBLE (ACCESS GRANTED WITHIN 10 TO 15 MIN).
 <b>GREEN CODE</b>	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.
 <b>WHITE CODE</b>	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.

Once the patient has been treated, a reassessment of incoming conditions is made and a second triage code is assigned at discharge. According to national guidelines, a 25-euro co-payment applies to non urgent adult patients that receive ER treatments classified as “white code”, while children under the age of 14 are exempted from such payment. As a matter of fact, current regional legislation in Lombardy allows all children under the age of 14 to freely access all the services provided by the Regional Health 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. In particular, all newborns are offered free of charge a number of clinical tests for congenital anomalies. These include three compulsory tests that needs 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). Moreover, until recent years, the regional government offered free of charge a hip ultrasound to detect developmental dysplasia of the hip (DDH), to be taken within the first 45 to 60 days.

### 3 Data

We use register 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* (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 geographical area managed by the Agency includes the city of Milan, the municipalities belonging to the province of Milan and those belonging to the province of Lodi.



We focus on the population of children aged 0-11 months. In particular, we consider those that underwent at least one outpatient treatment within the first year of age. As long as some tests for newborns are compulsory, this allows us to include all children that were actively followed by the Regional Health System. Our final sample is an unbalanced panel of 45,684 children, for a total of 146,122 observations.

We use a unique anonymous personal identifier to match each children 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 the ER, 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 attendance. From the individual-level archive (*Regional Roster*) we extract information on gender, presence of any diagnosed chronic disease<sup>3</sup>, area of residence (zip code) and citizenship (exact country) – used to distinguish migrants from natives –, 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 pediatricians’ age, years of practice and number of children attending the practice.

Moreover, we rely on external data sources in order to explore possible mechanisms behind the excess or unnecessary use of ER services by migrants. 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)<sup>4</sup> 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<sup>5</sup>. 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

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<sup>3</sup>These include cardiovascular diseases, Chronic Obstructive Pulmonary Disease (COPD), diabetes, chronic kidney diseases, cancer, neurological diseases, gastric diseases, immune system or endocrine system diseases.

<sup>4</sup>Data are freely available at [www.culturaldistance.com](http://www.culturaldistance.com).

<sup>5</sup>Muthukrishna et al. (2018) use 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).

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<sup>6</sup>.

Third, we rely on additional administrative data from the Agency for Health Protection to analyze the role played by supply side factors in shifting the demand for ER services. In particular, we match for each zip code information on the number of hospitals with an ED and/or with a pediatric ED.

Table 1 Sample descriptive statistics

	<i>Whole sample</i>		<i>Natives</i>		<i>Migrants</i>	
	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 <sup>a</sup>						
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	

<sup>a</sup> Incoming triage codes.

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 differences with respect to gender, while a larger share of migrants live in the city with respect to natives (about 50% vs 40%). In terms of health conditions and utilization of outpatient services, no meaningful differences can be observed between

<sup>6</sup>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.

native and migrant children. Overall, the average child 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 services, clear differences emerge between natives and migrants: 14.6% of native children use ER services with respect to 20.7% of migrants; just 1.7% (11.8%) of natives use ER more than once per month (year) compared to 2.9% (19.4%) of migrants; white and green codes are more common among migrants than among natives.

## 4 Empirical Strategy

We analyze differences in the use of ER services between native and migrant children by means of a Linear Probability Model:

$$Y_{it} = \alpha + \beta \text{Migrant}_i + X'_{it}\gamma + \psi_z + \delta_t + \phi_j + \epsilon_{it} \quad (1)$$

where  $Y_{it}$  is our binary outcome of interest (representing either admission to ER or inappropriate use of ER services<sup>7</sup>) for each child  $i$  in month-year  $t = 1, \dots, 24$ ;  $\text{Migrant}_i$  is a dummy for migrant status, defined according to the citizenship of each child  $i$ ;  $X'_{it}$  is a vector of individual characteristics including gender, presence of chronic conditions (dummy equal to 1 for children with at least one flag on chronic diseases) and a binary indicator for intensive use of outpatient services (dummy equal to 1 for children in the last quartile of the distribution of outpatient treatments). Finally,  $\psi_z$ ,  $\delta_t$  and  $\phi_j$  are, respectively, zip code, time and family doctor fixed effects, while  $\epsilon_{it}$  is the error term<sup>8</sup>. Throughout the paper, standard errors are clustered at the individual level.

To assess the inappropriateness of ER attendance, we rely on triage codes assigned to each child at the time of admission, and use *white codes* to define a binary variable equal to one when ER attendance is considered inappropriate. We further investigate inappropriateness, exploiting additional information on triage codes assigned at discharge<sup>9</sup>, as well as the length of stay at ED.

One potential threat to the identification of our parameter of interest concerning the inappropriate use of ER services by migrants, ( $\beta$ ), comes from the fact that the outcome is estimated only on the sub-sample of ER attenders, which may not be randomly dis-

<sup>7</sup>Baseline estimates refer to the universe of ER admissions. In alternative specifications we exclude from the sample all admissions related with traumatic injuries, to reduce possible noise in the estimation of inappropriate use to emergency care. Results are presented in Section 5.2.

<sup>8</sup>As a robustness check, we also estimate a more parsimonious specification of equation (1) – without fixed effects for family doctor – using a probit model. Results are virtually unchanged.

<sup>9</sup>In particular, we investigate whether there is any systematic differences between triage codes assigned upon admission and discharge

tributed. If some unobserved children’s characteristics both drive the selection process and the inappropriate use of ER services, sample selection bias arises as a special case of endogeneity bias. However, it should be noticed that in the present framework, the selection process is driven by parents’ decision, while inappropriateness in ER access is related to children characteristics. In other words, differently from other studies in the literature in which the inappropriate use of Emergency care is dependant on patient’s own characteristics, here the use the ER services is necessarily related to parents’ characteristics, which may be not perfectly correlated with their children health status, thus making the selection bias less severe. For example natives’ and migrants’ parents may systematically differ in their ability to assess the severity of their child’s symptoms, such that the less capable group will be more likely to resort to ED and get a white code for their children for non urgent symptoms. Still, to account for the potential bias arising from selection, we also estimate a Heckman Selection Model – based on a two-step control function approach – that jointly models the selection equation and the outcome equation.<sup>10</sup>

We also investigate potential mechanisms shifting the demand for emergency care between native and migrant children. First, we investigate whether cultural or linguistic barriers hamper the relationship between migrant parents and the family doctor, resulting in an increased use of unnecessary emergency care. To this end, we re-estimate equation (1) substituting the *migrant* dummy with *i*) a continuous indicator for linguistic distance between Italian and the language spoken in the country of origin of each migrant child and *ii*) a set of country clusters. Second, focusing on the supply side of the market, we investigate the role of pediatricians, building on the idea that some pediatricians might be less effective than others in steering patients to proper services, thus leading parents to increase the use of (unnecessary) emergency care for their children. To measure pediatricians’ efficiency we proceed as follows: *i*) retrieve family-doctor fixed effects from equation (1) (estimated separately for natives and migrants), *ii*) set the *efficiency benchmark* at the minimum, *iii*) calculate the inefficiency parameter as the distance between each coefficient and the efficiency benchmark, *iv*) rescale the parameter to be in the [0,1] interval (Greene, 2004; Sørensen et al., 2009). We then plot the inefficiency score obtained for the migrants’ sample against the same score for natives. Finally, we look at whether the presence of health-care facilities with an ED might be a pull factor for the demand of emergency care. In practice, we condition on the supply of ER services (or pediatric ER) in the area of residence to equation (1), by adding a binary indicator for the presence of an ED <sup>11</sup>.

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<sup>10</sup>See Section 5.2 for further details.

<sup>11</sup>In this specification, zip code fixed effects are replaced by dummies for the province of Milan and Lodi (the city of Milan being the reference category).

## 5 Results

### 5.1 Baseline results

In Table 2 we present estimates of the probability of admission to ER (Equation (1)), where our main variable of interest is the migrant status. The dependent variable is a dummy taking value 1 if the child has been admitted to the ER 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 family doctor (column 2), zip code fixed effects (column 3) and with a vector of variables capturing preexisting chronic conditions (column 4).

In line with evidence from previous studies (Markkula et al., 2018), the migrant dummy shows a positive and statistically significant coefficient, suggesting that migrant children have a higher probability of using ER services compared to natives. The magnitude of the coefficient is also very similar across the different specifications.

Unsurprisingly, the presence of preexisting chronic conditions is a significant predictor of ER visits, 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, a 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. Specification in column 4 will be our preferred one hereafter.

Table 2 Probability of admission to ER (Linear probability model)

	(1)	(2)	(3)	(4)
Migrant	0.0603*** (0.0028)	0.0567*** (0.0029)	0.0563*** (0.0029)	0.0564*** (0.0029)
girl	-0.0152*** (0.0021)	-0.0155*** (0.0021)	-0.0157*** (0.0021)	-0.0158*** (0.0021)
presence of chronic conditions				0.0415*** (0.0055)
> 2 outpatient treatments per month (p75)				-0.0392*** (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

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

In Table 3 we restrict attention to the sub-sample of emergency care users, and investigate the appropriate use of ER services contrasting migrant children with natives. As a proxy of the inappropriateness of ER access, we use the *color code* assigned during the triage process at the time of admission to ER and the length of stay within the ED.

In column 1, we consider as a dependent variable a binary indicator taking value 1 if the child was assigned a *white code* at admission. White codes are non-urgent cases that should have been addressed by the family doctor instead. Results show that, compared to natives, migrant children are more likely to receive a white code, suggesting a higher incidence of inappropriate use of ER services among migrants. The preexistence of chronic conditions shows a negative correlation, thus reducing the probability of being assigned with a white code upon acceptance, while the number of outpatient visits does not play any role in this process.

To further investigate inappropriateness in the use of ER services, 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. In particular, we explore whether children have been admitted to the ER service during family doctors' practice opening hours or in a different time of the day. Accordingly, we define "emergency hours" night shifts (from 8 pm to 8 am) on weekdays, afternoon and night shifts on Saturdays, all shifts on Sundays and holidays. We also consider whether the triage color code upon discharge from the ER shows a more severe evaluation of medical conditions of the patient as compared with admission <sup>12</sup> Finally, we consider the length of stay in ED, since the longer the stay the higher the likelihood that the use of ER services is inappropriate.

In Table 3, we re-estimate equation (1) using alternative dependent variables. Namely, in column 2, the dependent variable takes value 1 if admission to ED occurs outside family doctor's working 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 time of discharge and time of admission (incoming triage code being equal).

The correlation between the migrant dummy and admission to ED outside family doctor's working hours is negative and statistically significant (column 2), suggesting that at least part of the positive differential found in inappropriate use of emergency care between migrant and native children can be explained by a greater substitution between family doctors' visits and emergency care: migrants are found to be 3.5% less likely to access EDs during emergency hours. This substitution effect can be explained by the difficulties that migrants might incur in developing a relationship with the family doctor, such as cultural or communication barriers, or lack of information regarding the different alternatives available to obtain medical care.

We find evidence of a systematic revision upward of white codes assigned to migrant children at the time of admission. The coefficient on the migrant dummy is positive and

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<sup>12</sup>Since we consider monthly data, this specification is estimated on the sub-sample of children that only access ER once a month (98% of the total sample).

statistically significant, albeit small in magnitude (column 3), suggesting an underestimation (less than 1%) of the severity of initial health conditions of migrant children and an inefficient provision of emergency care.

While a higher length of stay in the ED is likely to imply an inappropriate use of ER services, we find no evidence of a statistically significant difference between migrant children and natives (for any given incoming triage code). The migrant dummy in this case is negative but it is not statistically significant at the usual confidence levels.

Table 3 Inappropriate access to ER service (Linear probability model)

	<i>White Code</i> (1)	<i>Emergency<sup>a</sup> Hours</i> (2)	<i>Underestim.<sup>b</sup> severity</i> (3)	<i>Length of stay</i> (4)
Migrant	0.0350*** (0.0053)	-0.0255*** (0.0079)	0.0042* (0.0021)	-0.0080 (0.0143)
girl	-0.0001 (0.0043)	0.0118* (0.0067)	0.0006 (0.0017)	-0.0066 (0.0123)
presence of chronic conditions	-0.0543*** (0.0075)	-0.0109 (0.0149)	-0.0074*** (0.0026)	0.121*** (0.0289)
> 2 outpatient treatments per month	-0.0098 (0.0063)	-0.0255** (0.0102)	0.0011 (0.0025)	0.0897*** (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

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

<sup>b</sup> 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.

Overall, the above evidence suggests that utilization of emergency care is more frequent among migrant children as compared to natives. Migrants are also more likely to make inappropriate use of ER services both resorting to ED when unnecessary, or underestimating the severity of health conditions of their children. Notice that, since the decision to seek care in an ED involves the consideration of many factors, lack or limited information about access and how hospitals or clinical services operate determine an inefficient use of health services. In particular, inappropriate access may affect patient's adherence to the care process, self-management of health and trigger a substitution of specialized and preventive medicine with emergency care. In what follows, we first check the sensitivity of our estimates (see Section 5.2), and second we explore the mechanisms that might explain the above patterns looking at cultural factors and at the inefficiency of pediatricians' practices (see Section 5.3).

## 5.2 Sensitivity analysis

In order to test the robustness of our main findings, in this section we perform a number of sensitivity checks, experimenting several changes with respect to the model specification, sub-samples of the population and estimation methods.

First, we replicate our analysis on the restricted sample of children born in Italy over the period of interest.<sup>13</sup> 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 emergency care for the whole sample of children might be over-estimated. Migrant mothers who gave birth to their child in a different country, lacking the necessary information, might in fact resort to emergency departments for medical services that should be provided by family doctors or on an outpatient basis. When we restrict the sample to exclude foreign-born children, results are virtually unchanged with respect to our baseline estimates (see, column 1 and 2, Table A1).

Second, in order to reduce possible noise in the estimation of inappropriate use to emergency care, we exclude from the sample all admissions related with traumatic injuries. Results from this exercise are consistent with baseline estimates.

Third, column 4 of Table A1 presents estimates of equation (1) without the inclusion of pediatricians' fixed effects. Also in this case, results are largely consistent with our main findings.

Finally, to address possible endogeneity in the migrant dummy emerging from sample selection, 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 attending ER as a function of the full set of individual characteristics and pediatrician characteristics, while in the outcome equation we estimate the probability of being assigned with a white code at the time of admission, conditional on ER admission. In order to achieve identification, we impose exclusion restrictions to the selection equation - i.e., variables that determine selection (the choice of accessing ER) but have no direct effect on inappropriate use of emergency care (being assigned a white code when admitted to the ER). In particular, we compute the share of females<sup>14</sup> and migrant children for each pediatrician, that are likely to influence the demand for emergency care (through a substitution effect), without any direct effect on the probability of being assigned with a white code for non-urgent cases.

Results from this exercise are reported in Table 4, along with the Wald test of inde-

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<sup>13</sup>Foreign-born children represent less than 1% of the sample.

<sup>14</sup>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.



Table 4 Heckman selection model (ML)

	<i>Outcome eq.</i>	<i>Selection eq.</i>
Migrant	0.0389*** (0.0056)	0.226*** (0.0126)
girl	0.0010 (0.0043)	-0.0665*** (0.0087)
Lives outside Milan	-0.0239*** (0.0076)	0.0589*** (0.0145)
Lives in Lodi	-0.100*** (0.0094)	0.318*** (0.0278)
presence of chronic conditions	-0.0605*** (0.0074)	0.164*** (0.0219)
> 2 outpatient visits 1y	-0.0085 (0.0066)	-0.170*** (0.0136)
% Migrants per family doctor		0.189*** (0.0502)
% Females per family doctor		-0.0273 (0.118)
Time dummies	✓	✓
Family doctor's characteristics <sup>a</sup>	✓	✓
atanh $\rho$	-0.0389** (0.0163)	
ln $\sigma$	-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	

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

<sup>a</sup> Family doctor's characteristics include years of practice and number of patients.

pendence 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 preexisting medical conditions and living outside Milan, while an intense use of outpatient services is negatively correlated with utilization of emergency services. The coefficients of the two exclusion restrictions suggests that a higher fraction of migrant patients is associated with increasing resort to ER, while the share of female patients has no statistically meaningful effect on the probability of being admitted to the ER. Results for the outcome equation confirm the positive relation between migrant status and inappropriate use of emergency care, even after controlling for sample selection.

### 5.3 Additional results and mechanisms

<https://it.overleaf.com/project/5ea2b9a088d7f90001f9effb>In this section, we discuss a number of mechanisms that might explain the more intense utilization of emergency care by migrants, along with a higher probability of seeking ER care inappropriately. In particular, using information on the parents' country of birth, we first investigate cultural or linguistic barriers, and second we turn to supply-side factors and consider the role of pediatricians.

Information about the functioning of the health care system, the opportunities it offers, the procedures to follow and the implied costs has a central role in the choice of appropriate care. 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).

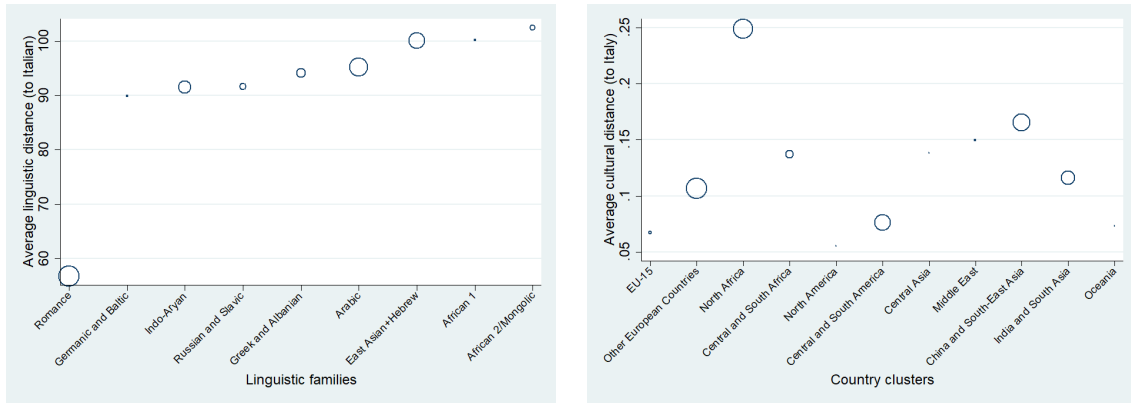
Most of migrants are likely to acquire health-related information through familiar, personal or neighborhood networks, rather than from institutional sources, which might be too problematic to be understood, because of linguistic difficulties (O'Donnell et al., 2008). In addition, cultural differences or parenting style can drive the choice of inappropriate care. For instance, there might be the perception that emergency services respond more rapidly than family doctors; and this might be more likely depending on cultural factors which push toward 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 rely on external databases. In particular, 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 a migrant, and *ii*) the online tool developed by Muthukrishna et al. (2018) to measure cultural distance<sup>15</sup>.

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<sup>15</sup>Information on both linguistic and cultural distance is available only for a subsample of 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 Sud Sudan) and for 99.7% of observations on migrants, while information on cultural distance is available only for 77% of the migrant sample (we

Figure 2 Linguistic and cultural distances between Italy and the migrants country of origin



(a) Linguistic distance

(b) Cultural distance

Panel (a) of Figure 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 numerosity of each group. The index varies between 0 and 100, 0 being Italian and 100 the linguistic family that is most dissimilar from Italian. Romance languages displays on average a value around 50, while most of the other linguistic families included in the sample are very far from Italian, with an index between 90 and 100. We clearly 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 with respect to cultural traits, while American countries are the closest.

Table 5 reports estimates of equation (1) when substituting the dummy *migrant* with each measure 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 being admitted to ER and of being assigned with a white code (i.e. inappropriate use) are positively associated with the presence of linguistic or cultural barriers. An increase of one standard deviation in 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 accessing it inappropriately.

Next, we turn to supply side factors and consider the role of family doctors, who – as previously discussed – provide primary care to all children and act as gatekeepers. Clearly

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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 equation (1) on the restricted sample of countries for which information on linguistic and cultural distance is available are virtually unchanged with respect to baseline estimates presented in Table 2. Results are available upon request.

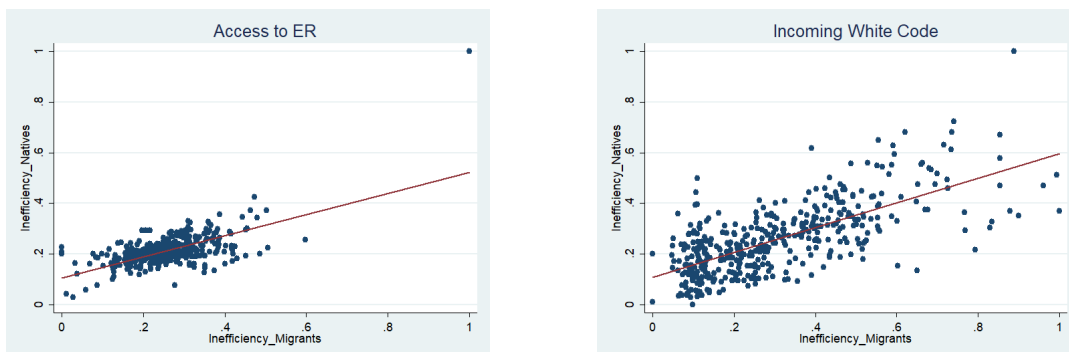
Table 5 Role of cultural and linguistic barriers

	<i>Access to ER</i>	<i>White Code</i>
Linguistic distance	0.0219*** (0.0012)	0.0152*** (0.0023)
N	146,015	23,413
Cultural distance	0.0216*** (0.0013)	0.0128*** (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.

accessibility of family doctor’s practice (i.e. office hours) and their style in managing patients (i.e. whether they are available to visit children at their residence), particularly migrants, are of primary importance in the use of health care services. While we do not have any direct information on practice office hours nor on doctor’s managing style, we can proxy their relative efficiency in assisting patients to get appropriate health care services by retrieving the estimated family-doctor fixed effects in equation (1). In particular, we estimated equation (1) on the sub-samples of natives and migrants, using as outcomes both the access to ER services and its inappropriate use (i.e. dummy for white codes). 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 rescale these parameters to be in the  $[0,1]$  interval. Figure 3 plots the inefficiency score obtained from the migrants’ sub-sample against the same score for natives for each family doctor. In both panels, there is a clear positive relationship, suggesting a large heterogeneity across doctors. Also, the inefficiency score for migrants is generally higher compared with the score of natives, thus indirectly confirming previous results.

Figure 3 Analysis of inefficiency of family doctors



Finally, we investigate whether proximity to hospitals with an ED affects the use of ER services, and whether it favours an inappropriate use of these services. Few studies investigating availability of service have found that proximity may play a significant role

in the decision making process to seek care in an ER or with a GP or other primary care providers (Phelps et al., 2000). Overall, we do not find any statistically significant effect of having an ED in the same zip code on the probability of using the ER service (see Table 6, column 1); while we do find that proximity to a health-care facility with an ED increases the probability of being assigned a white code (see column 2), suggesting that, if anything, proximity influences inappropriate use of ER. Surprisingly, no statistically significant effect is instead found in the case of a nearby pediatric ED, probably because they are very rare.

Table 6 Supply factors

	<i>Admission to ER</i>			<i>White Code</i>		
	Whole sample	Natives	Migrants	Whole sample	Natives	Migrants
ED facility	0.004 (0.0034)	0.0062* (0.0036)	-0.005 (0.0079)	0.016** (0.0072)	0.018** (0.0081)	0.016 (0.0147)
Pediatric ED facility	0.006 (0.0041)	0.003 (0.0044)	0.012 (0.0102)	-0.001 (0.0092)	0.004 (0.0105)	-0.007 (0.0186)

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

However, when we split the sample according to migrant status, we find that supply factors only influence natives' choice of resorting to ER as well as its inappropriate use, while the presence of EDs in the surroundings has no effect on migrants' use of ER services.

Taken together, our results suggest that the greater use of unnecessary ER services by migrant children 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 appropriate use of emergency care by children with less than one year of age. The importance of appropriate care for these children is emphasised by a literature suggesting that better care for young children is likely to have a large impact on future outcomes when adults (Currie et al., 2010). Our empirical analysis is based on a sample of more than 45,000 children living in the Metropolitan area of Milan. The sample provides detailed information on emergency and outpatient care access, as well as on patients' and family doctors' characteristics.

We find that migrants' children are characterized by a higher probability to use ER services, and they are more likely to make an inappropriate use of these services. These results are robust to a number of robustness checks, accounting for foreign-born children,

access to ER for traumatic injuries, and pediatrician characteristics. Findings are also robust to selection bias in the access to the ER service.

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. Supply side factors, like the availability of ED in hospitals close to patients' residence, do not play any relevant role.

Our results have important policy implications, as the inappropriate use of services has been shown to impact on children's health when adults. In order to reduce socioeconomic and health inequalities, governments should increase efforts towards the integration of migrants, both providing assistance to the appropriate use of health care services, as well as helping migrants improve their language skills (e.g., (Isphording, 2015)).

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## 7 Appendix

Table A1 Robustness checks

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





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