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Disparities in access to health care in three French regions

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ABSTRACT

Objectives: This paper compares access to primary and specialty care in three metropolitan regions of France: Ile de France (IDF), Nord-Pas-de-Calais (NPC) and Provence-Alpes-Côte d'Azur (PACA); and identifies the factors that contribute to disparities in access to care within and among these regions.
Methods: To assess access to primary care, we compare variation among residence-based, age-adjusted hospital discharge rates for ambulatory care sensitive conditions (ASC). To assess access on one dimension of specialty care, we compare residence-based, age-adjusted hospital discharge rates for revascularization – bypass surgery and angioplasty – among patients diagnosed with ischemic heart disease (IHD). In addition, for each region we rely on a multilevel generalized linear mixed effect model to identify a range of individual and area-level factors that affect the discharge rates for ASC and revascularization.
Results: In comparison with other large metropolitan regions, in France, access to primary care is greater in Paris and its surrounding region (IDF) than in NPC but worse than in PACA. With regard to revascularization, after controlling for the burden of IHD, use of services is highest in PACA followed by IDF and NPC. In all three regions, disparities in access are much greater for revascularization than for ASC. Residents of low-income areas and those who are treated in public hospitals have poorer access to primary care and revascularizations. In addition, the odds of hospitalization for ASC and revascularization are higher for men. Finally, people who are treated in public hospitals, have poorer access to primary care and revascularization services than those who are admitted for ASC and revascularization services in private hospitals.
Conclusions: Within each region, we find significant income disparities among geographic areas in access to primary care as well as revascularization. Even within a national health insurance system that minimizes the financial barriers to health care and has one of the highest rates of spending on health care in Europe, the challenge of minimizing these disparities remains.

1. Introduction

Comparisons of access to health care in Paris and other world cities suggest that Paris enjoys better access to health

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services and experiences less variation in access to care across geographic areas [1]. It is valuable to compare Paris with other world cities such as New York, London or Hong Kong because a comparison of cities with similar population size, per capita income and health care resources, among nations with radically different health care systems, allows one to explore the influence of national policy on access to health care services at the local level. In contrast, it can be revealing to complement this approach with a comparison of regions of different sizes, local economies and delivery system characteristics within the same country. How does Paris, and its surrounding metropolitan region, Ile de France (IDF), compare to other French regions and what is the extent of disparities within these regions?

We address this question by comparing access to health care in IDF with two other French regions: Nord-Pas-de-Calais (NPC) around Lille and Provence-Alpes-Côte d'Azur (PACA) around Marseille. IDF is the most heavily populated and wealthiest region in France [2]. NPC, located in the north of France, on the Belgian border, is the fourth largest metropolitan region in France and one of the poorest due to its high unemployment rate, its de-industrialized economy, low density of physicians and hospital beds and lowest levels of population health [3]. Provence-Alpes-Côte-d'Azur (PACA) is a culturally and economically diverse region located in the south of France along the Mediterranean Sea. It includes the wealthy cities of Aix-en-Provence, and Nice as well as Marseille, the second largest city in France, which is characterized by striking socioeconomic disparities [4]. In addition, it is characterized by a high density of physicians and hospital beds and high levels of population health.

We find that access to primary care is best in PACA followed by IDF and NPC, but after controlling for the burden of IHD, we find that use of revascularization – our example of specialty care – is greater in PACA than in IDF and NPC. More importantly, within each region, we find significant income disparities among geographic areas in access to primary care as well as revascularization. In all three regions, access to health care appears to be significantly worse among residents of lower-income areas and patients treated in public hospitals. Even within a system that minimizes the financial barriers to health care and has one of the highest rates of spending on health care in Europe, there are significant disparities in access to care among residents of these regions.

2. Measuring access to health care

One conventional approach for measuring health care access is to compare densities of health care professionals. Although it is possible to compare health system "inputs," a purely supply-side approach fails to account for differences in health care needs and other outcomes we may value [5]. A more recent French approach to measuring spatial access attempts to refine this measure of supply by accounting for a population's use of full-time equivalent health care professionals, not only within a given distance of their residence, but also in neighboring localities. Moreover, this method introduces a demand side dimension by adjusting the measure to the age distribution of the population [6]. But even if this approach were to result in proposed standards about appropriate relationships between health care resources and population health needs, we still have insufficient information and agreement about criteria for assessing needs [7].

Population health surveys can be used to provide helpful information about access to and the use of health care services. In the U.S., the Behavioral Risk Factor Surveillance System (BRFSS) is a telephone health survey that tracks health conditions, risk behaviors and access to care (http://www.cdc.gov/brfss/). Many of the questions from this survey have been adapted by local authorities, including Los Angeles and New York City, to provide information at the city level [8,9]. These efforts are rare, however, and there are no local or national surveys that allow us to compare morbidity and access to primary and specialty health care services across or within metropolitan areas in most countries, including France. The French National Health Survey (Enquete décennale santé, EDS) provides information about the use of health services at the national level, but it is carried out once every 10 years and although in specific cases it oversamples selected regions, it does not have sufficient power to disaggregate the results to local levels. Another more in-depth French survey (Enquete santé et protection sociale) combines telephone and face-to-face interviews, but it is carried out on a biennial basis and is also limited to national estimates.

In addition to measures of health care resources and population health surveys, health services and policy researchers often rely on hospital administrative data as indirect measures of access to primary care and as direct measures of residence-based hospital utilization for specific procedures. Our analysis of access to specialty care based on use of revasculariations (angioplasties and coronary artery bypass surgery) grows out of an extensive literature on variations in medical practice [10–12] and invasive treatment of heart disease [13,14]. Our analysis of access to primary care is based on the concept of hospital discharges for so-called "ambulatory-care sensitive conditions" (ASC), which has been less frequently used in France than in the U.S., Australia and the rest of Europe.

The rationale for studying ASC (Table 1) is that if patients have access to timely and effective primary care, it should be possible to avoid most hospitalizations for these conditions by preventing the occurrence of the disease (e.g. bacterial pneumonia) or managing the chronic condition in an outpatient setting (e.g. asthma, arterial hypertension, diabetes, congestive heart failure). High rates of ASC, therefore, are believed to reflect poor access to primary care [15,16].

Weissman et al. [17] reviewed the literature on ASC and selected 12 hospital discharge diagnoses, using a panel of internists, for which variations in hospitalization rates can be attributed to poor access to ambulatory care. Billings et al. [18] and Billings and Weinick [19] identified a more extensive group of principal discharge diagnoses, which they defined as "avoidable," if patients had received timely and effective primary care. One could infer from these studies that disadvantaged populations, or those with poorer coverage, are at greater risk of being hospitalized for ASC because of their higher rates of morbidity. Along with

Table 1
Ambulatory Care Sensitive Conditions (ASC) and ICD-10 Codes[a]

Bacterial pneumonia:	J13; J14; J15; J16.8; J18.0
Congestive heart failure:	I50
Cellulitis	J34.0; K12.2, L02; L03; L88
Asthma	J45
Hypokalemia	E87.6
Immunizable conditions	A35; A36; A37; A80; BO5; B26
Gangrene	I70.2; I73.0; R02
Complications of peptic	
Ulcer disease	K25.0; K25.1; K25.2; K25.4; K25.5; K25.6; K26.0; K26.1; K26.2; K26.4; K26.5; K26.6; K27.0; K27.1; K27.2; K27.4; K27.5; K27.6; K28.0; K28.1; K28.2; K28.4; K28.5; K28.6
Pyelonephritis	N10; N11; N12; N13.6; N15.8; N15.9; N17.2
Diabetes, acute complications	E10.0; E10.1; E11.0; E11.1; E13.0; E13.1; E14.0; E14.1
Ruptured appendix	K35.0; 35.1
Hypertension	I10; I11; I13; I15; I67.4

[a] Translated from ICD-9, [17]. The ICD-10 codes are updated annually. This translation of the Weissman et al. definition of ASC was accurate as of 2010 when this analysis was completed.

differences in the prevalence of chronic diseases, however, studies in the U.S. indicate that patients without health insurance, and therefore poorer access to primary care, have higher rates of ASC than those with insurance [17,20–22]. Moreover, there is evidence of an independent effect of better access to primary care with lower rates of ASC [23,54].

After various adjustments for health status, most studies support the conclusion that although hospital discharges for ASC may reflect morbidity and health seeking behaviors, it remains a good indicator of access to primary care [24]. The Institute of Medicine in the United States, supports the idea that ASC can serve as an indicator of access to the primary health care (Millman, 1993). The Agency for Healthcare Research and Quality currently devotes part of its efforts to tracking access to primary care by examining rates of ASC [25]. Likewise, the Commonwealth Fund [26] which has an abiding interest in comparing the health system in United States to that of «high performing» health systems, monitors ASC as a measure of access across states.

Beyond U.S., studies, there is solid international evidence in support of ASC as a measure of access to timely and effective primary care in Australia [27] and 2006); Brazil [28]; Canada [29], England and Spain [30–32,58,33], Italy [34], Hong Kong [35], New Zealand [36]; and many more countries. In France, research based on ASC is relatively new, but there are signs of emerging interest.[1]

It is, of course, important to recognize the limitations of ASC as an indicator of access to primary care. There exist many diseases for which the use of timely and appropriate primary care could help to avoid any hospitalization (for example, those for which there are effective vaccines). But for the majority of the hospitalizations included in the definition of ASC, access to primary care is only one of several factors. For complex diseases like congestive heart failure, asthma, and diabetes, for example, factors other than access to timely and appropriate primary care may influence the probability of hospitalization. The possibility of multiple morbidities complicates the situation further. Blustein et al. [56], suggest that the prevalence of these conditions is a factor that explains higher rates of ASC among older people.

In the absence of local data on prevalence of ASC, as well as differences in health seeking behaviors, it is difficult to disentangle the relative importance of health system factors influencing access to timely and effective primary care. The extent to which areas with high ASC rates reflect a demand-side factors versus health care system factors cannot be answered by the data we analyze here, but we speculate about these issues in our conclusions and policy recommendations.

3. Data and methods

The hospital administrative data for this study are from the Ministry of Health's Hospital Reporting System (PMSI – Program de Médicalisation des Systèmes d'Information), which centralizes hospital discharge data by diagnosis, procedure, age and residence of patients [37]. The PMSI includes data from all hospitals (public and private) of more than 100 beds, thus possibly excluding a very small number of discharges for ASC in the three regions. We extracted discharge data only for acute (short-term), hospital stays in medicine, surgery and obstetrics/gynecology (MCO) for the population 20 years and over since our definition of ASC is focused on adults and most revascularization is performed on adults. We excluded all hospital discharges for patients who stayed less than 24 hours, but included those for patients who died within this period. The region-level hospital discharge data are for residents of the three regions irrespective of whether they were hospitalized within or outside these regions.

Descriptive statistics: We calculate age-adjusted average annual hospital discharge rates over the period 2004–2008 for each indicator in each region and compare

[1] Vigneron [66] published a map of hospital discharges for ASC in IDF based on a study by Tonnellier [67]; the Regional Health Observatory of Pays de Loire organized a conference on avoidable hospitalizations in November, 2012 (http://www.odisse.fr); and IMS Health commissioned a study by the LEEM [68] comparing ASC in England and France. Also, two recent papers on ASC in IDF (Laborde et. al., 2013) and Pays de Loire (Buyck et. al. 2013) were presented to the Annual Meeting of the Fédération des Observatoires Régionaux de la Santé in Bordeaux (http://www.congres-ors.com/fileadmin/pdf/ORS_pdf/PROGRAMME_congres_2013.pdf).

intra-regional variation across the smallest population area for which residence-based rates are available in the PMSI dataset – an aggregation of communes known as a “PMSI area” whose boundaries and population size are defined by the Technical Agency for Hospital Information [38]. In IDF, there are 503 PMSI areas with 6,943,988 acute hospital discharges, 357,612 ASC discharges, and 104,235 revascularization procedures. In PACA there are 351 PMSI areas with 3,550,151 acute hospital discharges, 182,512 ASC discharges, and 71,270 revascularization procedures. In NPC, there are 386 PMSI areas with 2,867,471 acute hospital discharges, 153,619 ASC discharges and 41,759 discharges revascularization procedures. All PMSI areas are aggregations of local French administrative authorities (*communes* and/or *cantons*) for which the French National Statistical Agency (INSEE) collects population and socio-economic data. Each regional health observatory (ORS) with which we collaborated provided us with tables that defined the local authorities corresponding to each PMSI area in their region.

To calculate the age-adjusted rates, the reference population is Metropolitan France as reported in the 2006 French census (INSEE). For ASC, we use the least extensive definition by Weissman et al. [17], which is also used by Kozak et al. [22] and Papas et al. [39]. Based on a literature search, Purdy et al. [63] have identified a set of 36 potential ASCs. Since the magnitude of all hospital admissions for ASC is driven by congestive heart failure and bacterial pneumonia, for purposes of studying disparities among geographic areas and identifying those with high ASC rates, a parsimonious set of codes is appropriate.

To measure access to specialty care, we examine residence-based age-adjusted rates of revascularization – angioplasty and coronary artery bypass surgery – by PMSI area for the population aged 35 years and over because the prevalence of IHD is low under this age. Since it is possible that geographic differences in rates of revascularization may simply reflect differences in the need for these procedures, we adjust for the burden of disease by calculating the ratio of the age-adjusted rates of revascularization over the age-adjusted rates of hospitalizations for IHD. Although it is impossible to know the true prevalence of heart disease in a population because the disease is asymptomatic, we believe that age-adjusted rates of hospitalizations for IHD serve as a reasonable proxy [40]. We do not assume that each person having a hospital stay for IHD receives a revascularization procedure; nor do we assume that this is the only diagnosis for which this treatment is suitable. Our comparison of the ratios of the age-adjusted revascularization rates to the age-adjusted hospitalization rates for IHD is an effort to adjust regional disparities for the epidemiologic importance of IHD. Examining variations in the ratio of revascularizations to IHD rates allows us to assess disparities in access to this type of specialty care among and within these three regions [13].

Multi-level model for ASC hospitalizations: We present multi-level models for each region, which allows us to estimate an odds ratio for individuals hospitalized with an ASC (our dependent variable). The individual independent variables include age, gender, number of diagnoses, and whether the hospital is public or private. The PMSI area-wide variables include indicators for average household income quartile, density of general practitioners (*omnipraticiens*), population density as a measure of urbanization and level of education quartile based on the rate of population, 15 years and over, having completed the baccalaureate (BAC)+2 years of education.

We used SAS to run generalized linear mixed effect models to predict the probability of hospitalization with ASC among persons 20 years and over. The use of multilevel models is appropriate when, as in this study, variables of various levels (level 1: individual, level 2: PMSI area of residence, for example) are included and errors within each level are correlated. Multilevel models make it possible to account for the non-independence of the error terms and may generate more precise estimates [41].

For all of the multilevel models, the response variable is binary, taking values of 0 or 1. We let Y_{ij} denote the response variable from the *j*th subject in the *i*th PMSI area. The conditional mean of Y_{ij} depends upon fixed and random effects in the following equation: $\mathrm{Log}\{\mathrm{Pr}(Y_{\mathrm{ij}} = 1|b_i)/\mathrm{PR}(Y_{ij} = \eta_i = X_{\mathrm{ij}}\beta + b_i \ (b_i = Z_{i\gamma} + \mu_i)$. In this model, μ_i follows a normal distribution with zero mean and variance σ_2. X_{ij} refers to the individual level predictor variables. Z_i refers to the area level predictor variables.

Multi-level models for revascularization: For all three regions, we also completed generalized linear mixed effect models using SAS to predict the probability of receiving a revascularization among persons 35 years and older with a diagnosis of IHD. The independent individual variables are age, gender, number of diagnoses on the record (as a measure of severity of illness) and hospital ownership status (public or private). The neighborhood variables (at the PMSI area level) include indicators for average income quartile, education quartile (based on the BAC+2 rate for the population 15 years and over), population density and density of cardiologists. We include the variable, “age squared,” in all three models, in addition to continuous age variables, because the probability of revascularization increases between the ages of 35 and 75, but decreases thereafter due to increasing frailty. Since the individual data in the same geographical area can be correlated, we also ran ASC and revascularization models in which we included a dummy variable for each PMSI area.

To supplement our quantitative analysis, in all three regions we discussed our preliminary findings in meetings organized by the regional health observatories (ORS). These meetings were held with a convenience sample of ORS staff, physicians, and representatives of regional health agencies. We also met with representatives of the national health insurance fund (CNAMTS). The goal of all four meetings was to present our indicators and methods and discuss the local factors that may explain variations in ASC and revascularization.

4. Findings

Average age-adjusted rates of ASC hospitalizations are higher in NPC than in IDF and PACA. This probably reflects the lower socio-economic conditions in NPC and worse access to primary care there than in IDF or PACA (Table 2).

Table 2
Average annual hospital discharge rates for ASC among PMSI Areas[a] 2004–2008.

Ile de France (IDF)	10.24
Nord-Pas-de-Calais (NPC)	11.13
Provence-Alpes-Côte d'Azur (PACA)	9.14

[a] Age-adjusted rates per 1000 population 20 years and over.

Factors associated with hospitalization for ASC: The multi-level models for all three regions reveal a small influence for age, number of diagnoses on record, and density of primary care physicians, on ASC (Tables 3–5). The results for population density were modest and inconsistent. The odds of admission for ASC are higher among residents of low-density areas in IDF, but the relationship is reversed in NPC and PACA.

Table 3
Ile de France model for ASC.

Effect	Estimate	Standard deviation	*P* value
Intercept	−5.096	0.041	0
Female	−0.242	0.004	0
Ownership status of hospital	0.476	0.004	0
Age	0.029	0	0
Number of diagnoses	0.06	0.001	0
Lowest quartile income	0.147	0.028	0
Second quartile income	0.055	0.021	0.008
Third quartile income	0.046	0.017	0.005
Lowest quartile population density	0.071	0.026	0.006
Second quartile population density	0.1	0.024	0
Third quartile population density	0.081	0.024	0.001
Highest quartile higher education	−0.072	0.037	0.056
Second quartile higher education	−0.037	0.019	0.051
Third quartile higher education	−0.03	0.024	0.213
Density of general practitioners (omnipraticiens)	0.002	0.013	0.902

Table 4
Nord-Pas-de-Calais model for ASC.

Effect	Estimate	Standard deviation	*P* value
Intercept	−5.394	0.045	0
Female	−0.198	0.005	0
Ownership status of hospital	0.776	0.007	0
Age	0.029	0	0
Number of diagnoses	0.081	0.001	0
Lowest quartile income	0.066	0.024	0.006
Second quartile income	0.07	0.023	0.002
Third quartile income	0.063	0.02	0.002
Lowest quartile population density	−0.036	0.031	0.241
Second quartile population density	−0.047	0.031	0.121
Third quartile population density	−0.031	0.032	0.339
Highest quartile higher education	0.079	0.036	0.028
Second quartile higher education	0.002	0.025	0.943
Third quartile higher education	0.06	0.029	0.035
Density of general practitioners (omnipracticiens)	0.003	0.022	0.88

Table 5
Provence-Alpes-Côte d'Azur model for ASC.

Effect	Estimate	Standard deviation	*P* value
Intercept	−5.361	0.061	0
Female	−0.165	0.005	0
Ownership status of hospital	0.495	0.006	0
Age	0.031	0	0
Number of diagnoses	0.088	0.001	0
Lowest quartile income	0.059	0.03	0.052
Second quartile income	0.027	0.028	0.342
Third quartile income	0.035	0.024	0.15
Lowest quartile population density	−0.07	0.04	0.079
Second quartile population density	−0.059	0.042	0.161
Third quartile population density	−0.02	0.044	0.655
Highest quartile higher education	−0.118	0.032	0
Second quartile higher education	−0.033	0.024	0.177
Third quartile higher education	−0.069	0.028	0.013
Density of general practitioners (omnipracticiens)	0	0.022	0.998

The odds of admission for ASC were higher among residents in lower-income neighborhoods, in all three regions, but the relationship between area income quartile and the odds of admission for ASC was strongest in IDF (Table 3). The relationship between population level education rate and ASC is inconsistent. In IDF and PACA, the odds of admission for ASC are significantly higher among residents of PMSI areas with the lowest percentage of people with a BAC+2 level of education compared with residents of PMSI areas with the highest percentage of people with a BAC+2 level of education. In NPC, however, the relationship between education and ASC is small, but the relationship is reversed and the odds of admission for ASC is lower among people living in areas with lower levels of education than people living in areas with the highest level of education.

In all three areas, there is a strong positive relationship between admission to a public hospital and ASC. Finally, there is a strong relationship between gender and ASC in all three regions. Consistent with previous findings in the literature, the odds of admission for ASC are respectively lower for women than men [17,42].

Comparison of revascularization: In each region, we compared the average age-adjusted revascularization rate and the ratio of this rate to the age-adjusted rate of hospitalization for IHD. After controlling for the burden of IHD, residents of NPC receive fewer revascularizations than residents of IDF or PACA (Table 6). When we compare the maximum and minimum ratios within each region, we find that the variations are larger (one to five) in IDF and PACA than in NPC (one to four).

Factors associated with the use of revascularization: The results for all three multi-level models were similar. As we expected, in all regions, the odds of receiving a revascularization increased with age, but decreased as the number of secondary diagnoses increased. Similarly, in all regions, the odds of receiving a revascularization is lower among people living in areas with a lower population density and lower among people living in areas with the lowest rate of people with a BAC+2 level of education. In all three regions, the odds of receiving a revascularization are significantly lower among women, people who live in lower income neighborhoods and people who receive care in public hospitals (Tables 7–9).

Table 6
Average annual revascularization rates[a] and ratios of revascularization rates over rates of hospitalization for ischemic heart disease (IHD)[a] 2004–2008.

Ile de France	
Revascularization rate	2.99
Ratio: Rev/IHD	0.15
Ratio maximum	0.28
Ratio minimum	0.05
Nord-Pas-de Calais	
Revascularization rate	2.91
Ratio: Rev/IHD	0.11
Ratio maximum	0.19
Ratio minimum	0.05
Provence-Alpes-Côte d'Azur	
Revascularization	3.40
Ratio: Rev/IHD	0.18
Ratio maximum	0.30
Ratio minimum	0.06

[a] Averages are calculated over all PMSI areas by region over the 5-year period, 2004–2008. Rates are age-adjusted and calculated per 1000 population 35 years and over.

5. Limitations

Our study is limited by the use of hospital administrative data and our results may be affected by the reliability and validity of the recording systems. There is always the possibility of bias due to differences in coding practices among professionals working in different hospital medical information departments. However, given the consistency of results with other studies, e.g. gender and age differences in the odds of hospital discharges for ASC, we are confident that such bias is minimal. Also, the list of conditions included in our definition of ASC does not include all conditions that are sensitive to primary care. But as noted in the methods section on descriptive statistics, since the magnitude of all hospital admissions for ASC is driven by congestive heart failure and bacterial pneumonia, in assessing disparities among geographic areas, a parsimonious set of codes is appropriate. In addition, we do not have direct measures of important demand side factors, e.g. disease prevalence, and differences in care seeking behaviors among different groups.

Table 7
Ile de France model for revascularization.

Effect	Estimate	Standard deviation	*P*-value
Intercept	−4.24	0.116	0.000
Female	−0.464	0.009	0.000
Ownership status of hospital	−0.489	0.008	0.000
Age	0.159	0.003	0.000
Number of diagnoses	−0.118	0.001	0.000
Lowest quartile income	−0.139	0.052	0.007
Second quartile income	−0.125	0.038	0.001
Third quartile income	−0.023	0.031	0.449
Lowest quartile population density	−0.035	0.048	0.459
Second quartile population density	0.01	0.044	0.831
Third quartile population density	0.043	0.044	0.326
Highest quartile higher education	0.134	0.068	0.051
Second quartile higher education	0.13	0.035	0.000
Third quartile higher education	0.13	0.045	0.004
Age squared	−0.002	0.000	0.000
Density of cardiologists	0.058	0.085	0.496

Table 8
Nord-Pas-de-Calais model for revascularization.

Effect	Estimate	Standard deviation	*P*-value
Intercept	−3.811	0.154	0.000
Female	−0.354	0.013	0.000
Ownership status of hospital	−0.649	0.011	0.000
Age	0.142	0.005	0.000
Number of diagnoses	−0.107	0.002	0.000
Lowest quartile income	−0.193	0.031	0.000
Second quartile income	−0.188	0.03	0.000
Third quartile income	−0.075	0.027	0.005
Lowest quartile population density	−0.101	0.04	0.011
Second quartile population density	−0.07	0.039	0.069
Third quartile population density	−0.024	0.04	0.543
Highest quartile higher education	0.091	0.047	0.052
Second quartile higher education	0.046	0.033	0.163
Third quartile higher education	0.068	0.038	0.068
Age squared	−0.001	0.000	0.000
Density of cardiologists	0.103	0.165	0.534

Table 9
Provence-Alpes-Côte d'Azur model for revascularization.

Effect	Estimate	Standard deviation	*P*-value
Intercept	−4.252	0.167	0.000
Female	−0.4	0.011	0.000
Ownership status of hospital	−0.908	0.01	0.000
Age	0.16	0.004	0.000
Number of diagnoses	−0.034	0.002	0.000
Lowest quartile income	−0.119	0.058	0.038
Second quartile income	−0.122	0.053	0.021
Third quartile income	−0.073	0.046	0.109
Lowest quartile population density	−0.037	0.078	0.633
Second quartile population density	−0.019	0.081	0.814
Third quartile population density	−0.066	0.084	0.435
Highest quartile higher education	0.133	0.059	0.025
Second quartile higher education	0.068	0.046	0.135
Third quartile higher education	0.028	0.053	0.59
Age squared	−0.002	0.000	0.000

6. Conclusions and policy recommendations

Among the three regions we examine, the rate of ASC was highest in NPC. Based on our discussion with local experts in each of the three regions, there was broad consensus that NPC – one of the poorest regions in France with one of the lowest physician densities – would stand out, in comparison to IDF and PACA, as a region in which a higher proportion of the population would end up in hospitals for exacerbations of conditions that could otherwise be treated by community care general practitioners.

Although the rate of ASC is highest in NPC, area disparities in ASC are highest in IDF as measured by average area household income but not with our educational level indicator (Tables 3–5). This finding highlights the specific "world city" characteristics of Paris and its surrounding metropolitan region (IDF). Although previous research suggests that income-related disparities in access to primary care are less severe in Paris than in other world cities [1], they are much greater in IDF than in PACA and NPC, probably because income disparities among PMSI areas are greatest there as well.

We find that the age-adjusted use of revascularization – both before and after controlling for the burden of IHD, is highest in PACA followed by IDF and NPC (Table 6). Equally important, area-wide variations in the use of revascularization – by gender, PMSI-area household income and ownership status of hospital are consistent and substantial in all three regions. Finally, our linear mixed effects multi-level models suggest that, controlling for a host of individual and area-level variables, including diagnosis of IHD, age, and educational levels, residents of lower-income areas have a lower odds ratio for revascularization.

The findings summarized here reveal some important hospitalization consequences of access barriers to primary care (for ASC) and to specialty care (for revascularizations). However, our data do not allow us to untangle the relative importance of multiple health system characteristics from a host of demand-side considerations in explaining the nature of these barriers. In the case of revascularization, we were able adjust for burden of disease, number of diagnoses and age. In the case of ASC, we were only able to adjust for the latter two factors. But in neither case are we able to assess differences in care-seeking behaviors and qualitative differences in consultations among different socio-economic groups. Moreover, it is not possible for us to assess whether differences in rates of ASC and revascularization are due to differences in the density of physicians, quality of care, access barriers imposed by physicians who charge fees in excess of reimbursed rates, or a host of other patient-related factors [43,44].

Based on a representative survey of Paris and its surrounding three departments – the part of IDF most well-endowed with hospitals and health care professionals – Chauvin and Parizot [59] found that after adjusting for socio-economic status, health care coverage and health status, the density of health care professionals and hospitals had little effect on consultation rates. However, after refining this analysis with respect to women's pap smears, a screening service that most women routinely obtain, they found that 10% of women never had a single one, and 26% of women had not had one over the last two years. Moreover, variation among neighborhoods ranges from 11% to 58%; and those women whose daily activities were concentrated in their neighborhoods of residence were most likely to have the lowest rates of pap smears, independently of their SES and functional limitations [45]. Thus, for certain population segments, it would seem that the density of health care providers does matter.

Despite these findings, other French studies have noted that distance to physicians must not only be conceptualized in terms of geography, especially for the poor. After all, distance also has social, cultural and symbolic dimensions [46]. There may be a tendency to worry less about one's health when one is poor and has to worry about feeding one's children the next day. This may lead people living in lower-income areas to place a lower priority on accessing health services. In addition, they may have less information about health risks and on how to navigate the maze of a complex health care system. Also, as Chauvin [47] has noted, the "psycho-social cost" of seeking health care implies a capacity for facing possibly untoward consequences, projecting into the future, reconsidering lifelong priorities and reorganizing one's work schedule – capabilities that are not equally distributed among different socio-economic groups.

In conversations we organized with physicians and health care experts within each region, a recurring theme for explaining our findings with regard to the importance of area-wide average household income was precisely this tendency of some patients to delay in responding to their own symptoms, as well as in seeking screening services and health care. Another recurring theme was to invoke the presence of immigrants, especially in IDF and PACA. The Aide médicale d'État (AME) is means-tested and finances health care for undocumented immigrants with a serious medical condition that cannot be treated in their country of origin [48]. Since 2002, there have been a series of attempts to restrict access to this program and to make undocumented immigrants pay for a greater share of their health care. In 2010, for example, the French National Assembly adopted amendments to the annual finace law that requires AME beneficiaries to pay a registration fee of 30 euros per adult. Aside from this measure, AME beneficiaries continue to enjoy free access to health care. With the exception of pregnant women, children and people suffering from serious illnesses, undocumented immigrants are required to pay out-of-pocket for a portion of their care ([48], p. 364). There is substantial empirical support from the national health survey (EDS) that foreign immigrants in France have higher levels of perceived "poor health," chronic illness and lower consultation rates to GPs as well as specialists [49]. But it is more complicated to disentangle differences in use rates from differences in morbidity, socio-economic status, cultural and informational barriers, and direct discrimination by society and even by health care providers.

Finally, our finding on differences in rates of ASC and revascularization by hospital ownership status may raise eybrows because it is so strong in comparison to all of our other variables. In all three regions, patients treated in public hospitals are more likely to be hospitalized with an ASC and less likely to receive a revascularization when hospitalized with IHD. To interpret this finding, it is important to note the respective roles of the public and private hospitals in France. Measured in terms of all acute inpatient hospital stays, 64% are in public and private non-profit hospitals (most often affiliated with their public sector counterparts) and 36% in private for-profit hospitals and [50]. The public and private non-profit hospitals account for 74.8% of all medical stays and 43.8% of surgical stays [51]. However, with respect to revascularizations, private for profit hospitals account for more than half of all patient stays [52].

Given these differences, the fact that most ASC admissions are for medical conditions and that revascularization is a surgical condition, the importance of ownership status is less surprising. Add to this some evidence that patients over 80, and even more so, over 90 years old are disproportionately cared for by public hospitals than by private for-profit hospitals [53] and the finding is even less surprising. But perhaps the most important difference, one for which there some evidence, is that case mix, on average, may be more difficult in public and private non-profit hospitals than in private for-profit hospitals [53]. All of this would suggest that patients with the most serious complications of their disease may have a higher probability of hospital admission in public hospitals and to the extent that these patients do not obtain timely and effective primary care management of their ACS conditions, they have higher odds of being hospitalized in public hospitals. As for revascularizations, to the extent that many of these procedures are programmed in advance and that the majority are not the most complex, it is not unreasonable to observe that the odds of having these procedures performed in private for-profit hospitals are higher.

Since we have no data on patient characteristics, beyond age and number of diagnoses, and no information on patient care-seeking patterns before or after their hospitalizations, we can only speculate further on the meaning of these findings. A number of the health care experts with whom we met in each region suggested that many patients treated in public hospitals may be more likely to receive primary care in public hospital outpatient clinics and health centers than in private physicians' offices. When clinics and health centers become crowded, they may be more likely to refer patients to a local public hospital and this may explain the higher odds of ASC admissions among these patients. The experts with whom we met also claimed that these findings are consistent with the general perception that private for-profit hospitals, particularly in PACA, are more aggressive with regard to revascularization. We are unable to investigate either of these claims with our data, but given the stark differences in access, which we have found, particularly for revascularization, it seems important that these questions be explored further.

Health policy discourse in France today is promoting medical homes, renewed attention to population health, health promotion, disease prevention, and perhaps most importantly, the need to develop new strategies to manage chronic diseases so as to limit their flare-ups leading to necessary hospital treatment and manage their symptoms and evolution in more coordinated ways made possible by better information systems, telemedicine, and integrated medical records.

The HPST Law of 2009 created new agencies for each of France's 21 regions, which now consolidate health insurance, public health and hospital regulation functions so as to organize a range of services, including medical homes, for each French region. In this context, our findings that residents of lower-income areas have a higher odds ratio for ASC admissions and a lower odds ratio for revascularization have important policy implications. For whether or not demand-side factors or significant access problems related to health system organization and payment are the significant drivers of these findings, the important question for policy is how to alter the system to take into account the differences we have documented. It is not easy to change people's socio-economic circumstances however noble a long-term goal. In the meantime, it strikes us as important that French policymakers – even within a system of national health insurance (NHI) – pay greater attention as to how the health care system may be altered with eye to reducing the disparities in access documented in this paper.

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