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ORIGINAL ARTICLE

Is the use of emergency departments socially patterned?

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Abstract

Objectives To analyse the association between patients' socioeconomic position (SEP) and the use of emergency departments (EDs).

Methods This population-based study included all visits to ED in 2012 by inhabitants of the French Midi-Pyrénées region, recorded by the Regional Emergency Departments Observatory. We compared ED visit rates and the proportion of non-severe visits according to the patients' SEP as assessed by the European Deprivation Index.

Results We analysed 496,388 visits. The annual ED visit rate increased with deprivation level: 165.9 [95% CI (164.8–166.9)] visits per 1000 inhabitants among the most advantaged group, compared to 321.9 [95% CI (320.3–323.5)] per 1000 among the most disadvantaged. However, the proportion of non-severe visits was about 14% of the visits, and this proportion did not differ according to SEP.

Conclusions Although the study shows a difference of ED visit rates, the probability of a visit being non-severe is not meaningfully different according to SEP. This supports the assumption that ED visit rate variations according to SEP are mainly explained by SEP-related differences in health states rather than SEP-related differences in health behaviours.

Keywords Primary access to care · Social inequalities in health · Emergency department · Administrative database

Introduction

Across the medical literature, research findings describe overcrowding in emergency departments (EDs) in many countries, irrespective of the organisation of national health systems, type of medical protection or care consumption habits (Pines et al. 2011; Jayaprakash et al. 2009). In this debate, the terms "non-urgent ED visits" (Jayaprakash et al. 2009; Gentile et al. 2010; Padgett and Brodsky 1992; Lang et al. 1996) and even "inappropriate use" (Berchet 2015; Lee et al. 1999; Carret et al. 2007) have emerged. These terms are highly questionable and reflect the will to define legitimate versus illegitimate ED visits in a rationalised care context. Questions about the use or purported misuse of EDs are therefore at the heart of a controversial debate about the role of emergency services within a health system. The belief that non-severe visits are more frequent among disadvantaged people is common and founded on several hypotheses like the lack of up-front fees, ease of access, and because psychiatric, forensic or social ED visits are thought to be associated with deprivation. However, data on socioeconomic position are rarely available to explore this assertion, except by indirect measurement such as the type of health coverage in the USA for example. Using a socioeconomic position indicator constructed from the characteristics of patients' residential areas provides a solution for exploring the link between social position and health service use in the absence of more precise

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measurements. Such indicators capture dimensions related to the context in which people live to measure deprivation (Townsend 1987). These indicators therefore permit the use of large and exhaustive administrative databases to better understand the phenomenon, even if they do not contain individual socioeconomic data.

In France, health coverage is theoretically universal, publicly funded and supports all types of primary care use, which can be freely chosen by patients. In comparison to other health care systems, financial barriers to primary care are theoretically relatively weak. In this context, we explore whether disadvantaged people are more likely to use the ED for non-severe visits given that consultations with general practitioners (GP) usually have the same social security coverage as visits to the ED. In one study the socioeconomic characteristics of French patients was described according to the severity of the ED visit showing that non-severe visits were more commonly observed among younger and poorer patients (Lang et al. 1996). However, these findings were published in 1996, and the structuring of French primary care has considerably changed since. Notably, a universal health coverage for the poorest was implemented in 1999, and a 2004 law on health insurance governance led to a reorganisation of primary care coordination by attributing a central gatekeeping role to the GP. Given these changes it is therefore important to see how ED use in France has evolved. The aim of this study was to test the link between socioeconomic position (SEP) and the use of EDs. Firstly, we examined the relationship between SEP and ED visit rates, and secondly, between SEP and the proportion of non-severe visits.

Methods

Data

We examined data from the French Midi-Pyrénées region ED Observatory database, the oldest population-based register of ED visits in France. This Observatory was established in 2001 to exhaustively collect data from "emergency visit summaries", a standardised coded form filled in by each ED. This demographic, diagnostic and procedural data is routinely and exhaustively collected by private and public hospitals (covered in the same way by health insurance). We used emergency visit summaries for all visits made in 2012 to an ED in seven of the eight départements of the Midi-Pyrénées region (Ariège, Aveyron, Gers, Haute-Garonne, Haute-Pyrénées, Tarn and Tarn-et-Garonne). The eighth department was not included because its main hospital refused to participate.

Before the recent restructuring of French regions (2016), the Midi-Pyrénées region was the largest in France. It was populated by almost 3 million inhabitants, with 1.3 million living in the Toulouse metropolis and its urban area (the fourth largest in France). The rest of the region was predominantly rural (see maps in Web-only supplementary data). The organisation of health insurance and health services is centralized at the national level, so the region can be considered as representative of the French system overall.

On the basis of the patients' addresses, provided by each hospital specifically for this study, we identified the corresponding IRIS (Îlots Regroupés pour l'Information Statistique), i.e. the smallest geographical unit available in France for statistical information (about 2000 inhabitants). Data on socioeconomic position (SEP) and the type of residential area (rural or urban) are available at the IRIS level. For calculating rates, we also used the 2012 regional census data.

The database was exhaustive regarding the number of visits but contained missing data for several characteristics. We present the results from imputed data obtained by multivariate sequential imputation using chained equations (Marchenko 2011). We first imputed missing data for SEP and rural/urban residence, by age, sex and visited hospital. We then imputed data for the severity, the reason for visit and the outcome using age, sex, type of institution, duration of visit, time of visits, SEP and the place of residence. Data about transport contained too much missing data ($> 20\%$) to be imputed.

Study population

We included all visits to an ED by the inhabitants of each of the seven included département between January 1, 2012 and December 31, 2012. We limited our analysis to inhabitants aged 15 and over, because of the differences in ED use patterns between adult and paediatric populations.

Measures

In this study, we referred to the concept of multidimensional and relative deprivation defined by Townsend (1987). An ecological indicator (Pornet et al. 2012) was used as an individual-level proxy to measure SEP. This indicator, the European Deprivation Index (EDI), uses data at the IRIS level to identify the proportion of single-parent households, households with more than six persons, overcrowded homes, homes with no access to central or electric heating, non-homeowners, people with no access to a car, unemployment, people with no higher education, unskilled or farm workers, and people with a foreign nationality (Guillaume et al. 2015; Pornet et al. 2012). These

dimensions were chosen as they were declared to be basic needs for everyday living by a representative sample of the French population (Pornet et al. 2012). The final score divided into quintiles ranges from EDI 0 (very advantaged) to EDI 4 (very disadvantaged), each group corresponding to one-fifth of the French population. The EDI was calculated for each IRIS using census data; therefore, the patients' SEP was measured by the EDI of their residential IRIS.

The concept of visit severity is complex and does not have a single definition (Durand et al. 2011). In our study, a non-severe visit was defined as "a visit requiring no diagnostic or therapeutic procedures and made by a patient with a stable status". This corresponds to level 1 of the "Clinical Classification of Emergencies" (CCE, known as "CCMU" in France), a validated score used in France to evaluated the severity of visits to the ED (Fig. 1) (Fourestié et al. 1994). To provide sensitivity analyses, we also examined alternative definitions corresponding to "a visit made by a patient with stable status, i.e. non-severe or intermediate visits" (level 1 and 2 of CCE) and to "a visit which did not end with a hospital admission".

Statistical analysis

First, we compared ED visit rates by SEP. These rates are expressed in "annual number of ED visits per 1000 inhabitants". We defined the reference populations as the 2012 regional population aged at least 15 years within each socioeconomic group. To take into account age-and-sex structure differences between the groups, we performed a direct standardisation. We weighted the visit rates of each age and sex according to the age-and-sex structure of the WHO standard population (Ahmad et al. 2001). To take into account the use pattern differences between rural and urban populations, we also stratified our analyses, using the French National Statistical Institute (INSEE) categories: "Rural municipality", "Municipality belonging to an urban unit with less than 20,000 inhabitants", "Municipality belonging to an urban unit with 20,000–200,000 inhabitants", "Municipality belonging to an urban unit with more than 200,000 inhabitants".

We calculated the relative risk between the groups using the most advantaged group as the reference population. We also used the "proportion of visits which would not occur if all the population had the same probability of visit as the most advantaged group", corresponding to $[((Tx_i - Tx_{\text{ref}})/1000) \times N_i]/n_{\text{tot}}$, with Tx_i, the ED rate of group i, Tx_{ref}, the rate of the reference group, N_i, the number of inhabitants of group i and n_{tot}, the total number of visits. In order to describe the characteristics of additional visits, we calculated the differences in rates for each category of each variable, taking the most advantaged group as our reference.

In the second step of this work, we studied the link between SEP and the proportion of non-severe visits adjusted for age and sex, with logistic regressions. We compared the probability of a visit being considered as "not severe" (CCE-1), then the probability of a visit being considered as "not severe or intermediate" (CCE-1 or 2), and then the probability of not being admitted. We present the marginal effects with their confidence intervals, i.e. the average predicted probabilities for each co-variate. To take account of the difference of use pattern between a rural and urban population, we also presented stratified analysis.

Because of the large size of the sample, we did not use statistical tests, but compare the 95% confidence intervals to assess statistical significance. Statistical analyses were performed with STATA software version 14 (StataCorp LP, College Station, TX, USA) and with R release 3.3.2 for the rates calculation. The maps were made with QGIS release 2.18.6 (Web-only supplementary data).

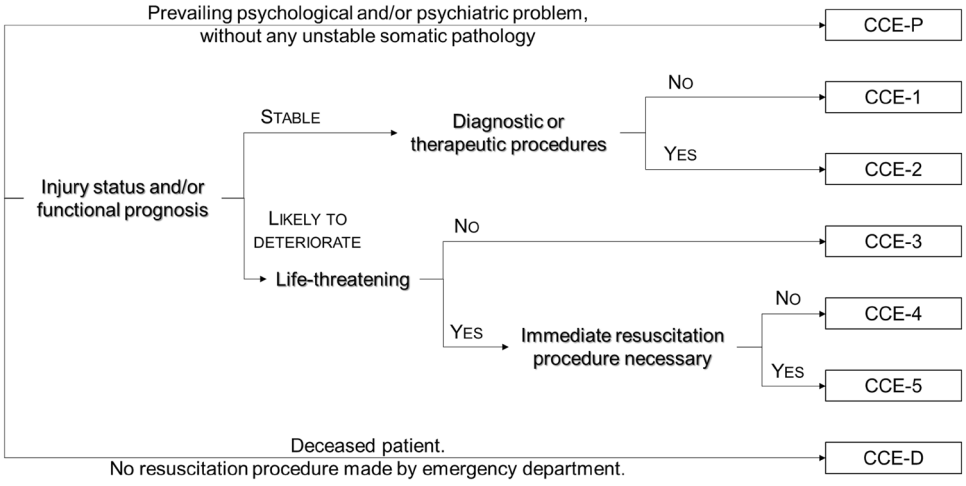

Fig. 1 Clinical classification of emergencies, France, 2012

With : CCE = Clinical Classification of Emergencies; P = psychiatric; 1-6 = severity levels; D=death

Results

Description of the population

The study dealt with 496,388 visits to EDs. The main characteristics of the study populations are described in Table 1. In the Midi-Pyrénées population, there were fewer very disadvantaged (14.9%) people in our sample than in the French population in general, for which the socioeconomic groups theoretically correspond to quintiles. This means that this population is less disadvantaged than the national mean.

ED visit rates according to socioeconomic position

The annual ED visit rate increased with increasing level of deprivation (Tables 2 and 3). Indeed, the ED visit rate

Table 1 Population characteristics (adults of at least 15 years old), France, 2012

	ED visits					Midi-Pyrénées population		
	Complete		Imputed					
	N	*n*	%	*n*	%	*N*	*n*	%
SE position	406,728					2282,777		
Very advantaged		63,304	15.6	78,304	15.8		472,061	20.7
Advantaged		72,130	17.7	89,777	18.1		434,856	19.0
Intermediate		87,488	21.5	104,955	21.1		513,731	22.5
Disadvantaged		93,923	23.1	113,686	22.9		521,435	22.8
Very disadvantaged		89,883	22.1	109,666	22.1		340,694	14.9
Place of residence	405,268					2282,777		
Rural municipality		110,139	27.2	134,644	27.1		699,504	30.6
Urban unit − 20,000		93,330	23.0	110,349	22.2		370,929	16.2
Urban unit 20,000–200,000		92,261	22.8	123,639	24.9		456,296	20.0
Urban unit + 200,000		109,538	27.0	127,756	25.7		756,048	33.1
Sex	496,388					2282,777		
Female		237,728	47.9	–	–		1099,711	48.2
Male		258,660	52.1	–	–		1183,067	51.8
Age (years)	496,388					2282,777		
15–29		136,492	27.5	–	–		486,920	21.3
30–44		104,965	21.2	–	–		532,926	23.3
45–59		89,188	18.0	–	–		555,979	24.4
60–74		64,938	13.1	–	–		418,780	18.3
Over 75		100,805	20.3	–	–		288,172	12.6
Severity	407,538							
Not severe		56,640	13.9	69,499	14.0	–	–	–
Intermediate		255,484	62.7	310,616	62.6	–	–	–
Severe		82,768	20.3	100,319	20.2	–	–	–
Very severe or death		8376	2.1	10,032	2.0	–	–	–
Only psychiatric		4270	1.1	5922	1.2	–	–	–
Outcome	465,545							
Home return		335,896	72.2	359,078	72.3	–	–	–
Admission		129,649	27.9	137,310	27.7	–	–	–
Reason	417,508							
Medico-surgical		222,858	53.4	266,187	53.6	–	–	–
Traumatic		148,576	35.6	176,540	35.6	–	–	–
Psychiatric		13,851	3.3	15,920	3.2	–	–	–
Poisoning		10,369	2.5	11,764	2.4	–	–	–
Other		21,854	5.2	25,977	5.2	–	–	–

ED emergency department, *N* total frequencies, *n* frequencies, % relative frequencies

Table 2 Population characteristics by socioeconomic position, France, 2012

	Very advantaged		Advantaged		Intermediate		Disadvantaged		Very disadvantaged	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Visits (ORU-MiP database)										
Place of residence										
Rural municipality	27,501	35.1	33,210	37.0	40,027	38.1	27,910	24.6	5996	5.5
Urban unit − 20,000	8534	10.9	18,945	21.1	22,182	21.1	31,570	27.8	29,118	26.6
Urban unit 20,000–200,000	13,620	17.4	19,020	21.2	23,217	22.1	24,296	21.4	43,486	39.7
Urban unit + 200,000	28,649	36.6	18,602	20.7	19,529	18.6	29,910	26.3	31,066	28.3
Sex										
Female	36,305	46.4	42,279	47.1	50,254	47.9	55,666	49.0	53,224	48.5
Male	41,999	56.6	47,498	52.9	54,701	52.1	58,020	51.0	56,442	51.5
Age (years)										
15–29	20,394	26.0	22,966	25.6	27,721	26.4	31,989	28.1	33,422	30.5
30–44	17,125	21.9	19,046	21.2	21,237	20.2	22,988	20.2	24,569	22.4
45–59	15,846	20.2	16,940	18.9	18,184	17.3	19,148	16.8	19,070	17.4
60–74	11,494	14.7	12,471	13.9	14,251	13.6	14,153	12.5	12,569	11.5
Over 75	13,445	17.2	18,354	20.4	23,562	22.5	25,408	22.4	20,036	18.3
Severity										
Not severe	11,025	14.1	12,316	13.7	14,200	13.5	15,218	13.4	16,740	15.3
Intermediate	49,180	62.8	56,975	63.5	65,775	62.7	70,786	62.3	67,900	61.9
Severe	16,106	20.6	17,849	19.9	21,668	20.7	23,816	21.0	20,880	19.0
Very severe or death	1415	1.8	1773	2.0	2257	2.2	2462	2.2	2125	1.9
Only psychiatric	578	0.7	864	1.0	1055	1.1	1404	1.2	2021	1.8
Outcome										
Home return	56,981	72.8	65,000	72.4	74,421	70.9	80,816	71.1	81,860	74.6
Admission	21,323	27.2	24,777	27.6	30,534	29.1	32,870	28.9	27,806	25.4
Reason										
Medico-surgical	40,461	51.7	47,824	53.3	56,934	54.3	61,007	53.7	59,961	54.7
Traumatic	30,283	38.7	33,139	36.9	37,859	36.1	40,018	35.2	35,241	32.1
Psychiatric	2035	2.6	2393	2.7	3016	2.9	3978	3.5	4498	4.1
Poisoning	1623	2.1	1758	2.0	2100	2.0	2925	2.6	3358	3.1
Other	3902	5.0	4663	5.2	5046	4.8	5758	5.1	6608	6.0
Population of Midi-Pyrénées										
Place of residence[a]										
Rural municipality	472,061	63.6	434,856	57.5	513,731	56.7	521,435	60.6	340,694	62.6
Urban unit − 20,000	167,579	22.6	171,948	22.7	198,783	21.9	132,758	15.4	28,437	5.2
Urban unit 20,000–200,000	33,853	4.6	75,798	10.0	103,492	11.4	105,565	12.3	52,221	9.6
Urban unit + 200,000	68,404	9.2	73,902	9.8	90,593	10.0	100,631	11.7	122,767	22.6
Sex[a]										
Male	240,058	50.9	222,245	51.1	266,569	51.9	272,619	52.3	181,576	53.3
Female	232,004	49.1	212,611	48.9	247,161	48.1	248,816	47.7	159,119	46.7
Age (years)[a]										
15–29	85,124	17.5	119,680	22.5	132,871	23.9	89,940	21.5	44,447	15.4
30–44	79,361	16.3	107,136	20.1	112,977	20.3	82,614	19.7	52,769	18.3
45–59	104,909	21.5	119,842	22.5	122,899	22.1	96,966	23.2	69,114	24.0
60–74	125,461	25.8	113,978	21.4	115,229	20.7	93,374	22.3	73,393	25.5
Over 75	92,064	18.9	72,291	13.6	72,004	13.0	55,886	13.3	48,450	16.8
Declared chronic disease[b]										
No	369,138	85.0	340,518	82.9	393,835	81.4	377,941	81.1	261,219	80.5

Table 2 (continued)

	Very advantaged		Advantaged		Intermediate		Disadvantaged		Very disadvantaged	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Yes	64,990	15.0	70,510	17.2	89,987	18.6	88,251	18.9	63,467	19.6
Treated diabetes[b]										
No	417,188	96.1	392,628	95.5	460,802	95.2	443,277	95.1	306,995	94.6
Yes	16,940	3.9	18,400	4.5	23,020	4.8	22,915	4.9	17,691	5.4
Treated psychiatric disease[b]										
No	428,871	98.8	404,463	98.4	475,480	98,3	456,248	97.9	315,883	97.3
Yes	5257	1.2	6565	1.6	8342	1.7	9944	2.1	8803	2.7

n frequencies, % relative frequencies

[a]Census data

[b]Health insurance database

among people from the very disadvantaged group was almost twice as high compared to the most advantaged group. If the probability of visiting an ED observed among the most advantaged group was attributed to the entire sample, 23.7% of the visits would not have occurred. We still observed differences after age-and-sex standardisation in complete-cases analyses and after performing a sensitivity analysis assuming that the missing SEP data was more often from the "very advantaged" than the non-missing SEP data was. People living in urban areas with less than 200,000 inhabitants made more visits. These are also the populations with the highest difference in ED visit rates between very advantaged and very disadvantaged.

Characteristics of additional visits

All kinds of visits contributed to the difference in visit rates between very advantaged populations and the others (Fig. 2), whatever the reason (psychiatric, traumatic, etc.) or the severity. For example, among the 156 additional visits per 1000 in the very disadvantaged group, there were 26 non-severe, 95 intermediate, 30 severe or very severe and 3 only psychiatric visits. These additional visits were medico-surgical for 90 of them, traumatic for 39, psychiatric (or for poisoning) for 15 and for other reasons (administrative, forensic, etc.) for 8.

As we explained above, 23.7% of visits would not occur if the whole population had the same probability of visiting EDs as the most advantaged ("AV" in Table 3). This corresponds to 86.5 activity days per ED department each year (23.7% of 365 days) distributed as follows: 12 days for non-severe visits, 54 for intermediate visits, 19 for severe visits and 1 for only psychiatric visits.

Visit severity according to socioeconomic position

If we attribute the characteristics of the very advantaged SEP group to the entire population, 13.7% [95% CI (13.4; 14.0)] of the visits would have been considered as "not severe" versus 14.7% [95% CI (14.4; 14.9)] if the whole population had been very disadvantaged (Table 4).

Adjusted for age and sex, visits made by very disadvantaged people were 1.08 [95% CI (1.05; 1.11)] times more likely to be considered as "not severe" and 1.03 [95% CI (1.00; 1.05)] times more likely to not be hospitalised, compared to the intermediate socioeconomic group, which had the lowest probabilities. The relative risks were of the same order of magnitude and even slightly lower with the complete-case analyses. The probability differences were therefore statistically significant but "clinically" negligible. Moreover, these differences were not found in all subgroups and the probabilities of being "not severe" tended even to be lower when the patients lived in rural municipalities (RR = 0.88) or in urban units of 20,000–200,000 inhabitants (RR = 0.96).

The pattern of ED use seems to depend more on the place of residence than on socioeconomic position. Indeed, for all the socioeconomic groups, the probability of being "not severe" or "not being hospitalised" was significantly lower among patients living in rural municipalities compared to patients from urban units, whatever their size.

Discussion

Main findings

Two main conclusions can be drawn from this population-based study. First, being disadvantaged has an impact on

Table 3 ED visit rates by socioeconomic position, and stratified by place of residence, France, 2012

	Gross rates					Standardised rates			
	Rate	95% CI		RR	AV	Rate	95% CI		RR
Total population									
Very advantaged	165.9	164.8	166.9			174.8	173.7	175.8	
Advantaged	206.5	205.3	207.7	1.24	3.6	212.7	211.5	213.9	1.22
Intermediate	204.3	203.2	205.4	1.23	4.0	203.3	202.1	204.4	1.16
Disadvantaged	218.0	216.9	219.2	1.31	5.5	212.0	210.9	213.1	1.21
Very disadvantaged	321.9	320.3	323.5	1.94	10.7	321.4	319.8	322.9	1.84
Total	217.5	216.9	218.0		23.7	218.3	217.7	218.8	
Rural municipality									
Very advantaged	164.1	163.1	165.2			177.4	175.9	178.9	
Advantaged	193.1	192.0	194.3	1.18	2.8	206.2	204.4	207.9	1.16
Intermediate	201.4	200.2	202.5	1.23	3.3	213.5	211.5	215.5	1.2
Disadvantaged	210.2	209.1	211.4	1.28	4.8	223.2	220.5	225.9	1.26
Very disadvantaged	210.9	209.7	212.0	1.28	4.9	223.4	218.7	228.0	1.26
Total	192.5	191.6	193.4		15.7	204.6	203.7	205.5	
Urban unit − 20,000									
Very advantaged	252.1	250.9	253.3			260.4	258.7	262.2	
Advantaged	249.9	248.7	251.2	0.99	− 0.2	253.2	251.3	255.0	0.97
Intermediate	214.3	213.2	215.5	0.85	− 3.3	215.5	213.4	217.5	0.83
Disadvantaged	299.1	297.8	300.4	1.19	4.9	302.8	299.8	305.8	1.16
Very disadvantaged	557.6	556.2	559.0	2.21	32.1	589.1	583.6	594.6	2.26
Total	297.5	296.0	299.0		33.4	302.1	301.0	303.1	
Urban unit 20,000–200,000									
Very advantaged	199.1	198.0	200.2			222.3	220.7	224.0	
Advantaged	257.4	256.1	258.6	1.29	5.5	280.7	278.8	282.6	1.26
Intermediate	256.3	255.0	257.5	1.29	5.0	272.5	270.3	274.7	1.23
Disadvantaged	241.4	240.2	242.7	1.21	4.4	250.6	247.8	253.5	1.13
Very disadvantaged	354.2	352.9	355.6	1.78	16.3	375.5	370.1	380.9	1.69
Total	271.0	269.7	272.3		31.2	288.3	287.2	289.3	
Urban unit + 200,000									
Very advantaged	141.7	140.7	142.7			146.3	144.9	147.7	
Advantaged	164.3	163.3	165.4	1.16	2.2	164.0	162.5	165.6	1.12
Intermediate	161.6	160.5	162.6	1.14	1.7	155.2	153.4	157.0	1.06
Disadvantaged	163.9	162.9	165.0	1.16	2.3	157.1	154.7	159.5	1.07
Very disadvantaged	226.3	225.1	227.5	1.60	8.9	223.4	218.7	228.0	1.53
Total	169.0	168.1	169.8		15.1	158.4	157.5	159.2	

ED emergency department, *Standardised rates* direct age-and-sex standardisation, with the WHO standard population, *Rate* number of visits per 1000 inhabitants, *95% CI* 95% confidence intervals of the rates, *RR* relative risk with the very advantaged group as reference, *AV* proportion of avoidable visits with the very advantaged group as reference (%)

the risk of using EDs: the most disadvantaged people were indeed 1.92 times more likely to go to EDs than the most advantaged people. Secondly, the probability of a visit being non-severe was not meaningfully different according to socioeconomic position. Even though visits made by very disadvantaged people had a higher probability of being "not severe", the difference was very small. Visit rates are higher and the effect of socioeconomic position is greater in small and medium-sized urban areas. The role of rural/urban area of residence, which reflects either differences in access to alternative care or different mechanisms of deprivation, might deserve to be more specifically explored (see maps in Web-only supplementary data).

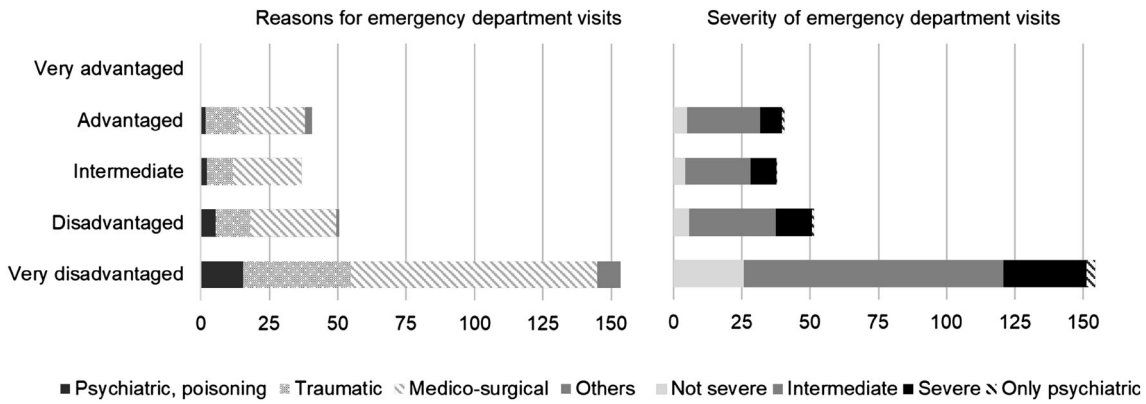

Fig. 2 Characteristics of additional visits to emergency departments, France, 2012. In order to describe the characteristics of additional visits, we calculated the differences in rates for each modality of the variables, using the most advantaged group as reference

Table 4 Probabilities of being "not severe" by socioeconomic position, adjusted for age and sex and stratified by place of patient's residence (logistic regression)—three alternative definitions, France, 2012

	Total population[a]			Total population[b]			Stratified analysis[b]											
							Rural municipality			Urban unit − 20,000			Urban unit 20,000–200,000			Urban unit + 200,000		
	ME	95% CI		ME	95% CI		ME	95% CI		ME	95% CI		ME	95% CI		ME	95% CI	
Probability of being "not severe"																		
Very advantaged	14.9	14.6	15.2	13.7	13.4	14.0	11.6	11.2	12.0	13.8	13.1	14.5	14.6	14.0	15.1	16.3	15.9	16.7
Advantaged	14.7	14.4	15.0	13.9	13.6	14.1	11.8	11.5	12.1	13.3	12.9	13.8	15.1	14.6	15.6	16.3	15.8	16.9
Intermediate	14.4	14.1	14.6	13.8	13.5	14.0	11.6	11.3	12.0	13.7	13.2	14.1	16.6	16.1	17.1	14.4	13.9	14.9
Disadvantaged	14.0	13.8	14.3	13.4	13.2	13.6	11.0	10.6	11.3	13.9	13.5	14.3	15.9	15.4	16.3	13.6	13.2	13.9
Very disadvantaged	15.3	15.1	15.6	14.7	14.4	14.9	10.2	9.4	10.9	14.3	13.9	14.7	16.0	15.7	16.3	15.0	14.6	15.4
Probability of being "not severe" or "intermediate"																		
Very advantaged	79.8	79.5	80.1	76.5	76.2	76.8	75.6	75.1	76.1	77.3	76.4	78.1	81.4	80.8	82.0	75.5	75.0	76.0
Advantaged	79.1	78.8	79.4	77.5	77.2	77.7	76.7	76.3	77.2	77.0	76.4	77.5	80.3	79.8	80.8	75.3	74.7	75.9
Intermediate	78.7	78.4	79.0	76.9	76.6	77.1	75.4	75.0	75.8	75.6	75.1	76.1	81.1	80.6	81.5	74.6	74.1	75.3
Disadvantaged	77.6	77.3	77.9	76.0	75.8	76.3	75.6	75.1	76.1	75.8	75.3	76.2	79.0	78.5	79.5	74.2	73.7	76.7
Very disadvantaged	76.9	76.6	77.1	76.2	75.9	76.4	75.4	74.4	76.4	77.3	76.9	77.8	78.0	77.6	78.3	74.0	73.5	74.4
Probability of not being admitted																		
Very advantaged	77.0	76.6	77.3	72.1	71.8	72.4	69.4	68.9	69.9	72.3	71.4	73.2	74.1	73.5	74.8	74.6	74.2	75.1
Advantaged	75.4	75.2	75.7	72.8	72.6	73.1	69.8	69.4	70.3	71.8	71.2	72.4	75.3	74.7	75.9	74.9	74.3	75.5
Intermediate	74.3	74.0	74.6	71.9	71.7	72.2	68.2	67.8	68.8	70.2	69.6	70.7	74.6	74.1	75.1	75.9	75.4	76.5
Disadvantaged	73.5	73.2	73.8	71.7	71.4	71.9	68.7	68.2	69.1	69.3	68.8	69.8	73.5	72.9	74.0	75.3	74.9	75.8
Very disadvantaged	74.0	73.8	74.3	73.2	73.0	73.5	69.0	68.0	70.1	72.6	72.1	73.1	73.8	73.4	74.2	75.7	75.2	76.1

ME marginal effect, i.e. the average predicted probability (average response in the model), *95% CI* 95% confidence intervals

[a]Complete cases

[b]Imputed data

Methodological strengths and limitations

The main strength of this study is in its exhaustiveness. Firstly, it was spatially exhaustive: visits to all the public and private EDs in the region were included, allowing us to study a multicentre regional network rather than several isolated hospitals. Secondly, the number of visits was exhaustive and collected in a standardised way each day and all the year. There were some missing data concerning the characteristics of the visits, so we carried out imputations using chained equations, one of the recommended methods to deal with missing data (Little et al. 2012). The patient's place of residence allowed us to use several interesting pieces of information from census data, especially the socioeconomic position and the rural or urban context of residence. Analysing these data allowed us to have a broader view of ED use than study using only urban centres. Of course, characteristics of the regional population structure had to be taken into account. This was why we used the WHO standard population for standardisation, in order to allow future comparisons.

To measure socioeconomic position, we used the European Deprivation Index, which is a validated ecological index and has already been used as a proxy of individual SEP (Guillaume et al. 2015; Pornet et al. 2012; Delpierre et al. 2016). The major risk in using an ecological indicator is to wrongly attribute to individuals the level of deprivation defined by their area of residence. However, this indicator takes into account the context in which people live, which is consistent with the multidimensional concept of deprivation. The advantaged of this indicator is that it takes into account several dimensions of deprivation, unlike other simple indicators of SEP such as income or socio-professional category. It was also the indicator which best fitted the definition of relative deprivation as proposed by Townsend (1987), since it was developed from the deprivation perception of the French population. There were other available multidimensional ecological indicators like the "Index of Multiple Deprivation" (Department for Communities and Local Government 2011) or the French "FDep" (Rey et al. 2013). However, they were either not validated on the French population or not developed on the basis of the underlying concept of basic needs taking into account the perception of the concerned population.

Concerning the identification of non-severe visits, there is no consensus in the medical literature for identifying those defined as "non-urgent", "self-referred", "inappropriate" or "avoidable" (Durand et al. 2011). These terms are based on the notion of severity but imply that these visits could be managed by a GP and thus moved towards this type of care. For this study, we chose to study level 1 of the CCE score, corresponding to a visit where no diagnostic or therapeutic procedure has been used. To provide some insight into the phenomenon, we also used alternative criteria. First, we used level 1 and 2 of the CCE score, corresponding to a "stable clinical status". It is a criterion often used in France to identify these visits (Cour des Comptes 2007), but level 2 visits are a large and heterogeneous category and it is difficult to say whether these visits could really be managed by a GP. Then, we used the non-admitted criterion, even if the visits which ended with a home return could not be completely managed by a GP. The fact that the effects of socioeconomic position or place of residence varied depending on the selected criterion might suggest different mechanisms underlying the phenomenon of non-urgent visits. The characteristics of visits identified by these criteria should therefore be better explored.

Transposing the results to represent the proportion of avoidable visits and to represent the annual number of avoidable activity days allowed us to measure the size of differences between groups in a more practical way. In the context of rationalisation of care, it may be useful to know that ED staff spend about 87 days a year on visits that would not have occurred if the entire population had had the same probability of using the ED as the most advantaged group. In fact, the burden of non-severe visits weighs less on the ED's activity than the social deprivation one (14.0% versus 23.7%).

Comparison with other studies

Regarding the overuse of EDs by the most disadvantaged people, our findings are consistent with observation from other countries: a similar tendency has been observed in Sweden (Rudge et al. 2013), Canada (Tozer et al. 2014) and the UK (Scantlebury et al. 2015; Harris et al. 2011), for example. This overuse was not unexpected, since disadvantaged people are generally in worse health than others (Mackenbach et al. 2008). However, this is also a population group which makes less use of other primary care facilities such as GPs (Devaux and de Looper 2012). Moreover, this tendency where more disadvantaged groups are less likely to use GP services was observed in the same year and in the same region as our study (Delpierre et al. 2016). We hypothesised therefore that for this disadvantaged population, such GP underuse may lead to an increase in non-severe ED visits, but this was not the case. Rather, deprived people may delay seeking health care, which could also explain the global "overuse" of EDs.

These results were not found in all health systems, suggesting an influence of the health care system organisation on this phenomenon. In the USA, for example, a 2013 study found that non-urgent ED visits (level V of the

Triage and Acuity Scale) were higher among Medicaid patients and those without insurance: respectively 12% and 12.5% versus 9% for patients with private insurance (Honigman et al. 2013). In the UK, however, a 2013 study had similar findings to ours, with 11.5–12% "inappropriate" visits (self-referred, no investigation, no treatment, no follow-up) whatever the social situation (McHale et al. 2013). The UK has a public and universally accessible national health system. This could explain the results similar to ours in France, where all primary care is also mostly covered by universal and public insurance. In Canada also, the primary care is covered by a public and universal insurance and yet, a 2014 study showed that 9.6% of the most deprived patients' visits were "non-urgent" (level V of the Canadian Triage and Acuity Scale), compared to 6.8% of the least deprived patients' visits (VanStone et al. 2014). To better understand these differences, it would be interesting to analyse these results according to the other characteristics of these health systems, such as the accessibility and the social inequalities in access to a GP, which do not just depend on monetary factors.

In France, the 1996 study showed that about 35% of visits made by patients living in inadequate housing and about 60% of visits made by the homeless were "non-urgent" ("symptoms minor or not recent, without any feeling of emergency on the part of the patient") versus about 25% for patients with stable housing conditions (Lang et al. 1996). The recent reorganisation of primary care centred around the GP and the implementation of universal health coverage for the poorest in 1999 may have contributed to the fact that the severity of visits is now less likely to be associated with social deprivation despite the underuse of local doctors by deprived people. However, this remains to be confirmed.

Finally, three explanations could be put forward to explain the higher ED visit rates of disadvantaged people: (1) poorer health status (poorer baseline health status, more comorbidities or more frequent acute conditions), (2) differential access to care and (3) differential behaviour (which would be more "inappropriate"). Our study showed that ED visits made by disadvantaged people were not less severe, so we assume that the third explanation is negligible. Social inequalities in health status may explain the differences in visit rates, at least partly, as the literature shows that deprived people have a poorer health status. For several reasons, we can assume that the organisation of care is also a factor. Firstly, disadvantaged people make less use of other primary care facilities, suggesting barriers to non-ED, alternative care, despite the theoretical robustness of French health coverage. Secondly, visits made by disadvantaged people are sometimes more often non-severe in other countries, such as the USA or Canada, suggesting an influence of the health care system organisation on this phenomenon.

Conclusions and implications

ED visit rates increase with deprivation, but this overuse should not be confused with misuse. In the context of universal health coverage, our results show that disadvantaged people are not more likely to visit the ED for minor reasons than their advantaged counterparts. Rather, this difference is likely to be due to their poorer health status. In the context of rationalisation of curative care, we should therefore make an effort to improve the health of disadvantaged people by developing specific primary preventive care, rather than blame already stigmatised populations for a phenomenon which probably depends more on the care system than on patient behaviour.

Compliance with ethical standards

Ethical approval All procedures performed were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
Formal consent was not required for this study. The Midi-Pyrénées ED observatory database was declared to the French National Commission for Data Protection and Liberties (CNIL): declaration n°761 633 (31/08/2001). For analysis and cross-referencing data between databases, permission was obtained from the Committee on the Treatment of Research Information in the Field of Health (CCTIRS) and from the French National Commission for Data Protection and Liberties (DR-2013-579 N°913509 Decision). In France, the CCTIRS and CNIL assessed the ethical and juridical aspect of the protocol.

Conflict of interest All authors declare no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work; no other relationships or activities that could appear to have influenced the submitted work. The authors declare that they have no conflict of interest.

References

Ahmad O, Boshi-Pinto C, Lopez A et al (2001) Age standardization of rates: a new WHO standard. GPE discussion paper series 31. EIP/GPE/EBD World Health Organisation, Geneva

Berchet C (2015) Emergency care services: trends, drivers and interventions to manage the demand, OECD Health Working Papers, No. 83. OECD Publishing, Paris

Carret ML, Fassa AG, Kawachi I (2007) Demand for emergency health service: factors associated with inappropriate use. BMC Health Serv Res 7(1):131. https://doi.org/10.1186/1472-6963-7-131

Cour des Comptes (2007) Annual public report—medical emergencies: findings and recent developments rapport public annuel.

Première partie—les observations des juridictions financières. Les urgences médicales: constats et évolution récente

Delpierre C, Fantin R, Chehoud H et al (2016) Social inequalities in access to care and prevention in Midi-Pyrenees, France, 2012. Inégalités sociales d'accès aux soins et à la prévention en Midi-Pyrénées, France, 2012. Bull Epidémiol Hebd 1:2–8

Department for Communities and Local Government (2011) The English indices of deprivation 2010. Department for Communities and Local Government, London

Devaux M, De Looper M (2012) Income-related inequalities in health service utilisation in 19 OECD countries, 2008–2009. OECD health working papers. Organisation for Economic Co-operation and Development, Paris. http://www.oecd-ilibrary.org/content/workingpaper/5k95xd6stnxt-en. Accessed 10 May 2016

Durand A-C, Gentile S, Devictor B et al (2011) ED patients: how nonurgent are they? Systematic review of the emergency medicine literature. Am J Emerg Med 29(3):333–345. https://doi.org/10.1016/j.ajem.2010.01.003

Fourestié V, Roussignol E, Delkharrat D et al (1994) Clinical classification of emergency patients (CCMU). Definition and reproducibility. Classification clinique des malades des urgences. définition et reproductibilité. Réanim Urgences 3:573–578

Gentile S, Vignally P, Durand A-C et al (2010) Nonurgent patients in the emergency department? A French formula to prevent misuse. BMC Health Serv Res 10(March):66. https://doi.org/10.1186/1472-6963-10-66

Guillaume E, Pornet C, Dejardin O et al (2015) Development of a cross-cultural deprivation index in five European countries. J Epidemiol Community Health. https://doi.org/10.1136/jech-2015-205729

Harris MJ, Patel B, Bowen S (2011) Primary care access and its relationship with emergency department utilisation: an observational, cross-sectional ecological study. Br J Gen Pract 61(593):e787–e793. https://doi.org/10.3399/bjgp11X613124

Honigman LS, Wiler JL, Rooks S, Ginde AA (2013) National study of non-urgent emergency department visits and associated resource utilization. West J Emerg Med 14(6):609–616. https://doi.org/10.5811/westjem.2013.5.16112

Jayaprakash N, O'Sullivan R, Bey T et al (2009) Crowding and delivery of healthcare in emergency departments: the European perspective. West J Emerg Med 10(4):233–239

Lang T, Davido A, Diakité B et al (1996) Non-urgent care in the hospital medical emergency department in France: how much and which health needs does it reflect? J Epidemiol Community Health 50(4):456–462

Lee A, Lau FL, Hazlett CB et al (1999) Measuring the inappropriate utilization of accident and emergency services? Int J Health Care Qual Assur 12(6–7):287–292

Little RJ, D'Agostino R, Cohen ML et al (2012) The prevention and treatment of missing data in clinical trials. N Engl J Med 367(14):1355–1360. https://doi.org/10.1056/NEJMsr1203730

Mackenbach JP, Stirbu I, Roskam A-JR et al (2008) Socioeconomic inequalities in health in 22 European countries. N Engl J Med 358(23):2468–2481. https://doi.org/10.1056/NEJMsa0707519

Marchenko Y (2011) Chained equations and more in multiple imputation in stata 12. United Kingdom Stata Users' Group Meetings 2011. Stata Users Group. http://econpapers.repec.org/paper/bocusug11/14.htm. Accessed 3 June 2016

McHale P, Wood S, Hughes K et al (2013) Who uses emergency departments inappropriately and when—a national cross-sectional study using a monitoring data system. BMC Med 11:258. https://doi.org/10.1186/1741-7015-11-258

Padgett DK, Brodsky B (1992) Psychosocial factors influencing non-urgent use of the emergency room: a review of the literature and recommendations for research and improved service delivery. Soc Sci Med 35(9):1189–1197

Pines JM, Hilton JA, Weber EJ et al (2011) International perspectives on emergency department crowding. Acad Emerg Med 18(12):1358–1370. https://doi.org/10.1111/j.1553-2712.2011.01235.x

Pornet C, Delpierre C, Dejardin O et al (2012) Construction of an adaptable European transnational ecological deprivation index: the French version. J Epidemiol Community Health 66(11):982–989. https://doi.org/10.1136/jech-2011-200311

Rey G, Rican S, Joula E (2013) Measuring social inequalities in mortality by cause of death. Ecological approach based on social a deprivation index. Bull Epidémiol Hebd 8–9:87–90

Rudge GM, Mohammed MA, Fillingham SC et al (2013) The combined influence of distance and neighbourhood deprivation on emergency department attendance in a large English population: a retrospective database study. PLoS One 8(7):e67943. https://doi.org/10.1371/journal.pone.0067943

Scantlebury R, Rowlands G, Durbaba S et al (2015) Socioeconomic deprivation and accident and emergency attendances: cross-sectional analysis of general practices in England. Br J Gen Pract 65(639):e649–e654. https://doi.org/10.3399/bjgp15X686893

Townsend P (1987) Deprivation. J Soc Policy 16(2):125–146. https://doi.org/10.1017/S0047279400020341

Tozer AP, Belanger P, Moore K, Caudle J (2014) Socioeconomic status of emergency department users in Ontario, 2003–2009. CJEM 16(3):220–225

VanStone NA, Belanger P, Moore K, Caudle JM (2014) Socioeconomic composition of low-acuity emergency department users in Ontario. Can Fam Physician 60(4):355–362