Healthcare Resource Consumptions and Costs of Myasthenia Gravis in France - the STAMINA study

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De Pouvourville G[1], Salort-Campana E[2], Laforet P[3], Crochard A[4], Chollet G[4], Nevoret C[5], Bouee S[5], Tard C[6]

[1] ESSEC, HEOR, Paris, France ; [2] APHM, Reference center for neuromuscular diseases, Marseille, France ; [3] Hôpital Raymond Poincaré, Department of Neurology, Garches, France ; [4] UCB, Department of Epidemiology, Colombes, France; [5] CEMKA, Department of Real-World Evidence, Bourg-la-Reine, France ; [6] CHU Lille, Department of Neurology, Lille, France.

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Objectives

The aim of this study was to estimate MG-related health care resource use (HCRU) and associated costs in France for adult patients.

Methods

STUDY DESIGN

- This study was conducted using the SNDS, which includes all items of reimbursed ambulatory and hospital care in more than 99% of the French population (nearly 66 million persons).
- Adult MG patients were identified using an algorithm based on the G70 ICD-10 code with/without an acetylcholinesterase inhibitor delivery. Patients with ICD-10 code other than G70.0 (MG) were excluded.
  - Incident cases were patients with a new MG diagnosis between 1st Jan 2012-31st Dec 2019.
  - Prevalent cases were patients with a MG diagnosis between 1st Jan 2008-31st Dec 2019 and alive on 1st Jan 2020.
- The incident and prevalent MG patients were compared with a control group matched on age, sex and region.
- Direct costs were estimated from a societal perspective and excluded over-the-counter drugs.

STATISTICAL ANALYSIS

- A multivariate Poisson model (using SAS®) was used to identify patient characteristics associated with higher MG costs. The results are adjusted on age, gender and region of residence.

Results

Overall, 18,921 prevalent adult MG cases and 11,336 adult incident MG cases could be matched (1:1) with a control (**Figure 1**). A small majority of MG patients were females and the mean age was around 60 years. Controls were the same age and gender as the MG patients (**Table 1**).

Figure 1: Flowchart for study inclusion

French nationwide healthcare administrative claims database study matched to controls (subjects without MG, matched on age, gender and region of residence)
Retrospective cohort of patients with MG

18,921 patients identified as prevalent (Jan 1st 2020) population and matched with a control

11,336 patients identified as incident (2012-2019) population and matched with a control

Mean cost was €8,506 per MG patient and €3,670 per control, i.e. an additional cost of €4,836 (more than twice the costs of controls)

Cost peaked in the first year after MG identification and declined sharply in the second year and gradually reduced thereafter

MG-associated costs in France are high, especially in the first year of the disease and are mainly driven by hospitalizations

Table 1: Description of the MG patients matched with a control

Population	Prevalent population Jan 1st 2020 N = 18,921	Incident population 2012-2019 N = 11,336
Sex*, n (%)		
• Female	10,828 (57.2%)	5,871 (51.8%)
Age (years)*		
• Mean (standard deviation)	59.6 (17.3)	61.1 (18.1)
• Median / Min / Max	61.0 / 18.0 / 106.0	64.0 / 18.0 /104.0
Time from first identification of MG to Jan 1st 2020 (years)		
• Mean (standard deviation)	10.7 (9.5)	-
• Median / Min / Max	8.0 / 0.0 / 65.0	-

*The results are the same for the control group

In 2019 and compared to the controls, higher proportions of MG patients had consultations with general practitioners, specialists, nurses, physiotherapists and were hospitalized (**Figure 2**).

MG patients had significantly higher HCRU than controls, including consultations with physicians, nurses, physiotherapists and hospitalizations (**Table 2**).

Figure 2: Proportions (%) of prevalent MG patients and controls who required health care resource utilization in 2019 (all differences are statistically significant with p<0.0001)

Table 2: Mean (SD) number of resource use (visits / hospital stays) for prevalent MG patients and controls in 2019 (all differences are statistically significant with p<0.0001, with the Wilcoxon rank-sum test)

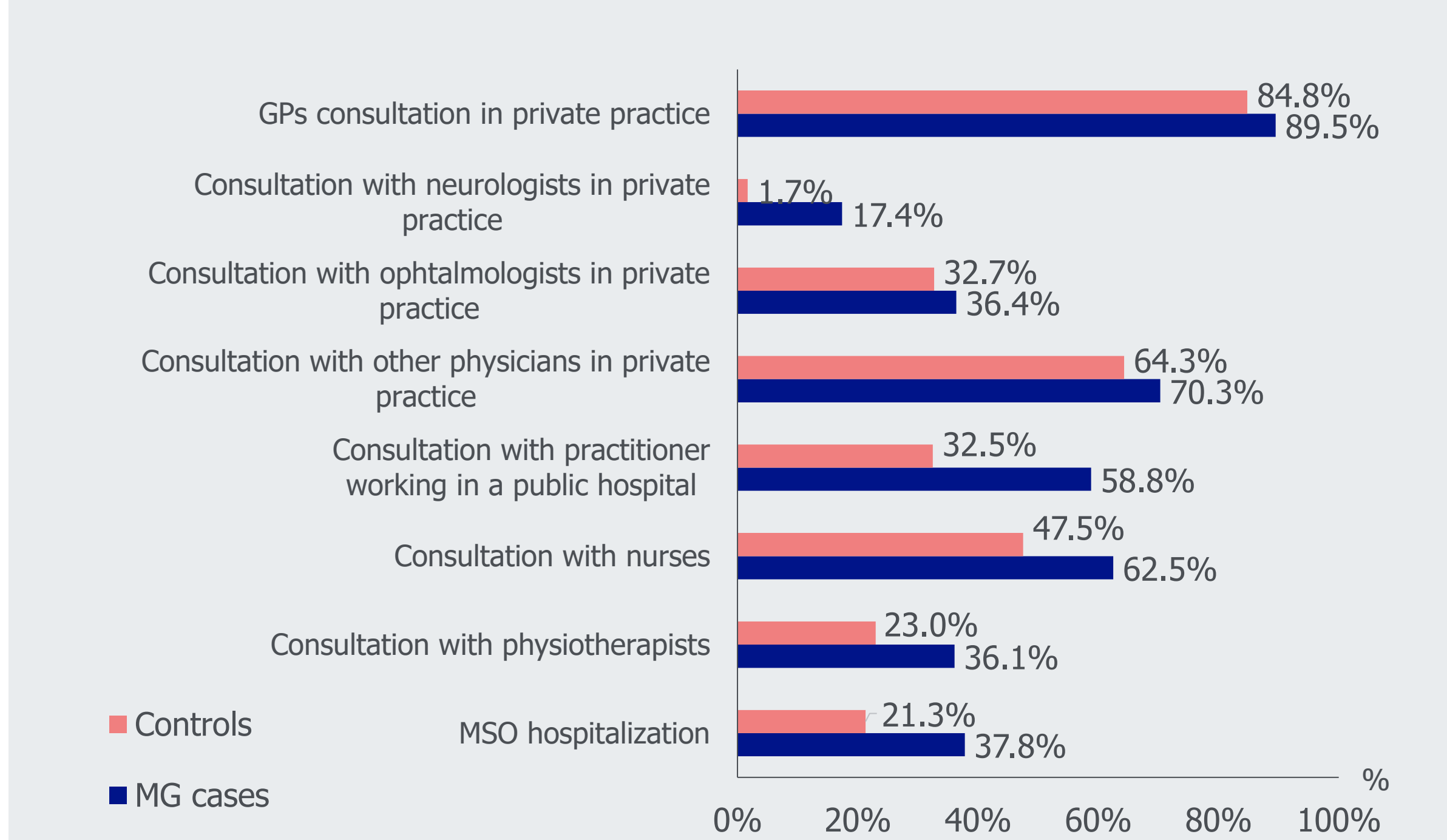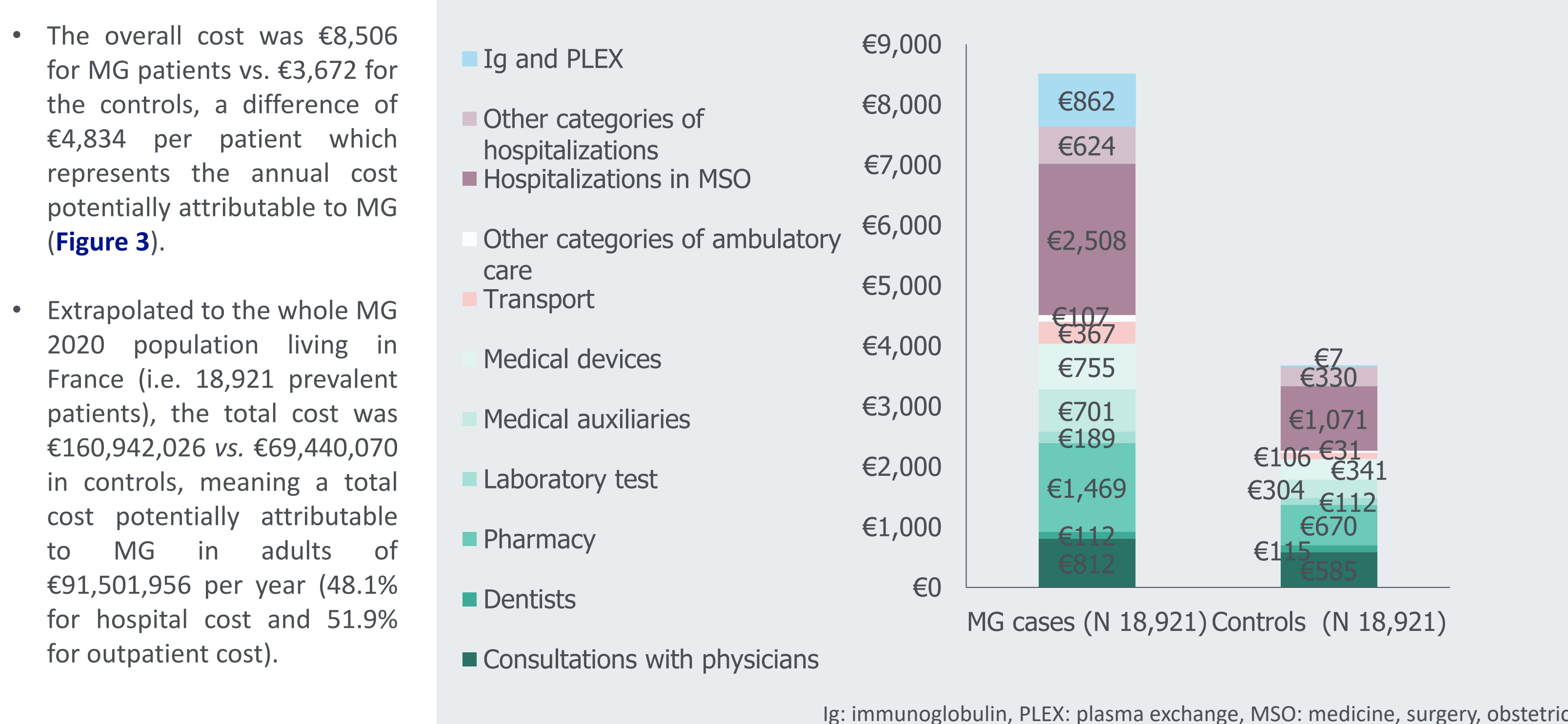| Population	GPs in private practice	Ophthalmologist in private practice	Neurologist in private practice	Other specialists in private practice	Practitioner working at hospital	Nurse	Physiotherapist	MSO hospitalization
Cases	7.2 (5.9)	1.7 (1.5)	2.1 (2.1)	5.1 (6.9)	5.1 (6.5)	30.5 (79.1)	42.9 (42.8)	3.3 (6.0)
Control	5.7 (4.9)	1.5 (1.4)	1.4 (1.2)	4.5 (6.8)	4.1 (7.8)	22.0 (67.2)	27.4 (32.5)	2.7 (9.1)

Figure 3: Mean cost per prevalent MG patient in 2019 compared with controls from a societal perspective (except dental care, all differences are statistically significant with p<0.0001)

- The overall cost was €8,506 for MG patients vs. €3,672 for the controls, a difference of €4,834 per patient which represents the annual cost potentially attributable to MG (**Figure 3**).

- Extrapolated to the whole MG 2020 population living in France (i.e. 18,921 prevalent patients), the total cost was €160,942,026 vs. €69,440,070 in controls, meaning a total cost potentially attributable to MG in adults of €91,501,956 per year (48.1% for hospital cost and 51.9% for outpatient cost).

Ig: immunoglobulin, PLEX: plasma exchange, MSO: medicine, surgery, obstetric

The main drivers for the overall cost were hospitalizations in MSO. A significant proportion of these costs were due to Ig and PLEX and these drugs and procedures represent 17.9% (3,386€) and 20% (6,832€) of the over costs, respectively for patients with exacerbation and with crisis in 2019 (**Figure 4**).

Figure 4: Cost of prevalent MG according to the occurrence of a crisis or an exacerbation in 2019 (societal perspective)

Ig: immunoglobulin, PLEX: plasma exchange, MSO: medicine, surgery, obstetric

In the 11,336 incident adult patients, cost peaked in the first year after MG identification, declined sharply in the second year, and gradually reduced thereafter. Hospitalization costs represented 68.9% of the first-year costs, with €12,178 per MG patient (**Figure 5**).
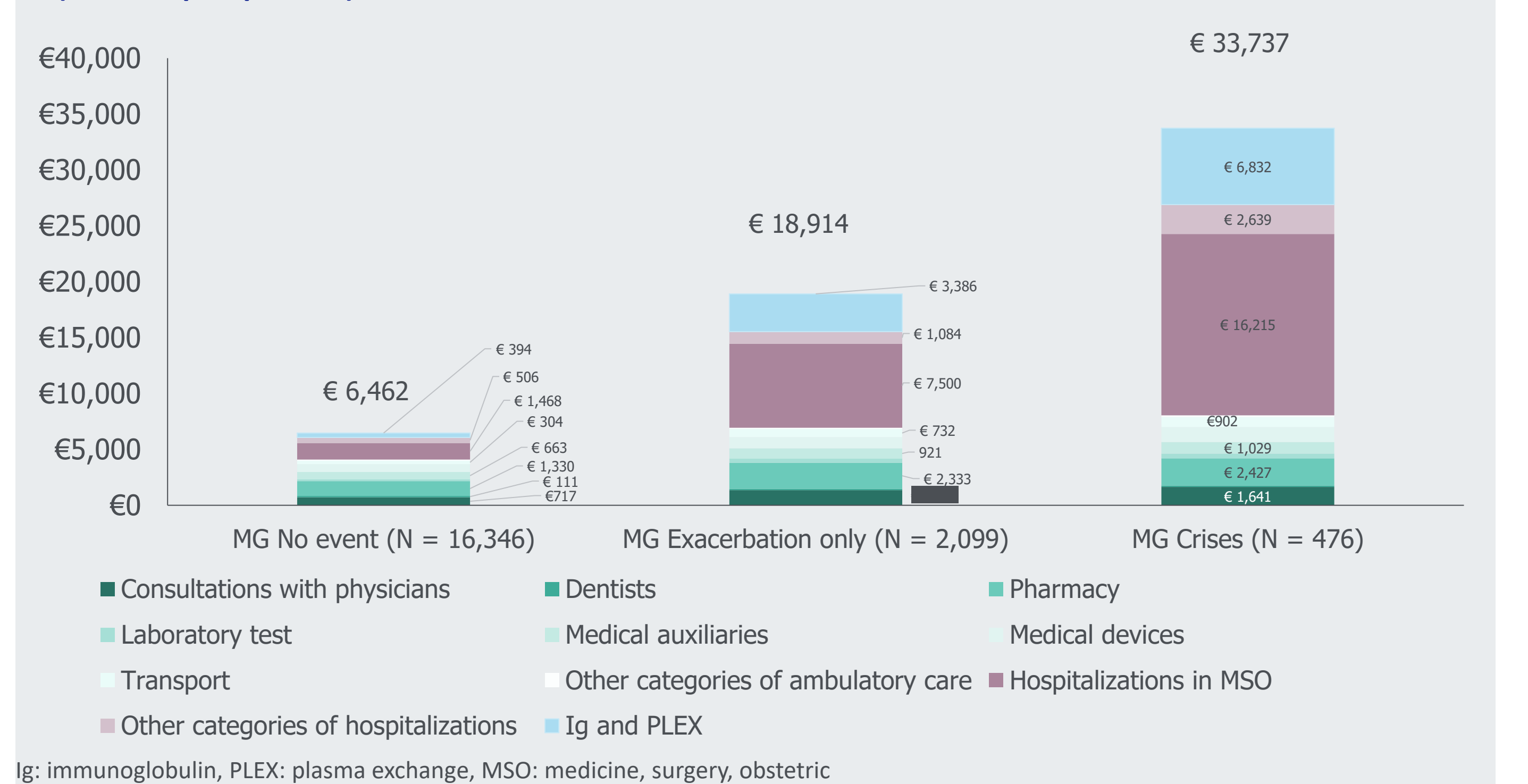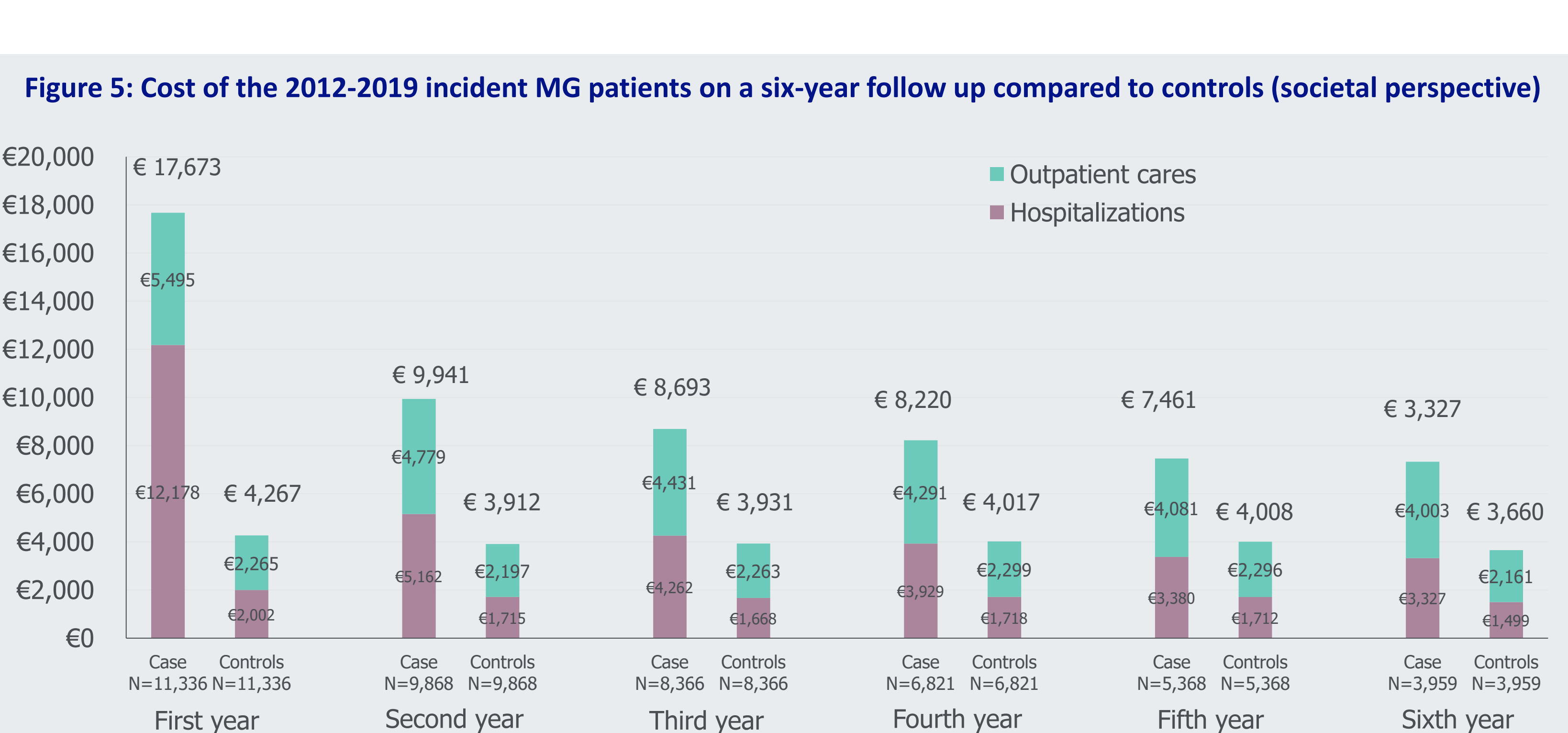
Figure 5: Cost of the 2012-2019 incident MG patients on a six-year follow up compared to controls (societal perspective)

Compared with untreated patients, the multivariable analyses show a 3.7-time higher cost for patients treated with Ig and/or PLEX (**Table 3**) and a 20% higher cost for patients treated with CS and those treated with NSIST in association with CS.
For both analyses (univariate and multivariate), patients who experienced at least one crisis in 2019 had a higher cost than those who experienced an exacerbation.

Table 3: Results of the univariate and multivariate regression models reporting the influence of covariates on the cost of prevalent population

Population		Univariate analysis		Multivariate analysis	
		Coefficient	Confidence interval	Coefficient	Confidence interval
Chronic treatment in 2019	No chronic treament	1		1	
	AChEIs	1.126	[1.125 – 1.126]	0.856	[0.855 – 0.856]
	CS	1.733	[1.732 - 1.734]	1.200	[1.199 - 1.201]
	NSIST w. CS	1.773	[1.771 - 1.774]	1.138	[1.138 - 1.139]
	NSIST w/o CS	1.294	[1.293 - 1.294]	0.967	[0.967 - 0.967]
	Ig/PLEX	6.896	[3.893 – 6.898]	3.671	[3.669 - 3.673]
Event in 2019	No crisis or exacerbation	1		1	
	At least one exacerbation without crisis	2.920	[2.919 - 2.921]	2.188	[2.187 - 2.189]
	At least one crisis	4.982	[4.980 – 4.985]	3.369	[3.368 - 3.371]
Time since MG identification (years)	≥10	1		1	
	<1	1.934	[1.933 - 1.935]	1.095	[1.094 - 1.095]
	[1-6[	1.21	[1.210 - 1.210]	1.019	[1.018 - 1.019]
	[6-10[	1.026	[1.025 - 1.026]	0.956	[0.956 - 0.957]

AChEIs: acetylcholinesterase inhibitors , CS: corticosteroids, NSIST: non-steroidal immunosuppressive treatments, Ig: immunoglobulin, PLEX: plasma exchange

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