

# **Exploratory Analysis**



**POPUP**

Zakaria

## Outline

- The **Data**
- The **Static** Insights
- The **Dynamic** Insights
- The **Spatial** Insights

# The Data



# The Data

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- PMSI Sample, with the following structure
  - PUMA Patients (1% Random Sample) - (Protection Universelle Maladie)
  - AME Patients - (Aide Médicale d'Etat)
  - SUV Patients - (Soins Urgents et Vitaux)
- 3M hospital stay observations from 2011 to 2021 ( 2011 missing for PUMA)
- 1.8M unique patients over this period
- ~ 27 native variables + ~ 20 analysis variables
- This EA analysis aims to characterize **key top level differences** between the 3 systems
- Intuitively, the insights we can extract can be derived from :
  - a static stand point considering univariate/bivariate info over the 10 year period as a whole
  - a dynamic stand point considering yearly evolutions
  - a spatial standpoint allowing us to visualize geographical trends

# The Data : Disclaimer

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- Artefacts regarding 2011 data for SUV and AME
  - Stays related to important and rather stable GHMs are missing
  - Provenance is missing
- For reassuring statistical significance, statistical tests are in the making for each data visualization

# The Static Insights



# The **Static** Insights

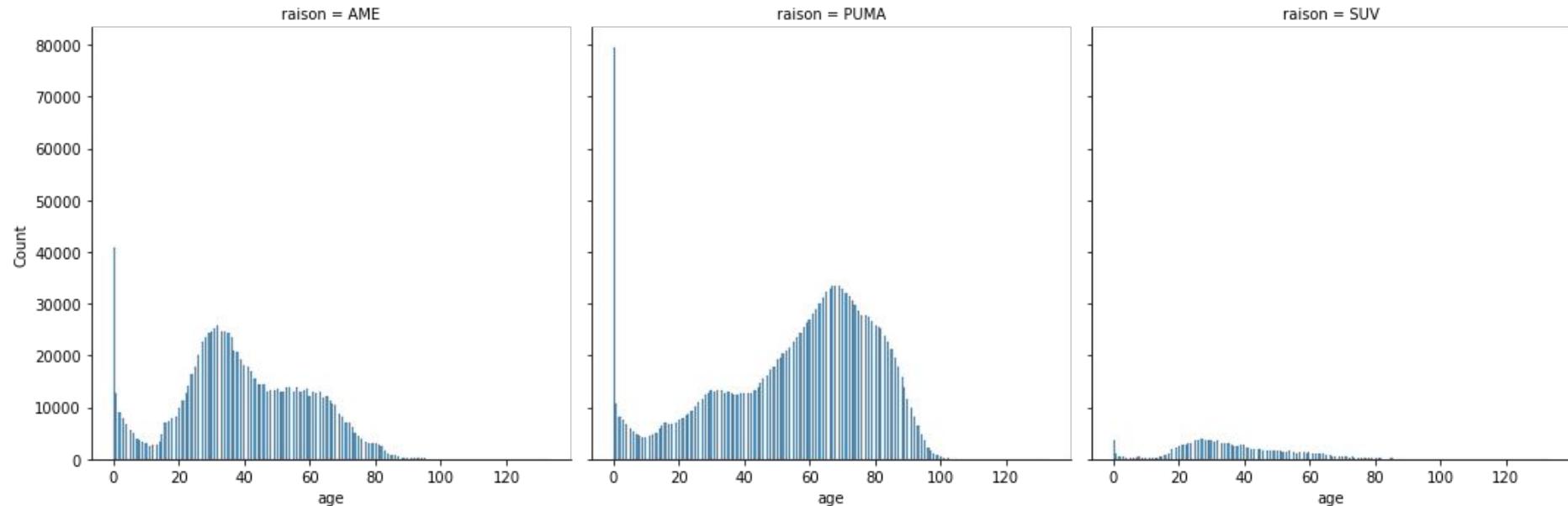
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In our effort to characterize static top level differences between AME, SUV and PUMA, we'll explore :

- Demographics
- Stays and Patients distribution
- Curated GHM Group Structure
- Cost
- Pathology Severity
- Stay Supplement
- Patient Stay Provenance

**Let's dive deeper**

# The Static Insights



**Average age : PUMA 55 y-o | AME 39 y-o | SUV 36 y-o**

*insight : significantly younger population in the social initiatives*

# The Static Insights

raison	sexe	
	Homme	Femme
AME	38,03%	62,00%
PUMA	46,45%	53,55%
SUV	47,52%	52,49%

*insight : near parity in all systems, except AME which is skewed towards women*

# The Static Insights

	AME	raison	PUMA	SUV
	326 338	1 421 781		54 781

# patients

	AME	raison	PUMA	SUV
	1 023 400	1 664 066		124 902

# stays

	AME	raison	PUMA	SUV
	3,136	1,170		2,280

avg stay (in days)

*insight : the proportionally important catchup of AME in terms of stays relative to patients is explained by a GHM structure skewed towards condition requiring recurring care*

# The Static Insights

Ventilation du *CMD Séance* sur le  
nombres de patients et séjours, pour  
chaque dispositif

Libellé GHM (groupe)	raison		
	SUV	AME	PUMA
Aphérèses sanguines	12 (P)	311 (P)	2 478 (P)
	29 (S)	1 379 (S)	3 234 (S)
	2,42 (SM)	4,43 (SM)	1,31 (SM)
Chimiothérapie	1 628 (P)	13 095 (P)	196 772 (P)
	5 281 (S)	95 896 (S)	234 310 (S)
	3,24 (SM)	7,32 (SM)	1,19 (SM)
Hémodialyse	763 (P)	1 893 (P)	39 840 (P)
	18 562 (S)	164 696 (S)	140 515 (S)
	24,33 (SM)	87,00 (SM)	3,53 (SM)
Oxygénothérapie hyperbare	7 (P)	58 (P)	3 194 (P)
	47 (S)	1 322 (S)	4 027 (S)
	6,71 (SM)	22,79 (SM)	1,26 (SM)
Radiothérapie (toutes techniques confondues)	121 (P)	2 679 (P)	153 730 (P)
	1 646 (S)	55 620 (S)	176 967 (S)
	13,60 (SM)	20,76 (SM)	1,15 (SM)
Transfusions	201 (P)	1 632 (P)	16 019 (P)
	501 (S)	6 257 (S)	18 380 (S)
	2,49 (SM)	3,83 (SM)	1,15 (SM)

(P): nombre de patients

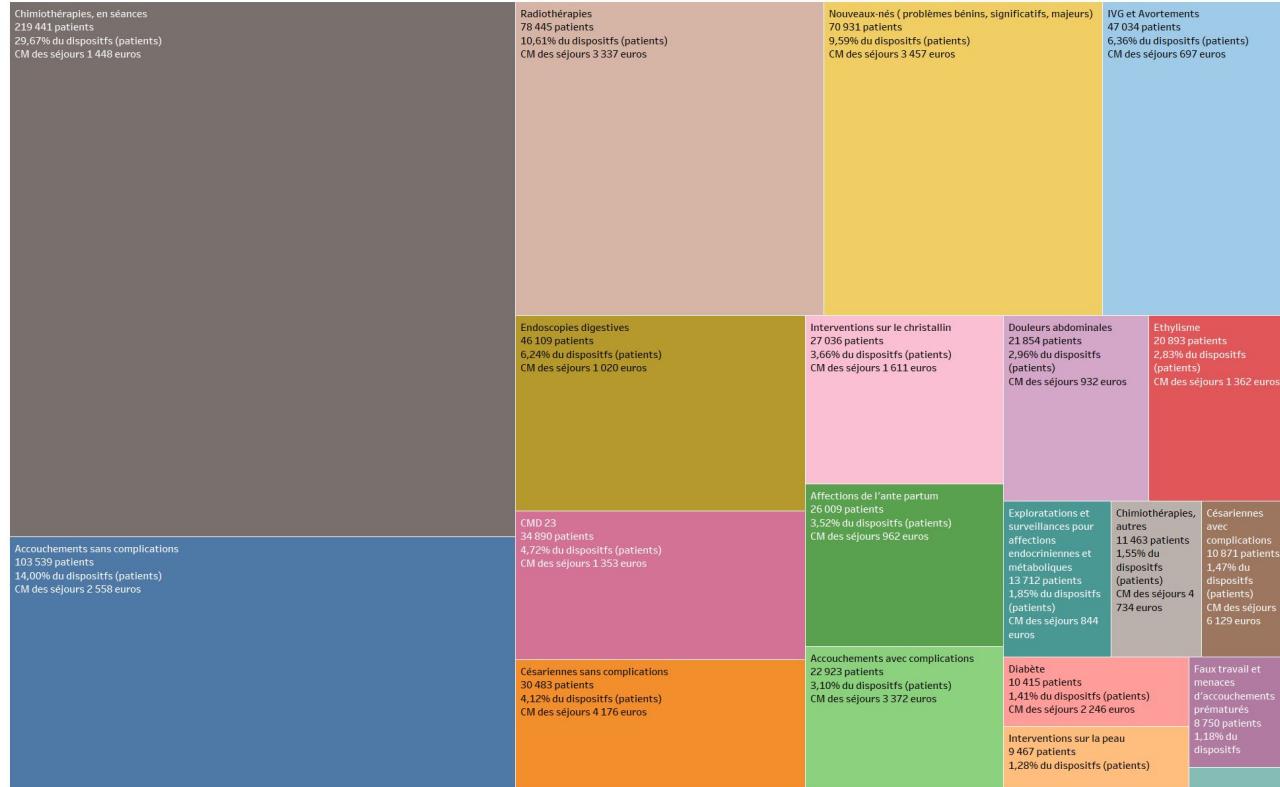
(S): nombre de séances

(SM): séances moyennes par patient

*insight : the previous AME stays distribution skewness is explained by the fact that AME hemodialysis patients have about 4 times more sessions than SUV patients and about 20 times more than PUMA patients.*

# The Static Insights

Répartition des groupes ( toutes années confondues, en terme de patients, tout dispositif)



*insight :  
fragmentation of  
the leading groups  
in term of  
pathology, followed  
by an obstetric  
themed middle  
pack.*

# The Static Insights

Répartition des groupes ( toutes années confondues, en terme de patients) - PUMA



*insight : greater fragmentation, obstetric themed middle pack is much less present.*

# The Static Insights

Répartition des groupes ( toutes années confondues, en terme de patients) - AME



*insight : globally obstetric themed for the top groups, even repartition for the following conditions*

# The Static Insights

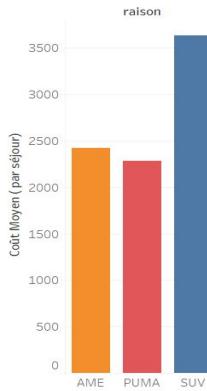
Répartition des groupes ( toutes années confondues, en terme de patients) - SUV



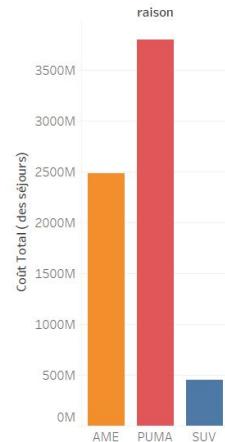
*insight : even stronger obstetric domination, more complications and severity, significant skin intervention relative to its general population occurrence.*

# The Static Insights

CM toutes années confondues, par séjour et selon le dispositif



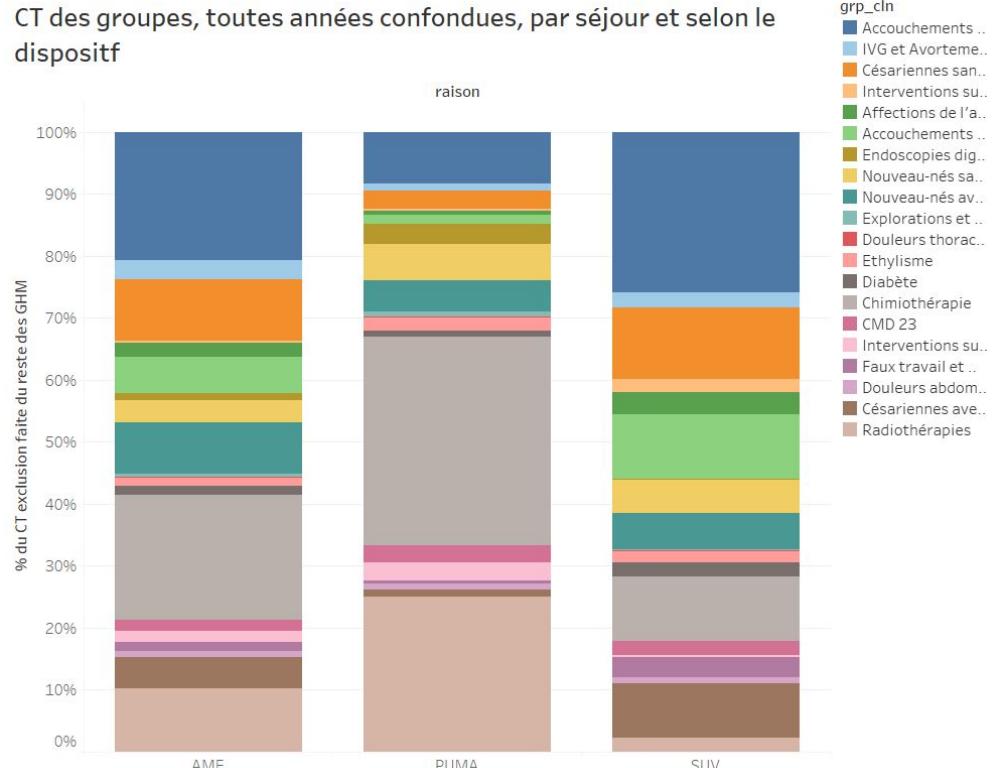
CT toutes années confondues, par séjour et selon le dispositif



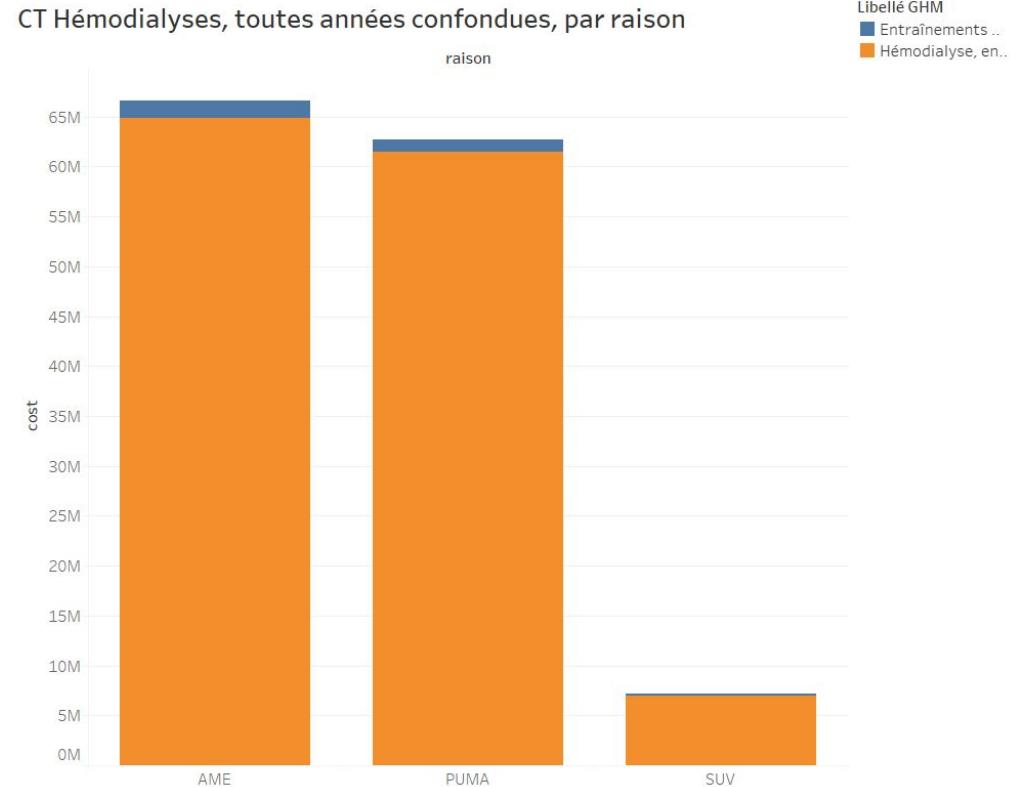
*insight : average stay cost follows the level of precarity, however the gap between AME and PUMA seems narrow.*

# The Static Insights

CT des groupes, toutes années confondues, par séjour et selon le dispositif

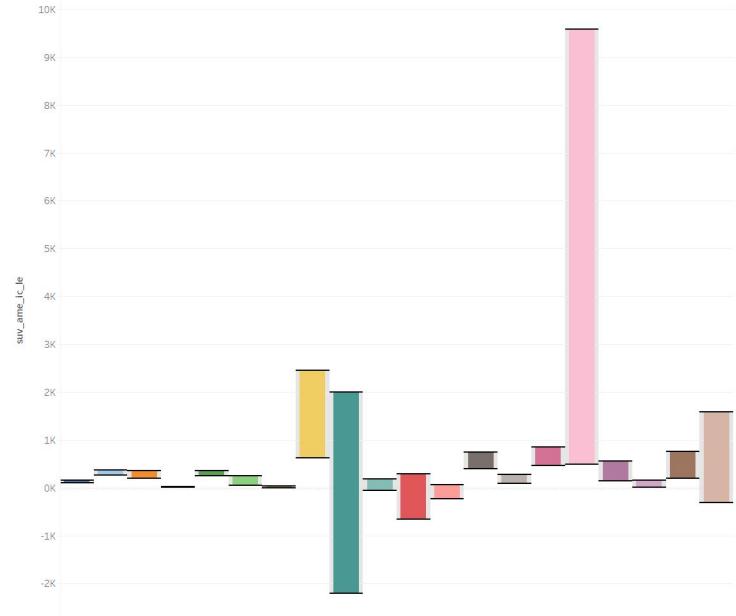


# The Static Insights



# The Static Insights

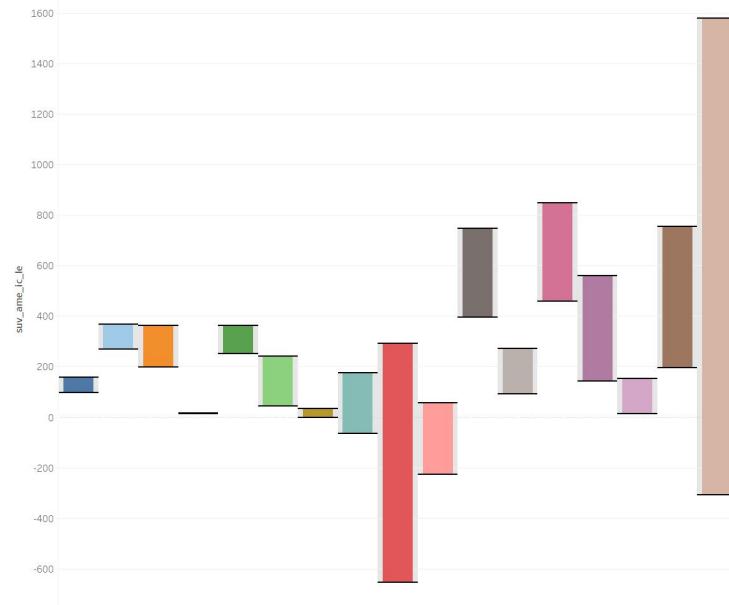
Surcoût de la précarité - SUV vs AME  
(intervalles de confiance à 95%)



grp\_cin

- Accouchements ..
- IVG et Avortement ..
- Césariennes san..
- Affections de la ..
- Affections de l'a..
- Accouchements ..
- Endoscopie digé..
- Nouveau-nés san..
- Nouveau-nés ave..
- Explorations et s..
- Douleurs thoraci..
- Ethylosme
- Diabète
- Chimiothérapie
- CMD 23
- Interventions su..
- Faux travail et m..
- Douleurs abdomi..
- Césariennes ave..
- Radiothérapie

Surcoût de la précarité - SUV vs AME - Nouveaux-nés et Interventions sur le christallins exclus  
(intervalles de confiance à 95%)



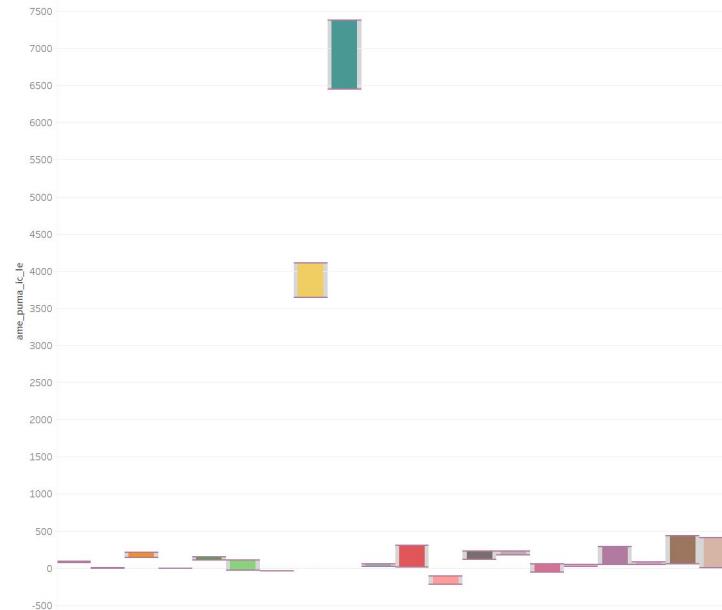
grp\_cin

- Accouchements ..
- IVG et Avortement ..
- Césariennes san..
- Affections de la ..
- Affections de l'a..
- Accouchements ..
- Endoscopie digé..
- Nouveau-nés san..
- Nouveau-nés ave..
- Explorations et s..
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- Ethylosme
- Diabète
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- Césariennes ave..
- Radiothérapie

SUV vs AME

# The Static Insights

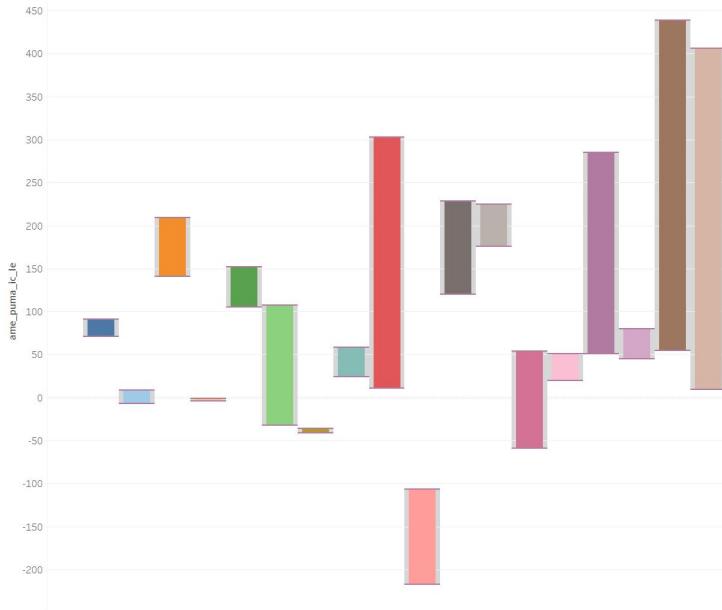
Surcoût de la précarité - AME vs PUMA  
(intervalles de confiance à 95%)



grp\_cin

- Accouchements ..
- IVG et Avortement ..
- Césariennes san..
- Affections de la ..
- Affections de l'a..
- Accouchements ..
- Endoscopie dige..
- Nouveau-nés san..
- Nouveau-nés ave..
- Explorations et s..
- Douleurs thoraci..
- Ethylosme
- Diabète
- Chimiothérapie
- CMD 23
- Interventions su..
- Faux travail et m..
- Douleurs abdomi..
- Césariennes ave..
- Radiothérapie

Surcoût de la précarité - AME vs PUMA - Nouveaux-nés exclus  
(intervalles de confiance à 95%)



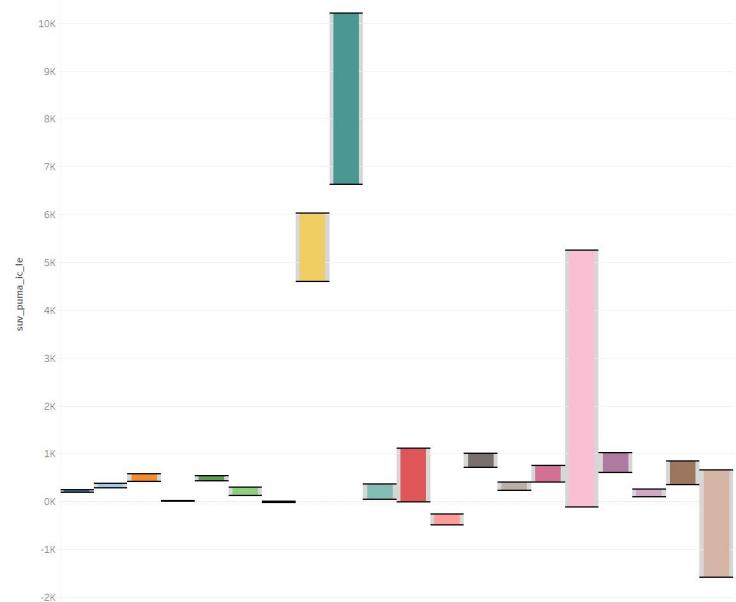
grp\_cin

- Null
- Accouchements ..
- IVG et Avortement ..
- Césariennes san..
- Affections de la ..
- Affections de l'a..
- Accouchements ..
- Endoscopie dige..
- Nouveau-nés san..
- Nouveau-nés ave..
- Explorations et s..
- Douleurs thoraci..
- Ethylosme
- Diabète
- Chimiothérapie
- CMD 23
- Interventions su..
- Faux travail et m..
- Douleurs abdomi..
- Césariennes ave..
- Radiothérapie

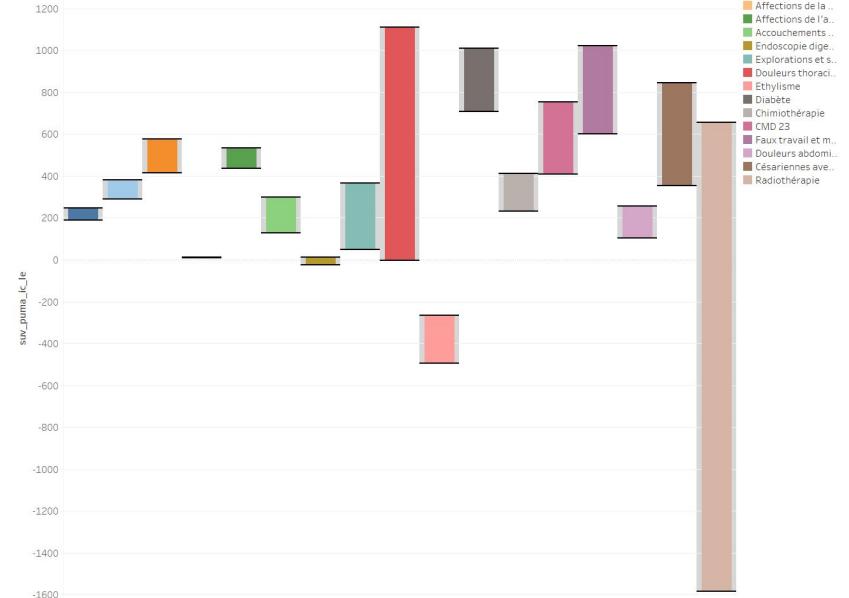
AME vs PUMA

# The Static Insights

Surcoût de la précarité - SUV vs PUMA  
(intervalles de confiance à 95%)



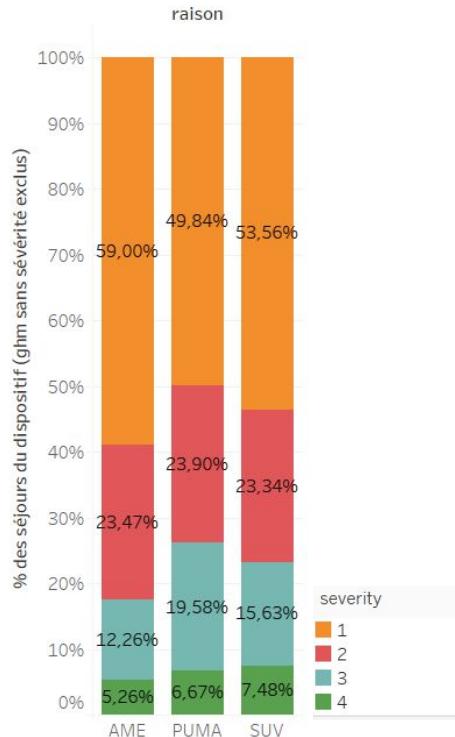
Surcoût de la précarité - SUV vs PUMA - Nouveaux-nés et Interventions sur le cristallins exclus  
(intervalles de confiance à 95%)



SUV vs PUMA

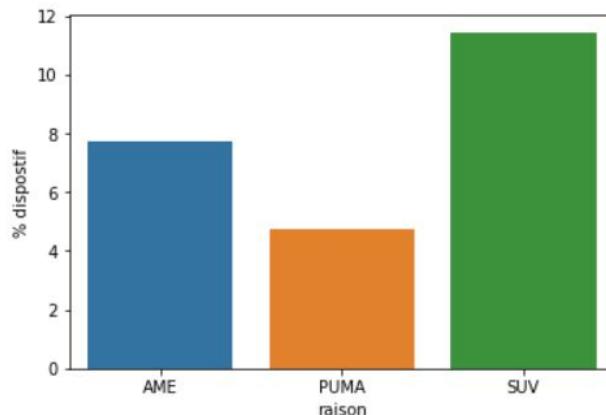
# The Static Insights

Répartition de la sévérité selon le dispositif

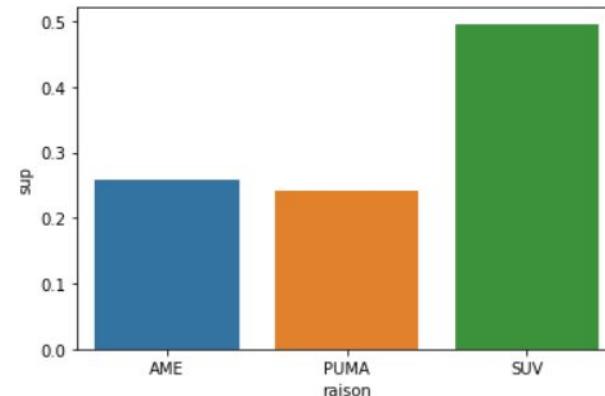


*insight : no greatly significant distortion in terms of severity across systems.*

# The Static Insights



# patients with at least a supplement



average supplement (in terms of days)

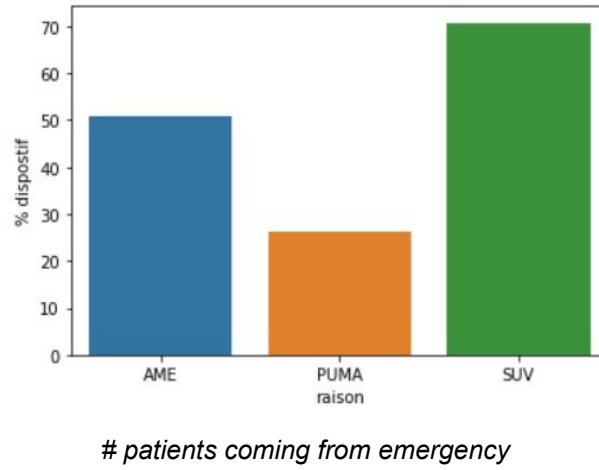
*insight : skewed towards the systems with the more precarious patients. SUV highlights itself on both views. AME difference with PUMA is more subtle in terms of average supplement.*

# The Static Insights

Supplément moyen par groupe, toutes années confondues

grp_cln	raison		
	AME	PUMA	SUV
Accouchements san..	0,0009	0,0007	0,0001
IVG et Avortements	0,0024	0,0023	0,0154
Césariennes sans co..	0,0041	0,0030	0,0024
Interventions sur la ..	0,0019	0,0002	0,0000
Affections de l'ante ..	0,0010	0,0010	0,0018
Accouchements ave..	0,0255	0,0142	0,0386
Endoscopies digesti..	0,0002	0,0004	0,0146
Nouveau-nés sans c..	0,0014	0,0002	0,0000
Nouveau-nés avec c..	0,0366	0,0232	0,0090
Explorations et surv..	0,0044	0,0016	0,0000
Douleurs thoraciques	0,4218	0,2996	0,2697
Ethyisme	0,0789	0,0482	0,2167
Diabète	0,0121	0,0072	0,0111
Chimiothérapie	0,0796	0,0289	0,1133
CMD 23	0,0236	0,0182	0,0176
Interventions sur le ..	0,0002	0,0004	0,0000
Faux travail et mena..	0,0012	0,0024	0,0077
Douleurs abdominal..	0,0078	0,0054	0,0297
Césariennes avec co..	0,2776	0,2711	0,2402
Radiothérapies	0,0000	0,0000	0,0000

# The **Static** Insights



*insight : significantly skewed towards the systems with the more precarious patients.*

# The Dynamic Insights



# **The Dynamic Insights**

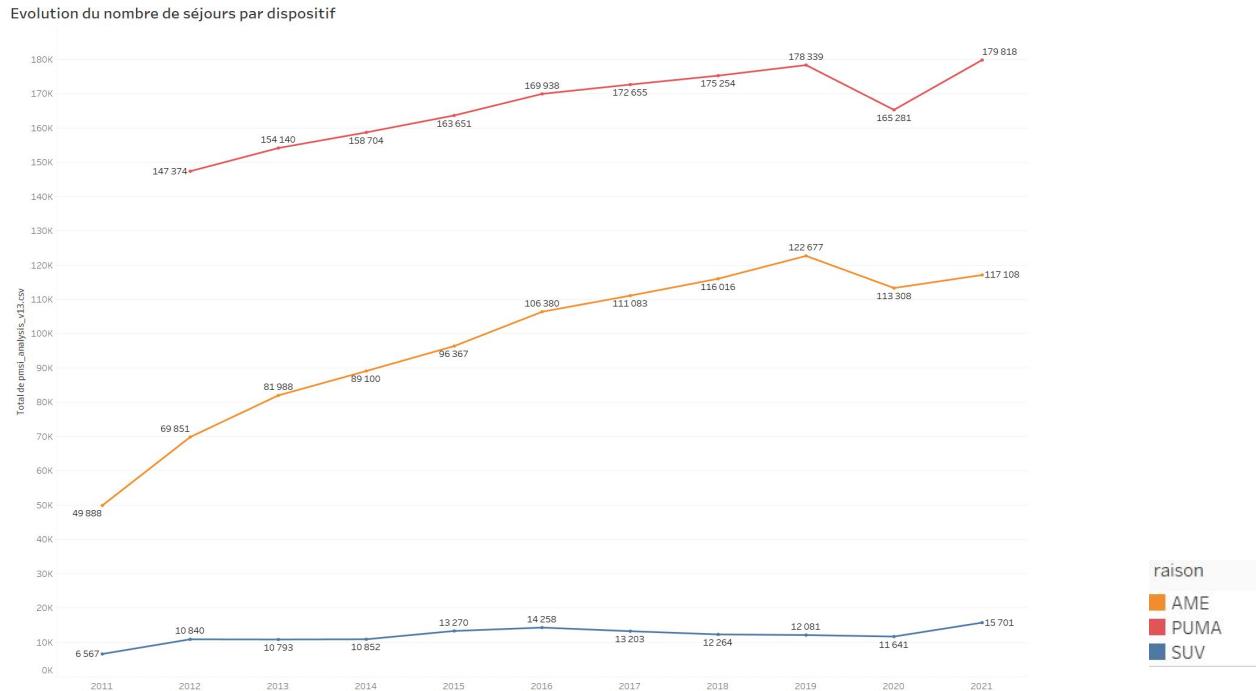
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In our effort to characterize static top level differences between AME, SUV and PUMA and the effect of public policies, we'll explore :

- Stays and Patients distribution
- Curated GHM Group Structure
- Cost
- Pathology Severity
- Stay Supplement
- Patient Stay Provenance

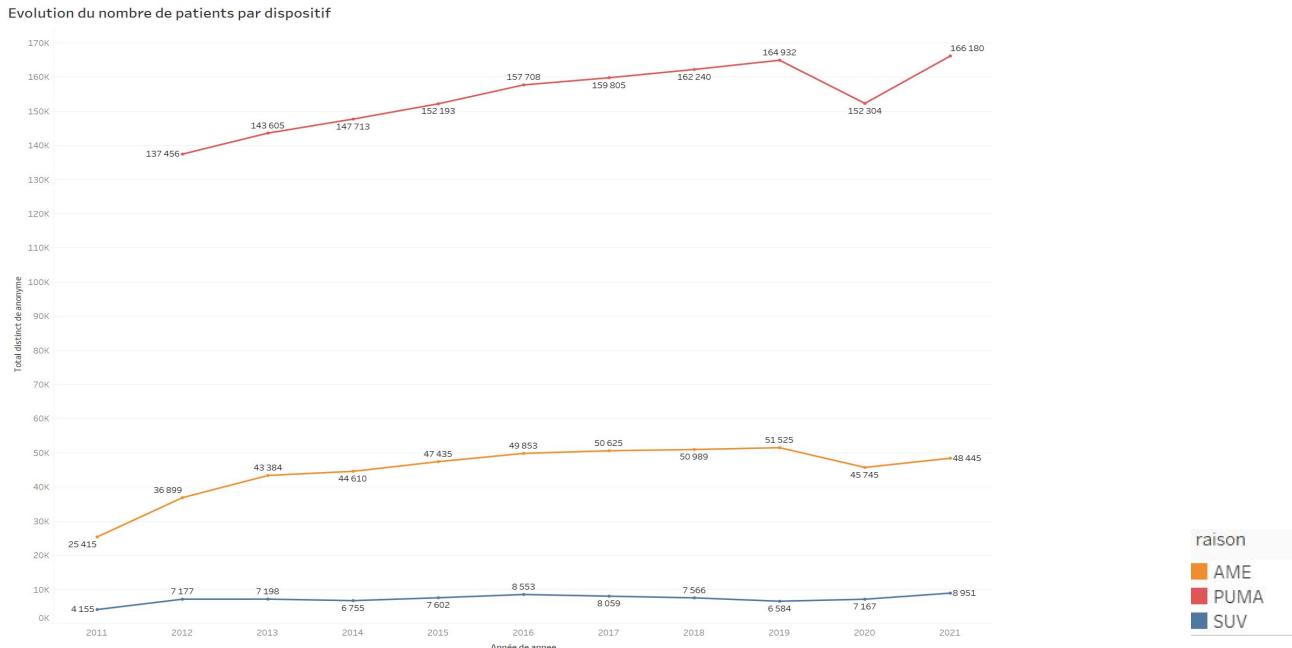
**Through time, on a yearly basis**

# The Dynamic Insights



insight : steady trend on all systems, except for a slight dip in 2020 for PUMA and AME

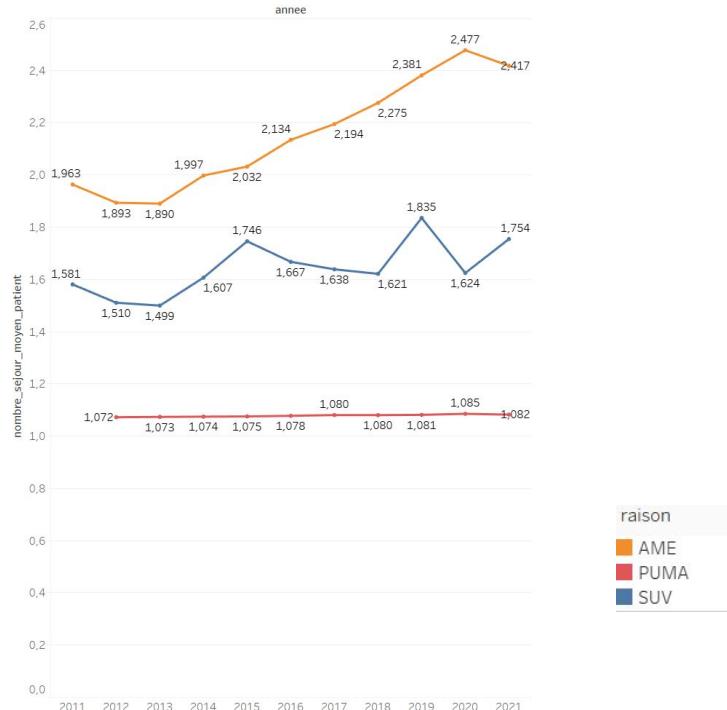
# The Dynamic Insights



insight : steady trend on all systems, except for a slight dip in 2020 for PUMA and AME

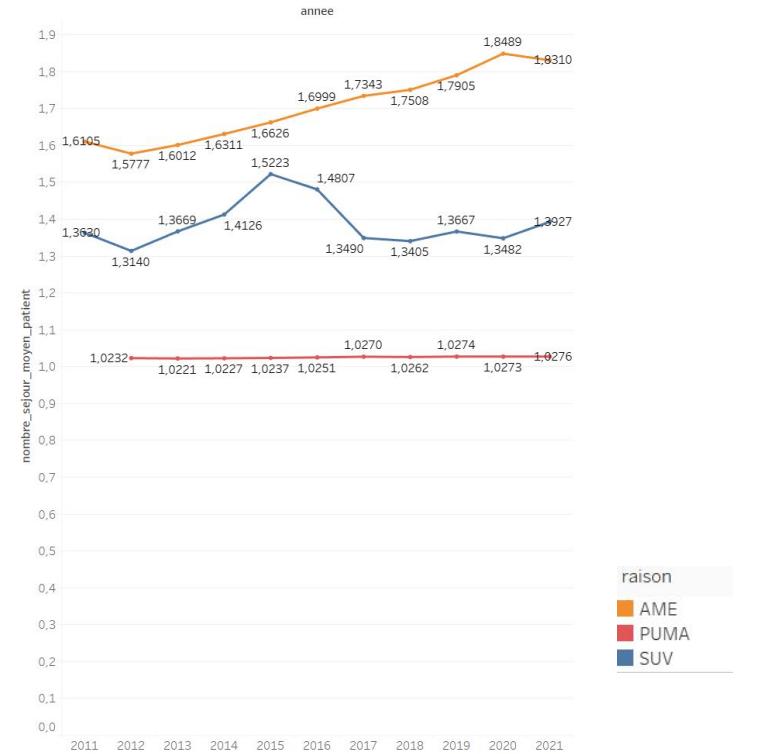
# The Dynamic Insights

Evolution du nombre de séjours moyen, par dispositif



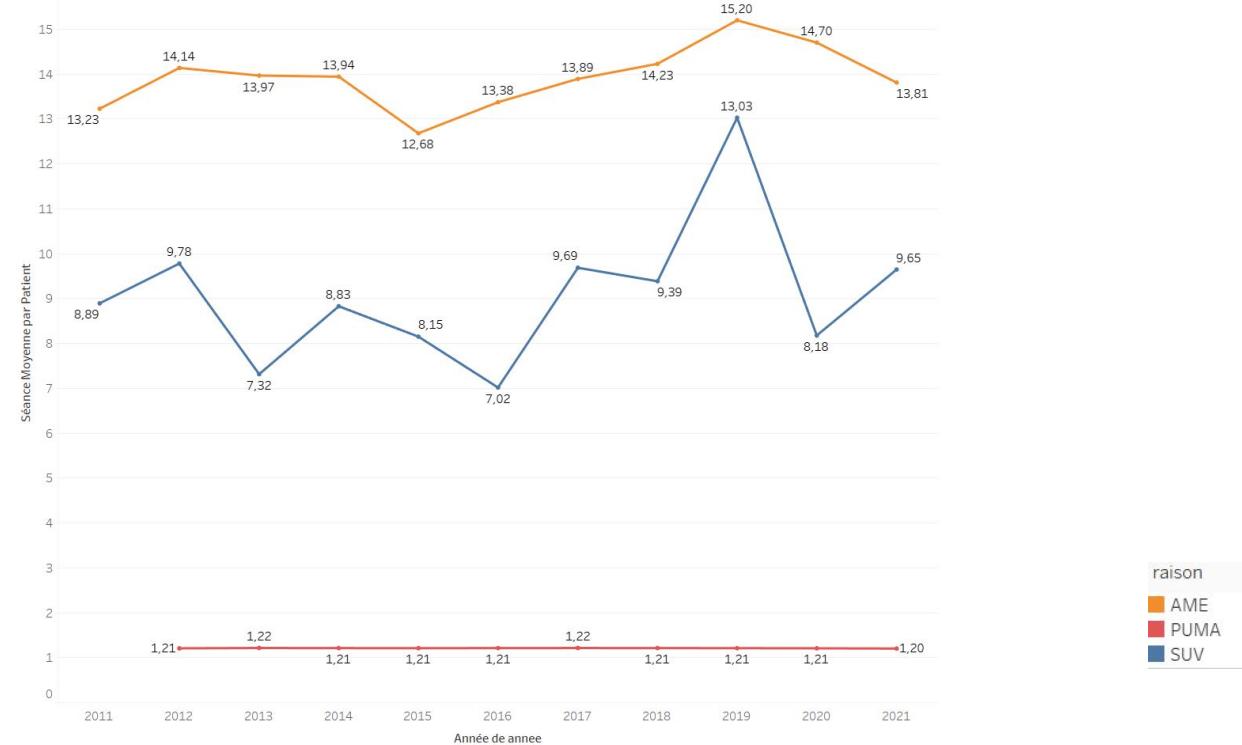
# The Dynamic Insights

Evolution du nombre de séjours moyen, par dispositif - Hémodialyses et Radiothérapies exclues



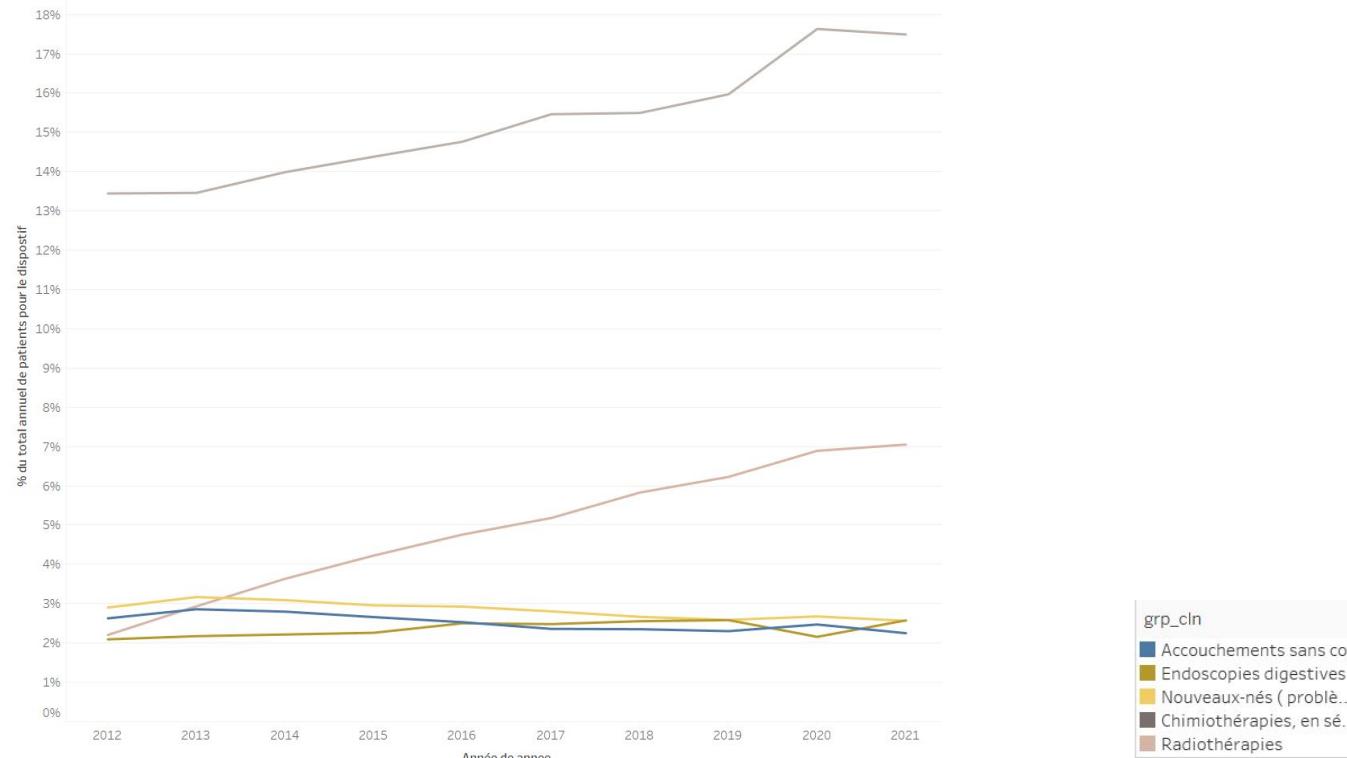
# The Dynamic Insights

Séances moyennes par dispositif, évolution annuelle



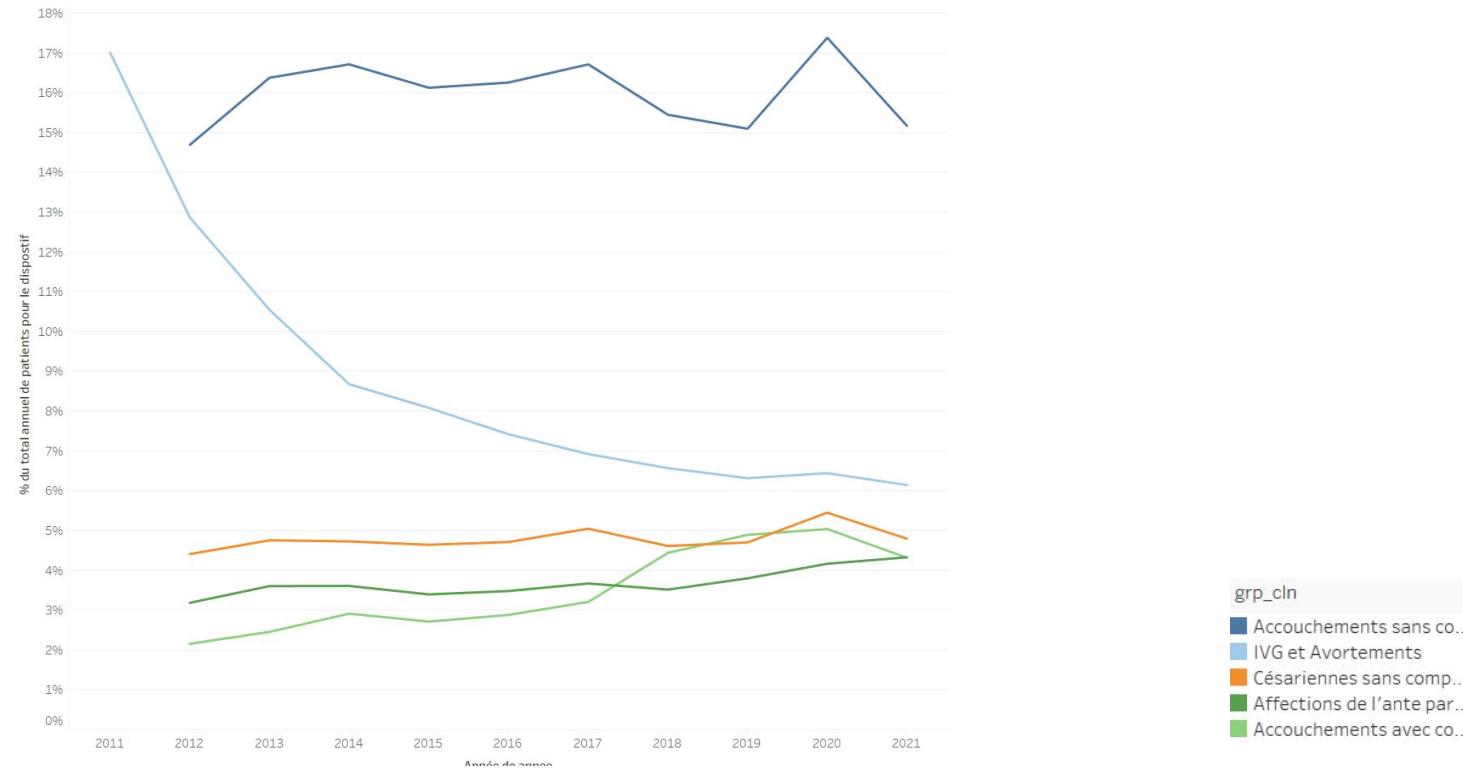
# The Dynamic Insights

Evolution annuelle de l'effectif de patients par top groupe - PUMA



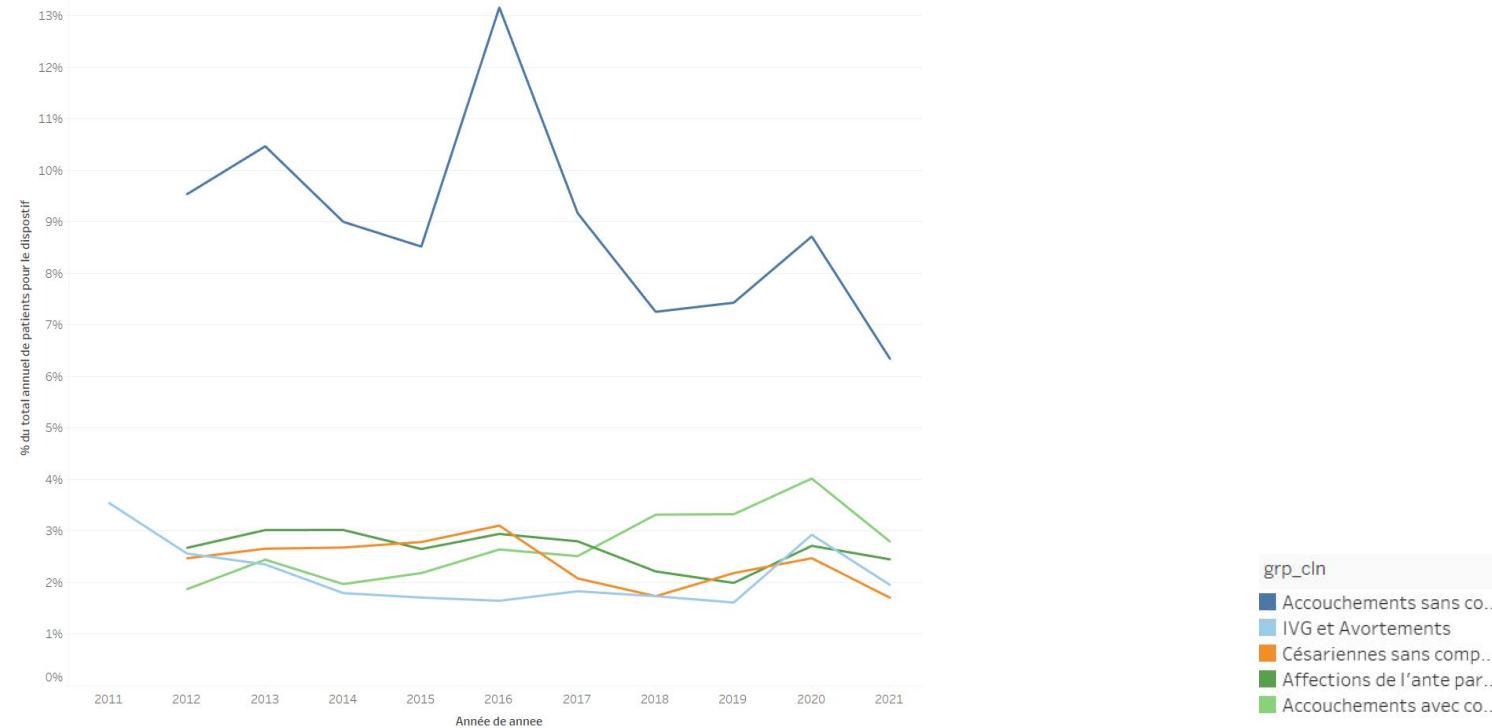
# The Dynamic Insights

Evolution annuelle de l'effectif de patients par top groupe - AME



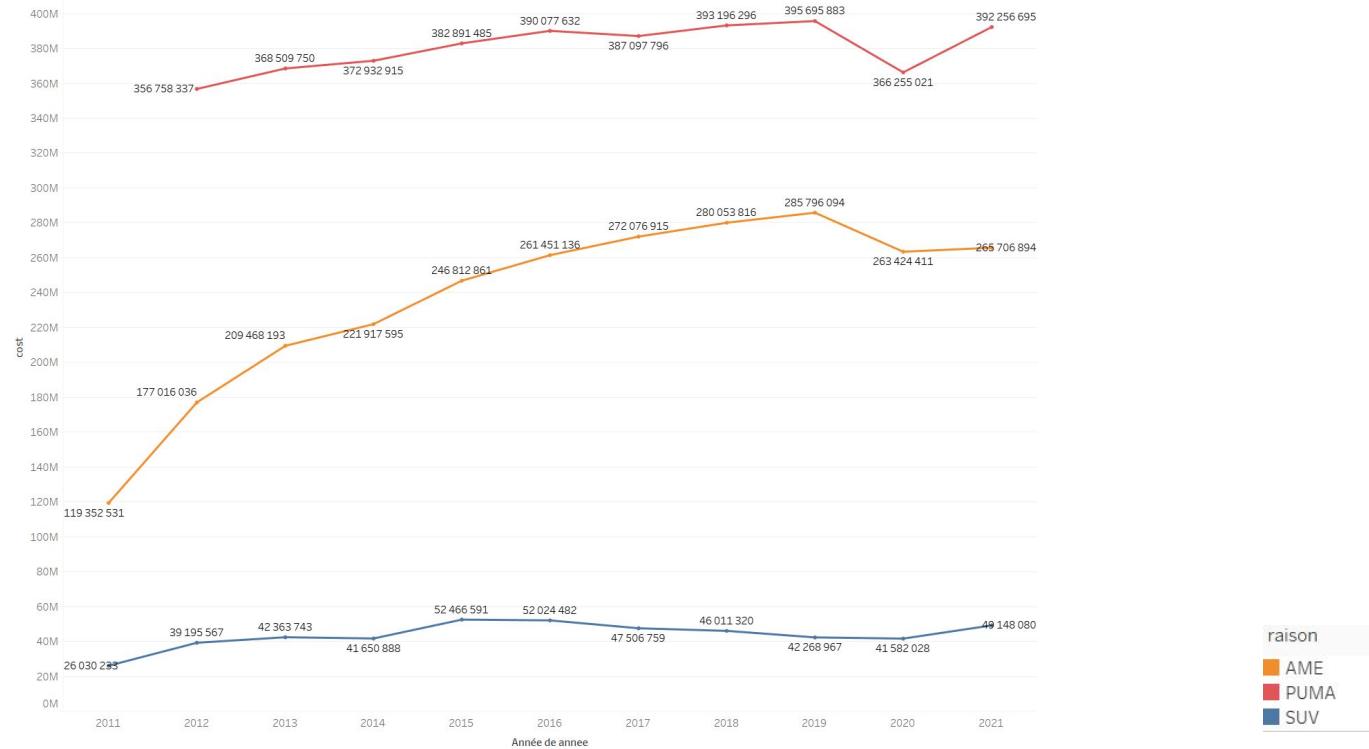
# The Dynamic Insights

Evolution annuelle de l'effectif de patients par top groupe - SUV



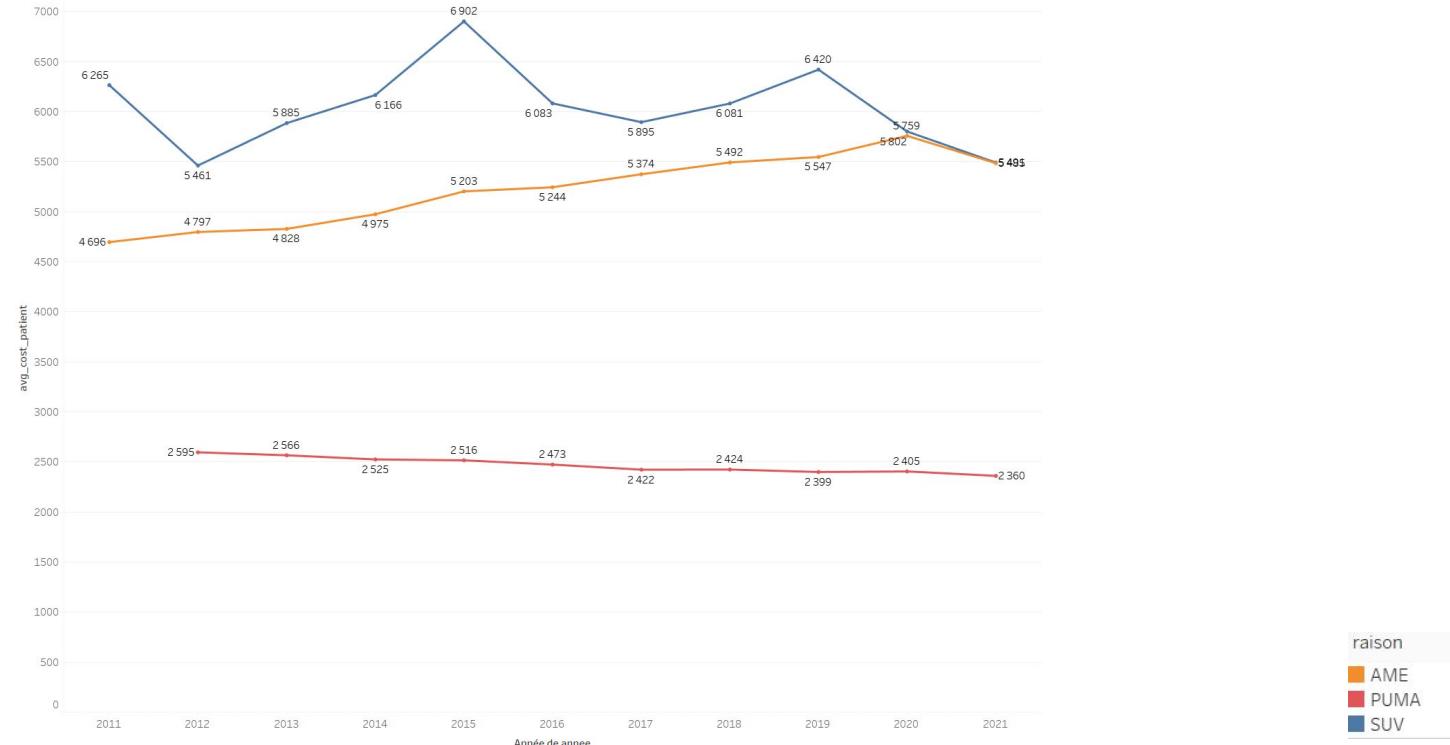
# The Dynamic Insights

Evolution du coût global selon le dispositif



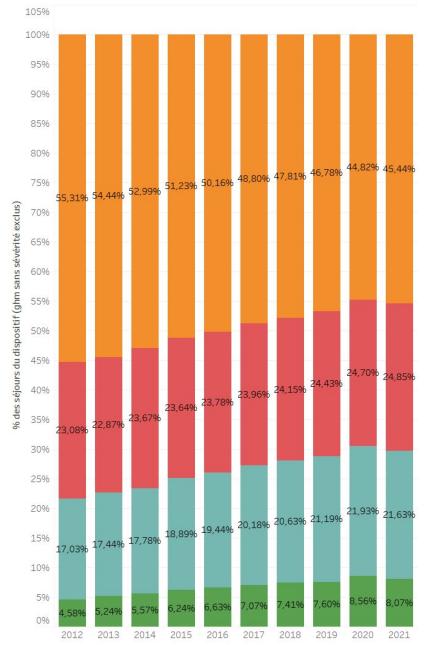
# The Dynamic Insights

Evolution du coût moyen par patient, selon le dispositif

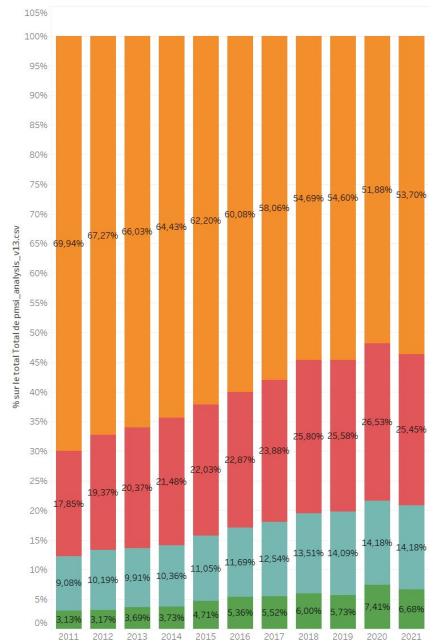


# The Dynamic Insights

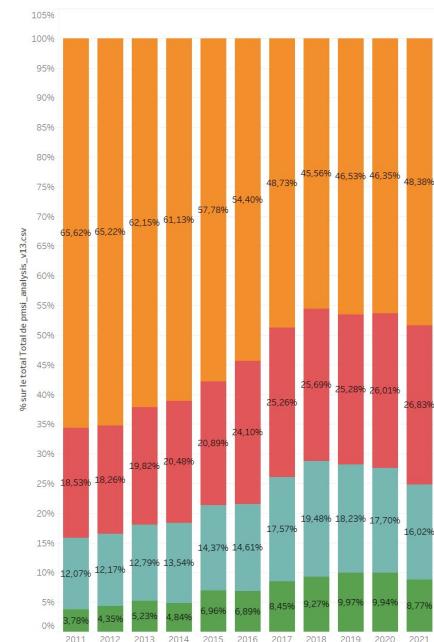
Evolution Sévérité PUMA



Evolution Sévérité AME



Evolution Sévérité SUV

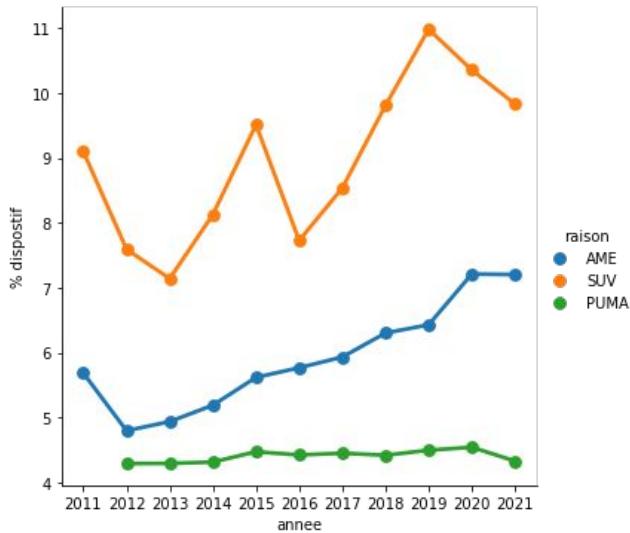


severity

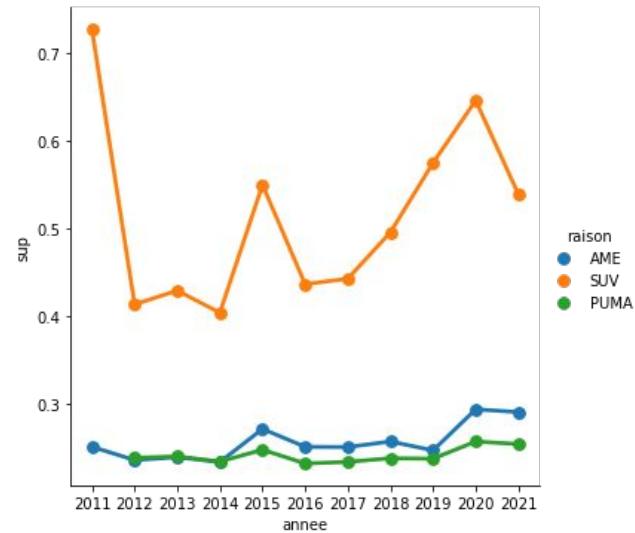
- 1
- 2
- 3
- 4

*insight :roughly the same structure overtime*

# The Static Insights

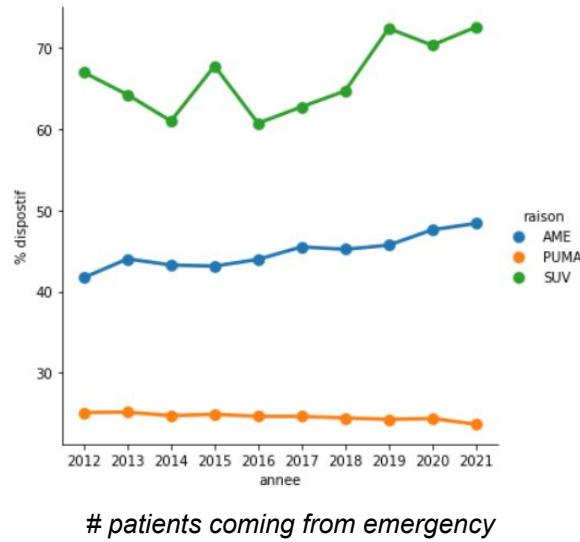


# patients with at least a supplement



average supplement (in terms of days)

# The **Static** Insights



*insight : significantly skewed towards the systems with the more precarious patients.*

*Upward trend for SUV & AME, SUV bumps in 15' and 19'. Stable/slightly decreasing profile for PUMA.*

# The Spatial Insights



## The **Spatial** Insights

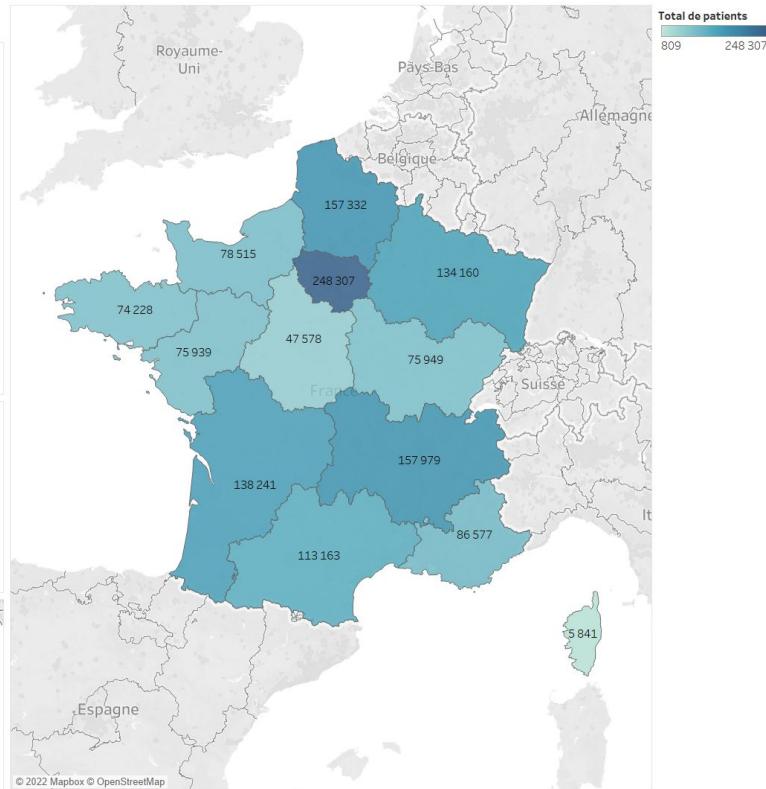
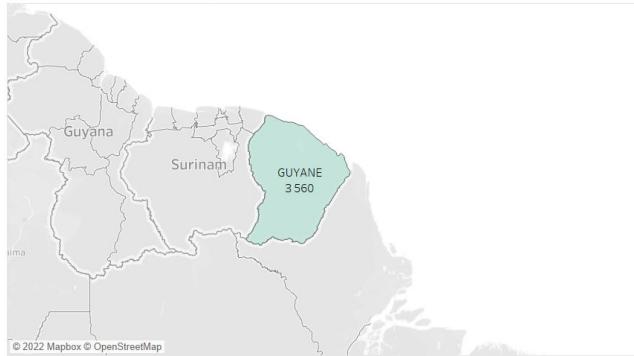
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In our effort to characterize static top level differences between AME, SUV and PUMA and the effect of public policies, we'll explore :

- Geographical distribution across french regions
- Yearly evolution of geo-distribution

# The Spatial Insights

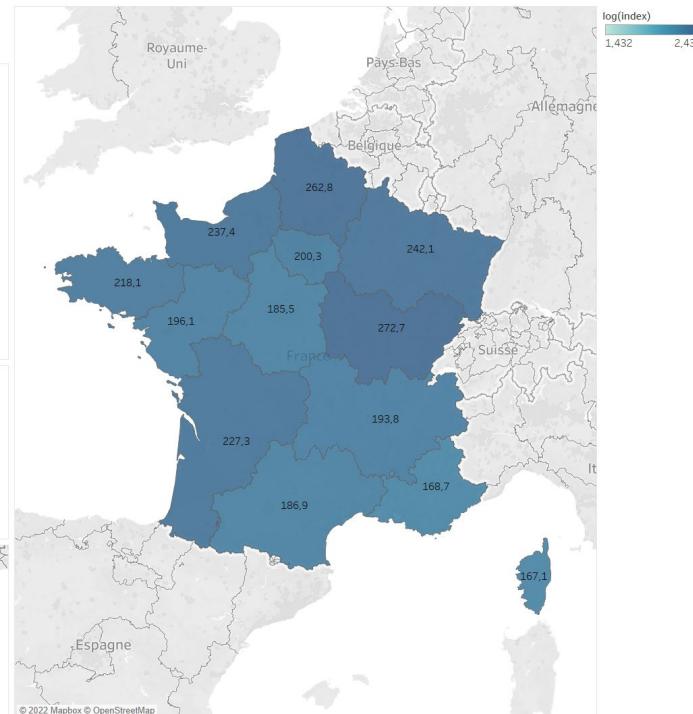
Répartition géographique des patients pris en charge - PUMA



# patients

# The Spatial Insights

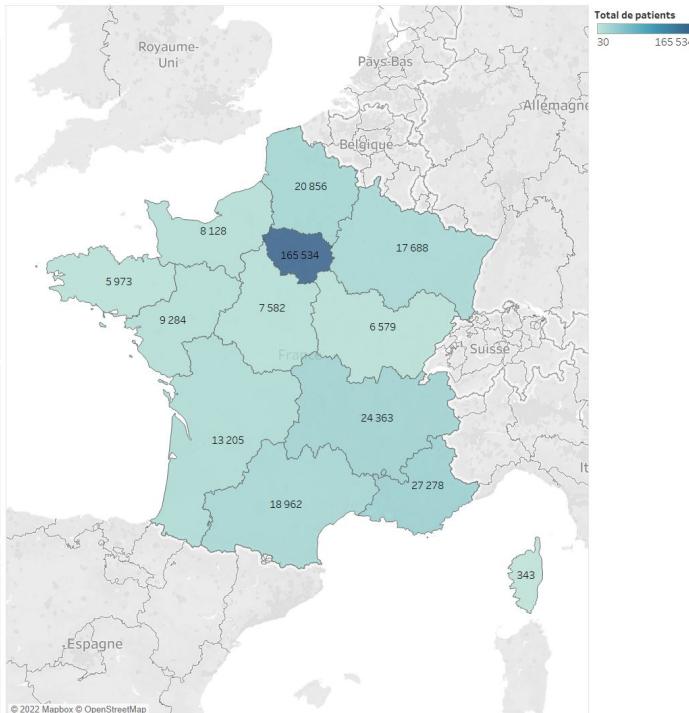
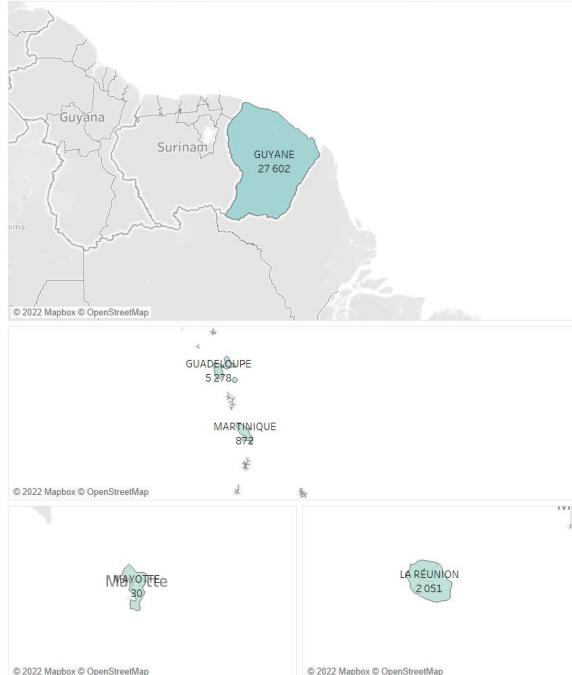
Répartition géographique des patients pris en charge - PUMA  
(nombre de patients pour 10 000 habitants)



demographic index [log for the gradient]

# The Spatial Insights

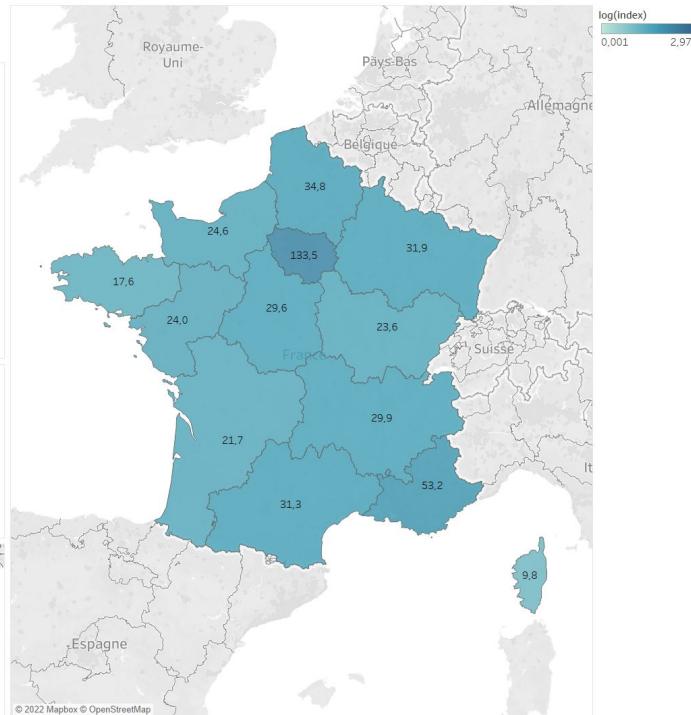
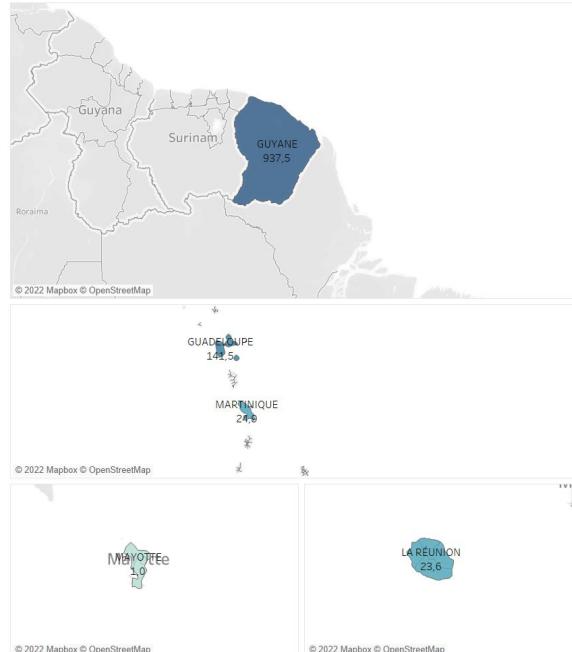
Répartition géographique des patients pris en charge - AME



# patients

# The Spatial Insights

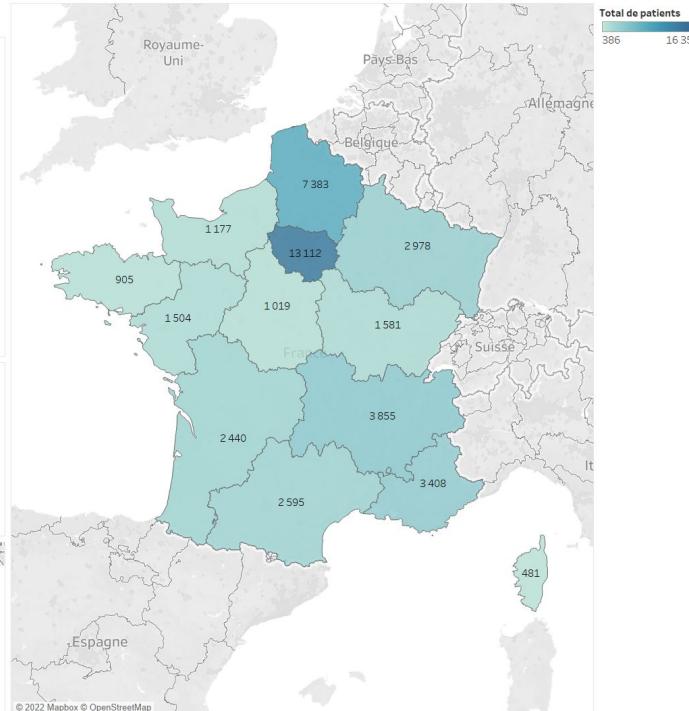
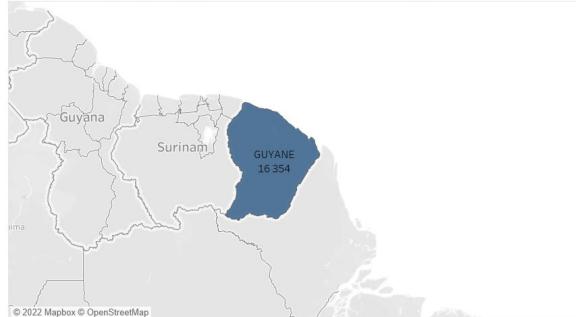
Répartition géographique des patients pris en charge - AME  
(nombre de patients pour 10 000 habitants)



demographic index [log for the gradient]

# The Spatial Insights

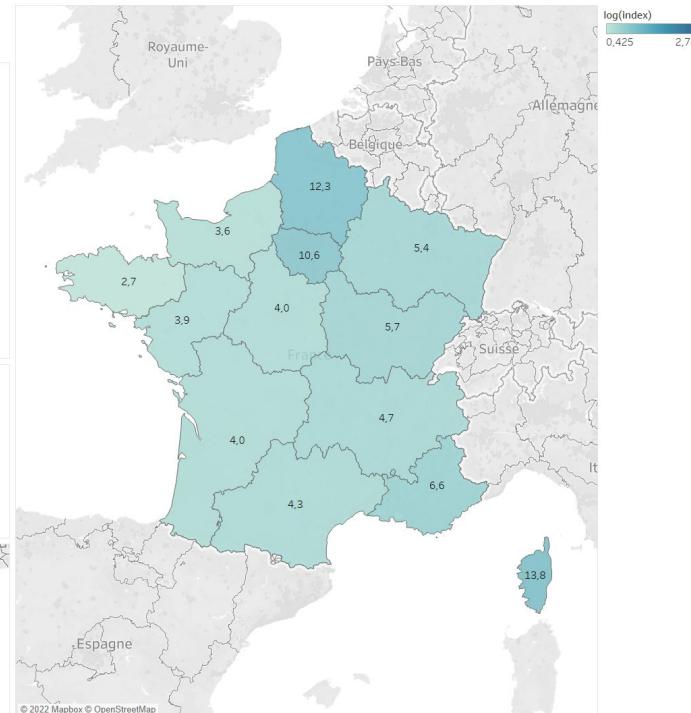
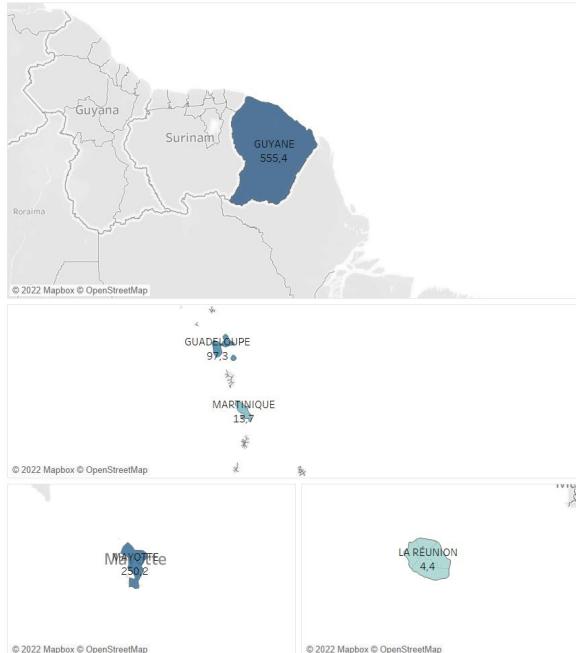
Répartition géographique des patients pris en charge - SUV



# patients

# The Spatial Insights

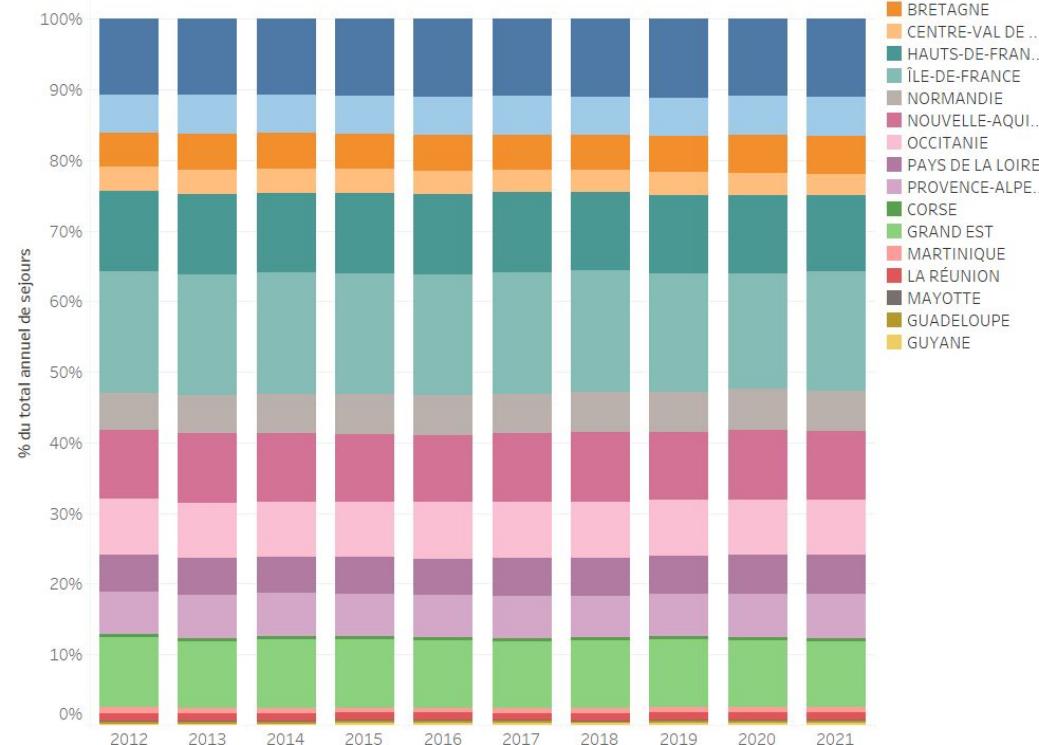
Répartition géographique des patients pris en charge - SUV  
(nombre de patients pour 10 000 habitants)



demographic index [log for the gradient]

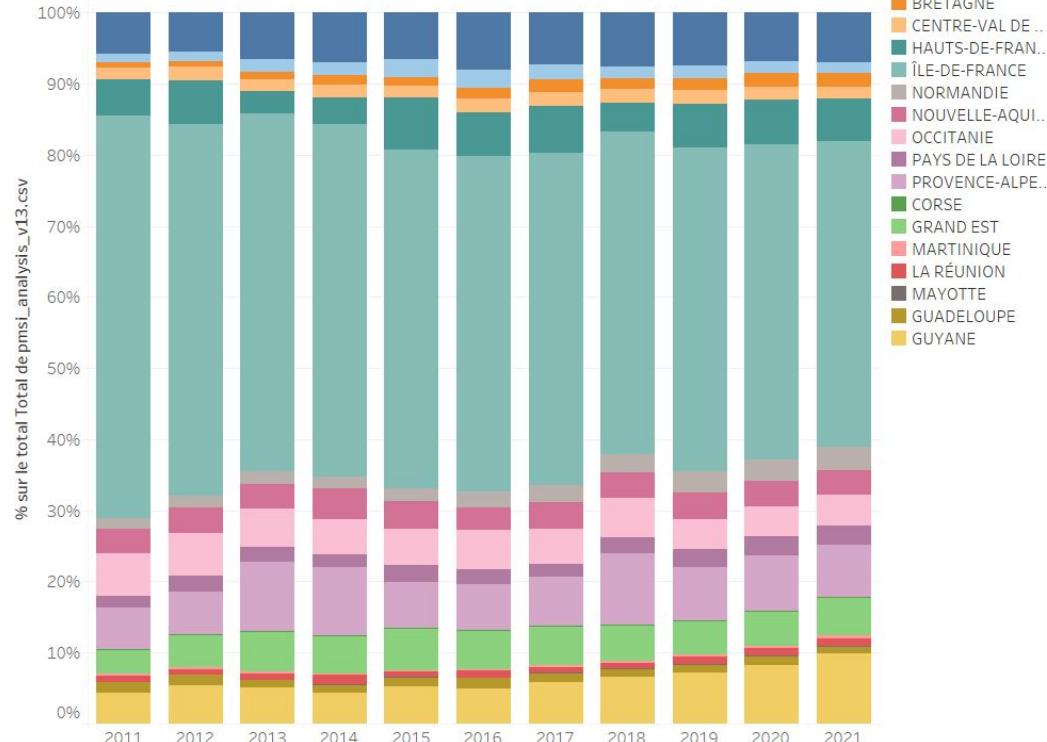
# The Spatial Insights

Evolution annuelle de la répartition régionale des séjours - PUMA



# The Spatial Insights

Evolution annuelle de la répartition régionale des séjours - AME



# The Spatial Insights

