aPHRO-CoV

Dynamiques Epidémiques : Séries Temporelles et Clusters Spatiaux

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Géo-Epidemiologie

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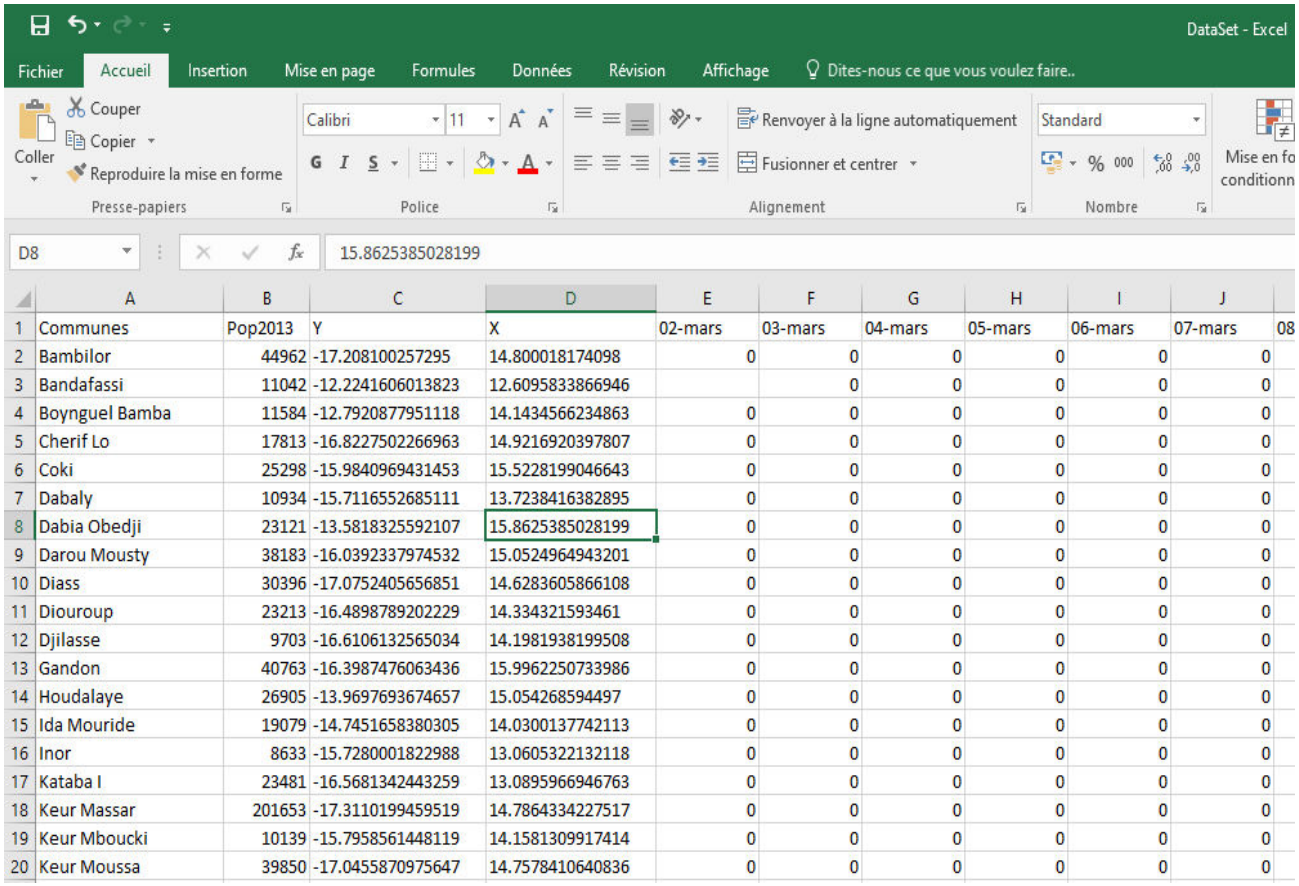
Séries Temporelles : Format

Un outil simple : tableur (type Excel®, Open Office®…)

- 1 ligne / Commune
- ID Commune +++
- Population
- Longitude et latitude
- 1 colonne / Date



	A	B	C	D	E	F	G	H	I	J
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars
2	Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0	0
3	Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0	0
4	Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0	0
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0	0
6	Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0	0
7	Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0	0
8	Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0	0
9	Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0	0
10	Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0	0
11	Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0	0
12	Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0
13	Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0
14	Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0
16	Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0
17	Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0
18	Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0
19	Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0
20	Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0

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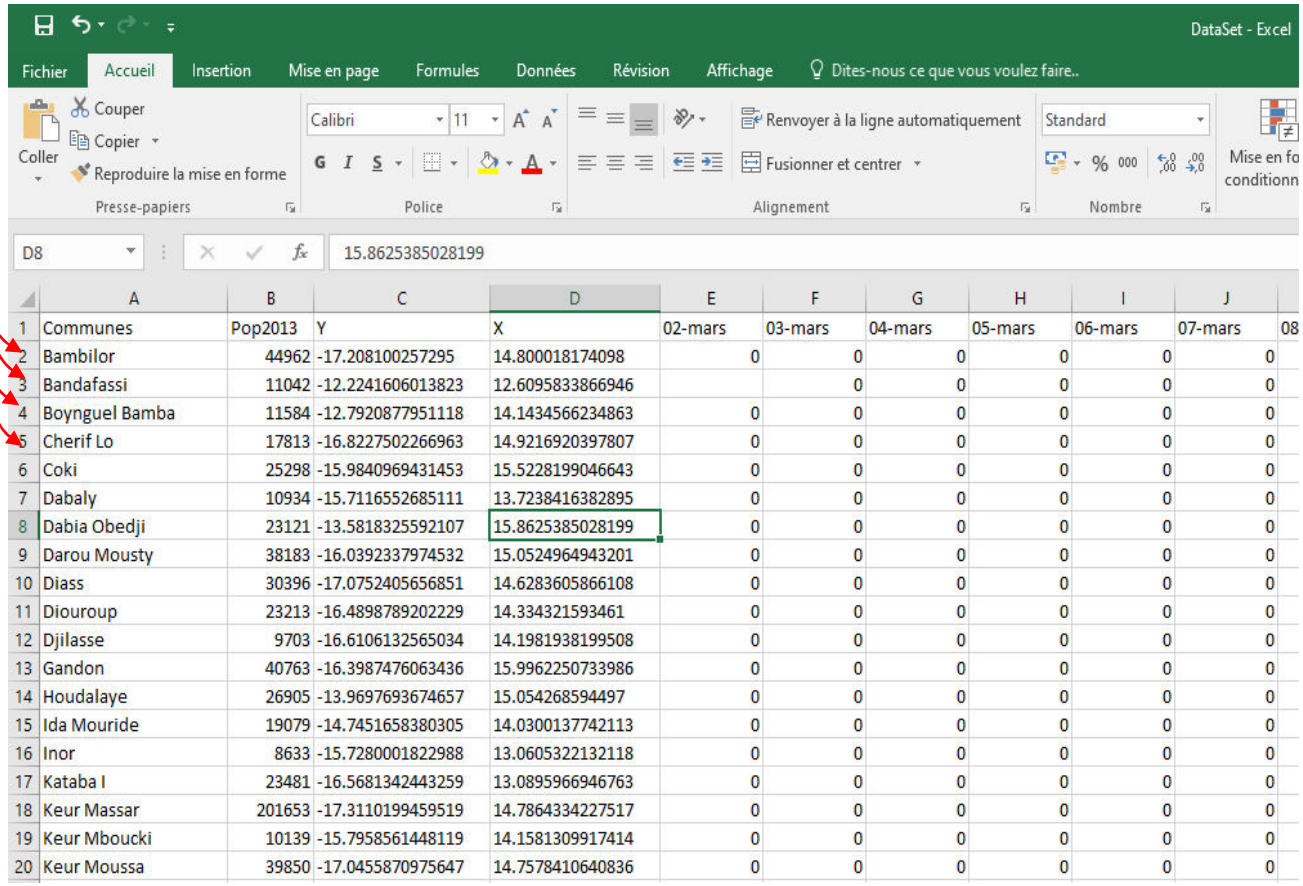
Vérifier l'écriture (aucune ne doit manquer même si 0 cas)



	A	B	C	D	E	F	G	H	I	J
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars
2	Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0	0
3	Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0	0
4	Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0	0
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0	0
6	Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0	0
7	Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0	0
8	Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0	0
9	Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0	0
10	Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0	0
11	Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0	0
12	Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0
13	Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0
14	Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0
16	Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0
17	Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0
18	Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0
19	Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0
20	Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0

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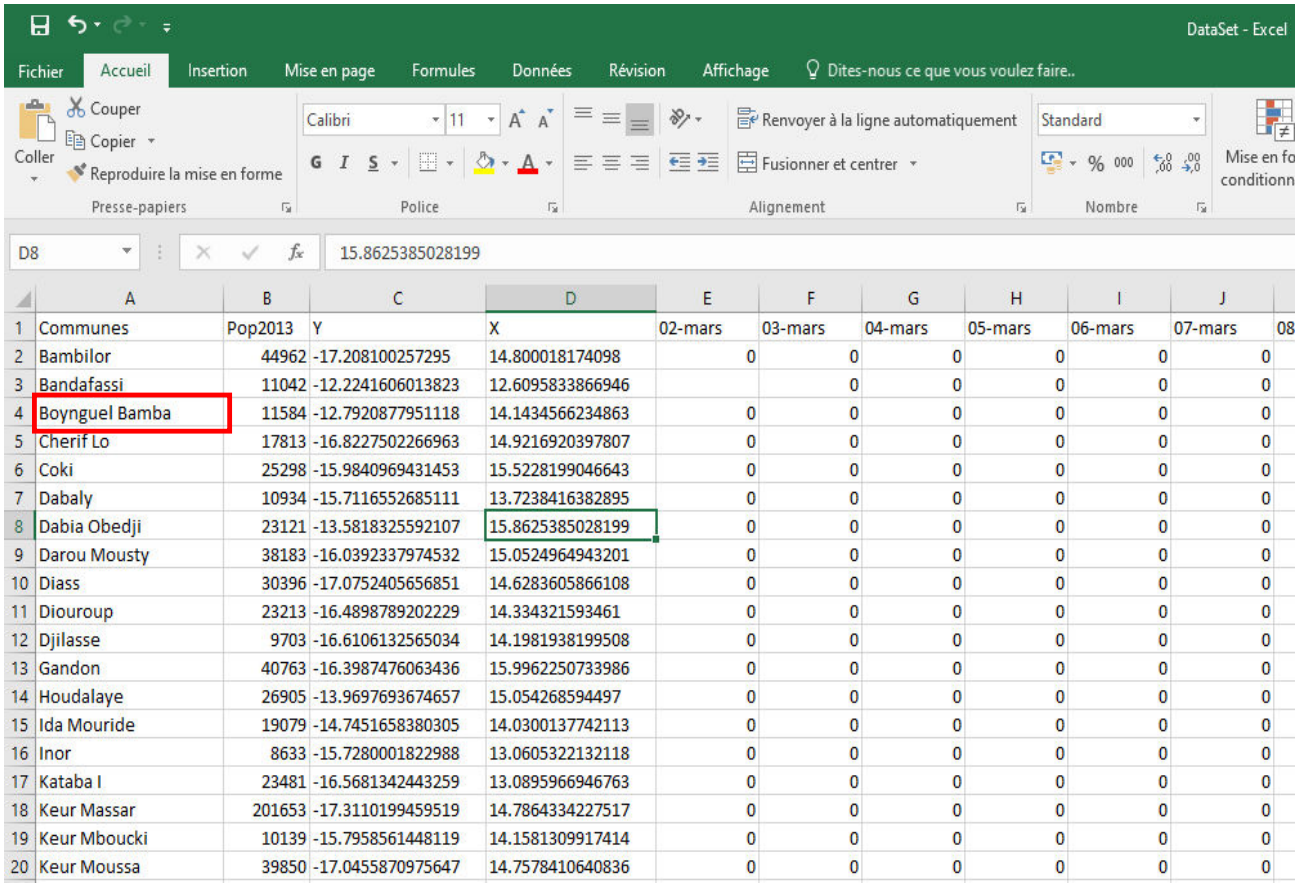

	A	B	C	D	E	F	G	H	I	J
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars
2	Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0	0
3	Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0	0
4	Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0	0
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0	0
6	Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0	0
7	Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0	0
8	Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0	0
9	Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0	0
10	Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0	0
11	Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0	0
12	Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0
13	Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0
14	Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0
16	Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0
17	Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0
18	Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0
19	Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0
20	Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0

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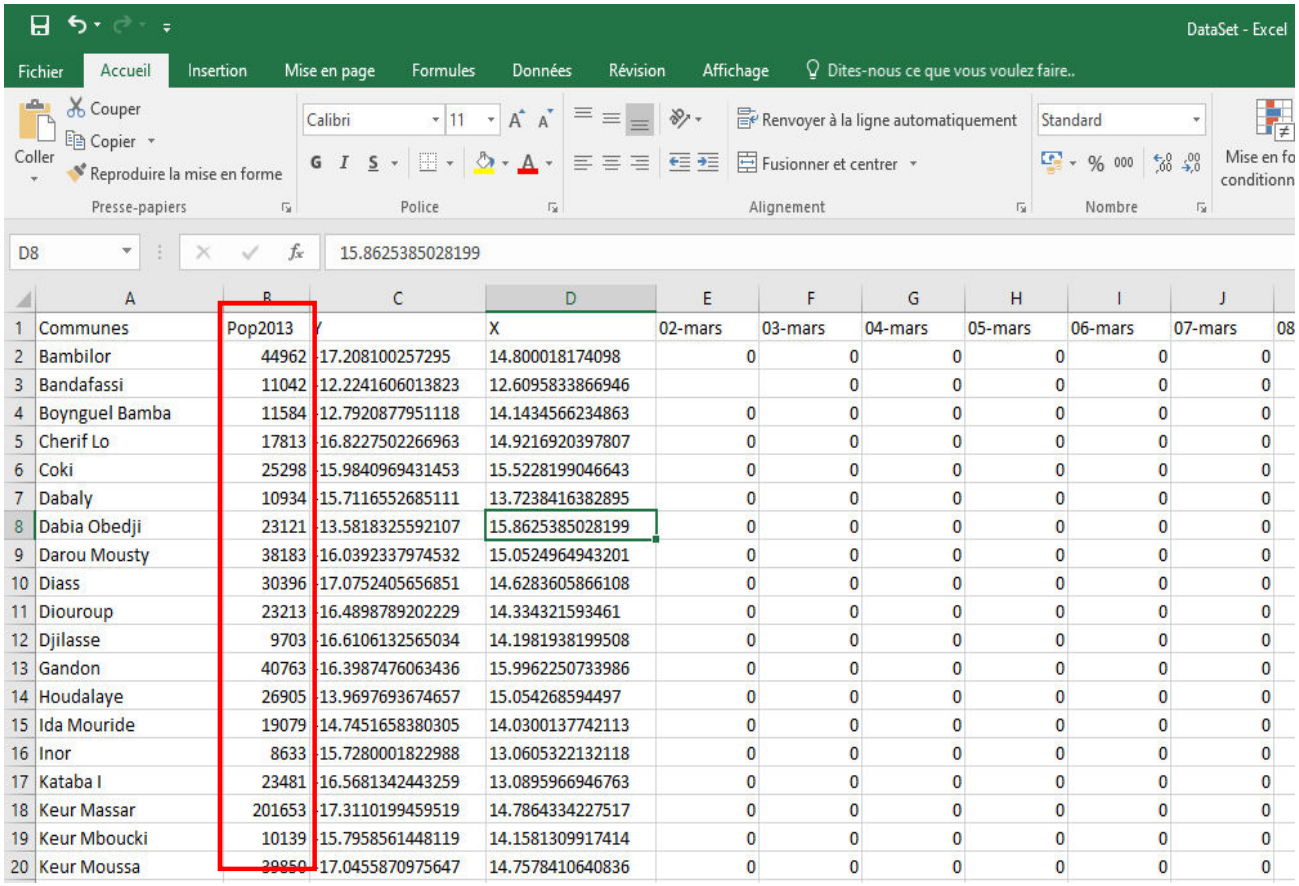

	A	B	C	D	E	F	G	H	I	J	
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars	08
2	Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0	0	
3	Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0	0	
4	Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0	0	
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0	0	
6	Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0	0	
7	Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0	0	
8	Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0	0	
9	Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0	0	
10	Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0	0	
11	Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0	0	
12	Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0	
13	Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0	
14	Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0	
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0	
16	Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0	
17	Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0	
18	Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0	
19	Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0	
20	Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0	

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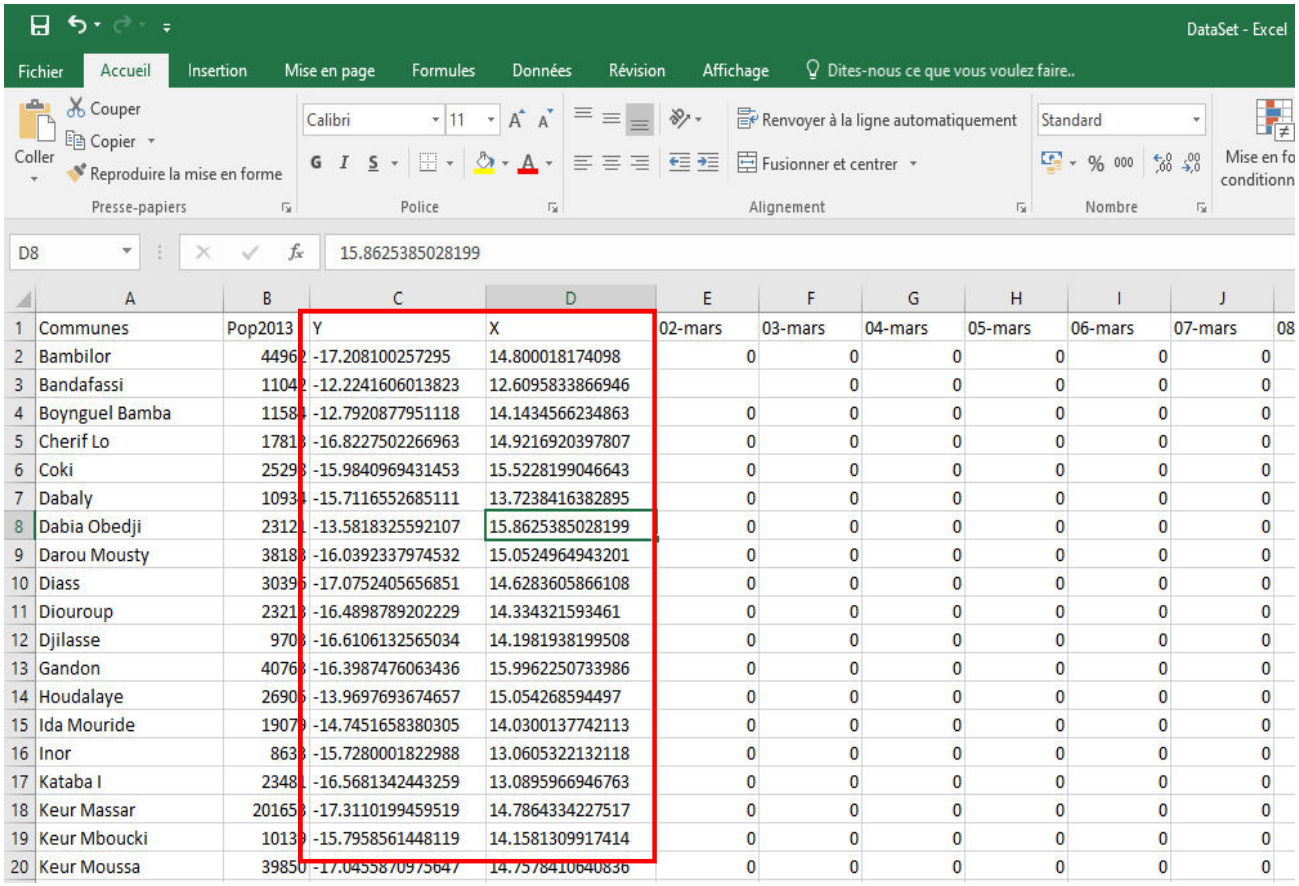

	A	B	C	D	E	F	G	H	I	J	08
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars	
2	Bambilor	4496	-17.208100257295	14.800018174098	0	0	0	0	0	0	
3	Bandafassi	1104	-12.2241606013823	12.6095833866946		0	0	0	0	0	
4	Boynguel Bamba	1158	-12.7920877951118	14.1434566234863	0	0	0	0	0	0	
5	Cherif Lo	1781	-16.8227502266963	14.9216920397807	0	0	0	0	0	0	
6	Coki	2529	-15.9840969431453	15.5228199046643	0	0	0	0	0	0	
7	Dabaly	1093	-15.7116552685111	13.7238416382895	0	0	0	0	0	0	
8	Dabia Obedji	2312	-13.5818325592107	15.8625385028199	0	0	0	0	0	0	
9	Darou Mousty	3818	-16.0392337974532	15.0524964943201	0	0	0	0	0	0	
10	Diass	3039	-17.0752405656851	14.6283605866108	0	0	0	0	0	0	
11	Diouroup	2321	-16.4898789202229	14.334321593461	0	0	0	0	0	0	
12	Djilasse	970	-16.6106132565034	14.1981938199508	0	0	0	0	0	0	
13	Gandon	4076	-16.3987476063436	15.9962250733986	0	0	0	0	0	0	
14	Houdalaye	2690	-13.9697693674657	15.054268594497	0	0	0	0	0	0	
15	Ida Mouride	1907	-14.7451658380305	14.0300137742113	0	0	0	0	0	0	
16	Inor	863	-15.7280001822988	13.0605322132118	0	0	0	0	0	0	
17	Kataba I	2348	-16.5681342443259	13.0895966946763	0	0	0	0	0	0	
18	Keur Massar	20165	-17.3110199459519	14.7864334227517	0	0	0	0	0	0	
19	Keur Mboucki	1013	-15.7958561448119	14.1581309917414	0	0	0	0	0	0	
20	Keur Moussa	3985	-17.0455870975647	14.7578410640836	0	0	0	0	0	0	

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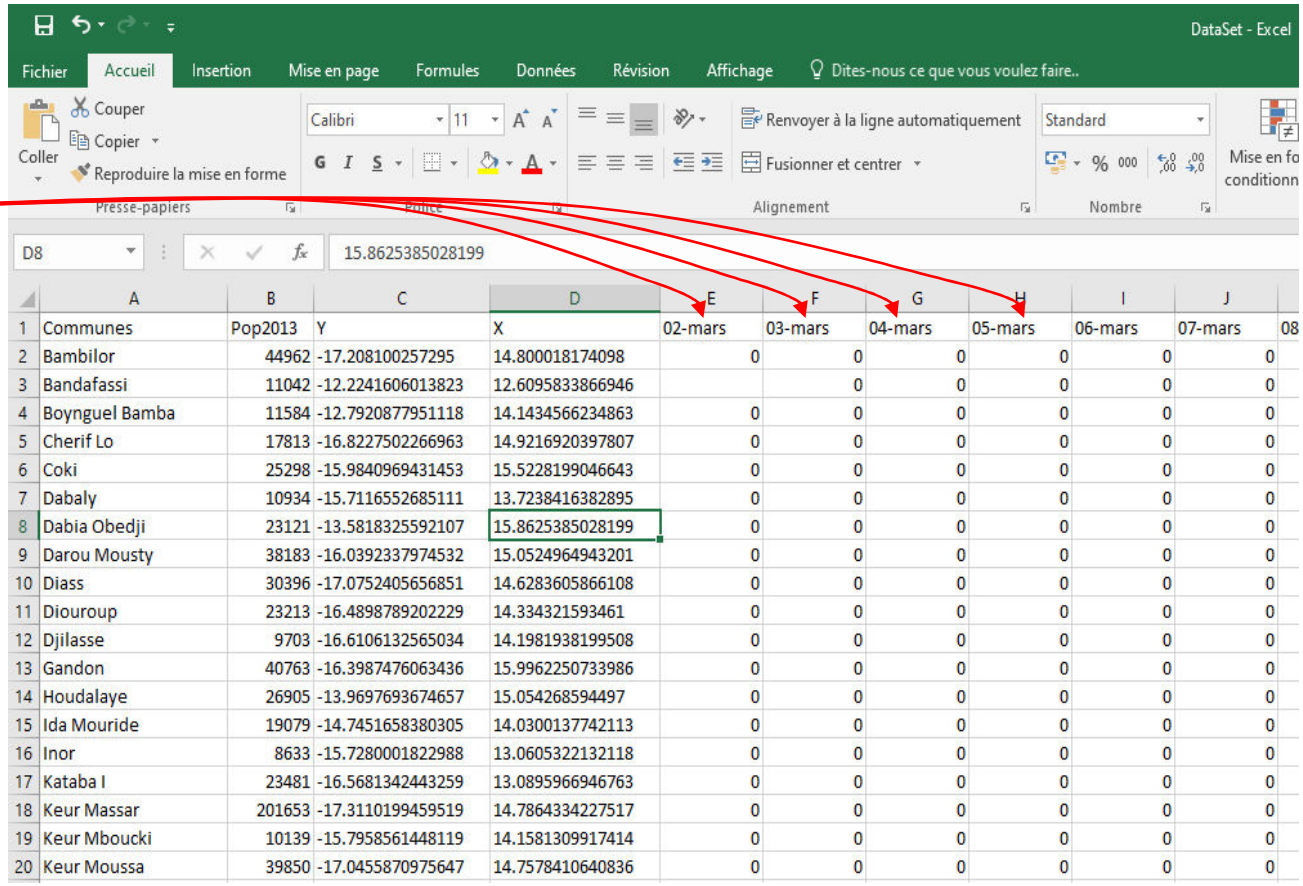


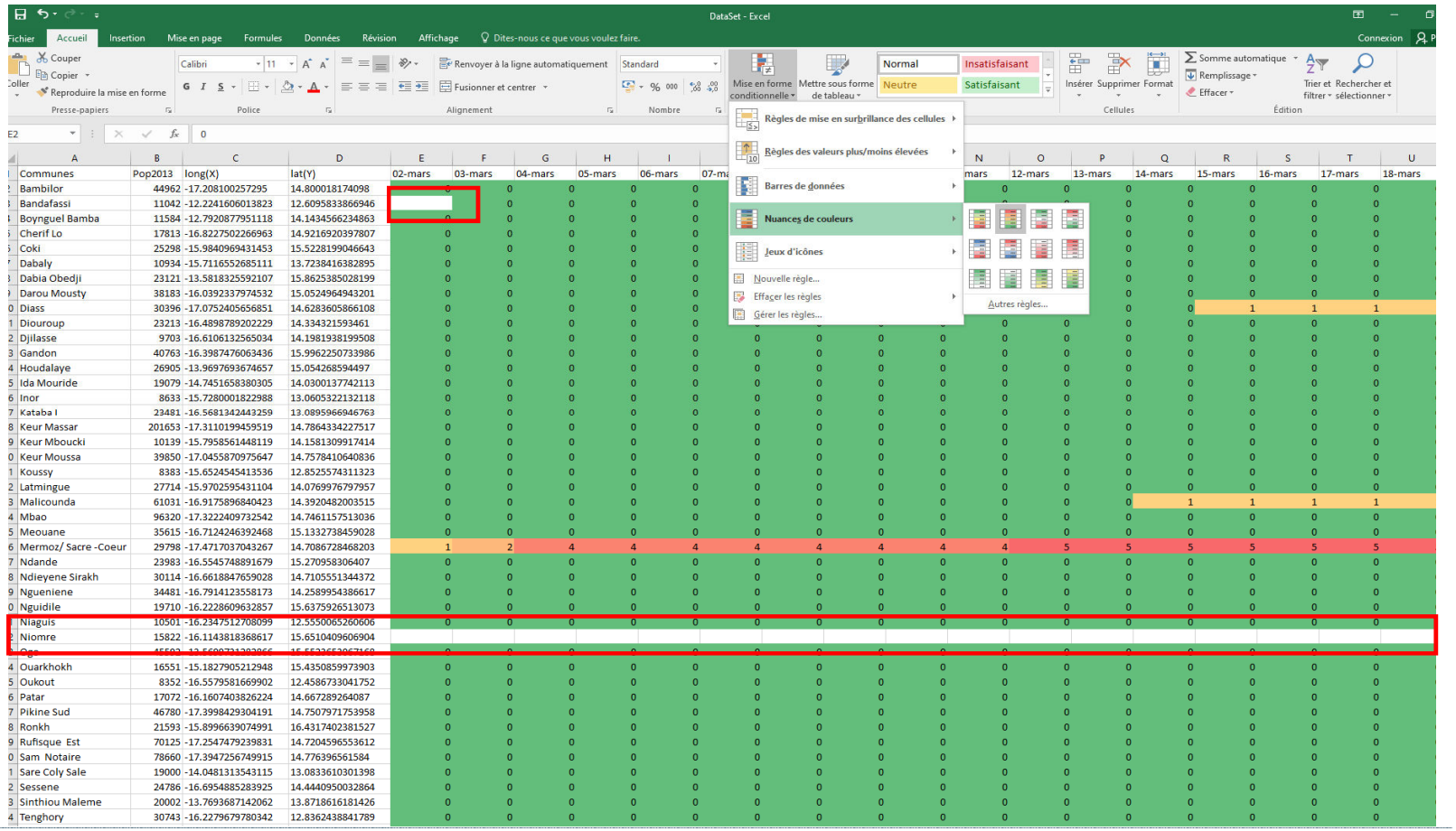
	A	B	C	D	E	F	G	H	I	J	
1	Communes	Pop2013	Y	X	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars	08
2	Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0	0	
3	Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0	0	
4	Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0	0	
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0	0	
6	Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0	0	
7	Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0	0	
8	Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0	0	
9	Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0	0	
10	Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0	0	
11	Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0	0	
12	Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0	
13	Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0	
14	Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0	
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0	
16	Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0	
17	Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0	
18	Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0	
19	Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0	
20	Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0	

Vérifier les dates (aucune ne doit manquer, même si 0 cas)

Séries Temporelles : Format

Repérer les erreurs :

- « trous »
- Cumuls faux



Communes	Pop2013	long(X)	lat(Y)	02-mars	03-mars	04-mars	05-mars	06-mars	07-ma	mars	12-mars	13-mars	14-mars	15-mars	16-mars	17-mars	18-mars
Bambilor	44962	-17.208100257295	14.800018174098	0	0	0	0	0			0	0	0	0	0	0	
Bandafassi	11042	-12.2241606013823	12.6095833866946		0	0	0	0					0	0	0	0	
Boynguel Bamba	11584	-12.7920877951118	14.1434566234863	0	0	0	0	0					0	0	0	0	
Cherif Lo	17813	-16.8227502266963	14.9216920397807	0	0	0	0	0					0	0	0	0	
Coki	25298	-15.9840969431453	15.5228199046643	0	0	0	0	0					0	0	0	0	
Dabaly	10934	-15.7116552685111	13.7238416382895	0	0	0	0	0					0	0	0	0	
Dabia Obedji	23121	-13.5818325592107	15.8625385028199	0	0	0	0	0					0	0	0	0	
Darou Mousty	38183	-16.0392337974532	15.0524964943201	0	0	0	0	0					0	0	0	0	
Diass	30396	-17.0752405656851	14.6283605866108	0	0	0	0	0					0	1	1	1	
Diouroup	23213	-16.4898789202229	14.334321593461	0	0	0	0	0			0	0	0	0	0	0	
Djilasse	9703	-16.6106132565034	14.1981938199508	0	0	0	0	0	0	0	0	0	0	0	0	0	
Gandon	40763	-16.3987476063436	15.9962250733986	0	0	0	0	0	0	0	0	0	0	0	0	0	
Houdalaye	26905	-13.9697693674657	15.054268594497	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ida Mouride	19079	-14.7451658380305	14.0300137742113	0	0	0	0	0	0	0	0	0	0	0	0	0	
Inor	8633	-15.7280001822988	13.0605322132118	0	0	0	0	0	0	0	0	0	0	0	0	0	
Kataba I	23481	-16.5681342443259	13.0895966946763	0	0	0	0	0	0	0	0	0	0	0	0	0	
Keur Massar	201653	-17.3110199459519	14.7864334227517	0	0	0	0	0	0	0	0	0	0	0	0	0	
Keur Mboucki	10139	-15.7958561448119	14.1581309917414	0	0	0	0	0	0	0	0	0	0	0	0	0	
Keur Moussa	39850	-17.0455870975647	14.7578410640836	0	0	0	0	0	0	0	0	0	0	0	0	0	
Koussy	8383	-15.6524545413536	12.8525574311323	0	0	0	0	0	0	0	0	0	0	0	0	0	
Latmingue	27714	-15.9702595431104	14.0769976797957	0	0	0	0	0	0	0	0	0	0	0	0	0	
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Mbao	96320	-17.3222409732542	14.7461157513036	0	0	0	0	0	0	0	0	0	0	0	0	0	
Meouane	35615	-16.7124246392468	15.1332738459028	0	0	0	0	0	0	0	0	0	0	0	0	0	
Mermoz/ Sacre -Coeur	29798	-17.4717037043267	14.7086728468203	1	2	4	4	4	4	4	4	5	5	5	5	5	5
Ndande	23983	-16.5545748891679	15.270958306407	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ndieyene Sirakh	30114	-16.6618847659028	14.7105551344372	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ngueniene	34481	-16.7914123558173	14.2589954386617	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nguidile	19710	-16.2228609632857	15.6375926513073	0	0	0	0	0	0	0	0	0	0	0	0	0	
Niaguis	10501	-16.2347512708099	12.5550065260606	0	0	0	0	0	0	0	0	0	0	0	0	0	
Niomre	15822	-16.1143818368617	15.6510409606904														
Ogo	45593	-13.5608731383865	15.5523653067168	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ouarkhokh	16551	-15.1827905212948	15.4350859973903	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oukout	8352	-16.5579581669902	12.4586733041752	0	0	0	0	0	0	0	0	0	0	0	0	0	
Patar	17072	-16.1607403826224	14.667289264087	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pikine Sud	46780	-17.3998429304191	14.7507971753958	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ronkh	21593	-15.8996639074991	16.4317402381527	0	0	0	0	0	0	0	0	0	0	0	0	0	
Rufisque Est	70125	-17.2547479239831	14.7204596553612	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sam Notaire	78660	-17.3947256749915	14.776396561584	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sare Coly Sale	19000	-14.0481313543115	13.0833610301398	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sessene	24786	-16.6954885283925	14.4440950032864	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sinthiou Maleme	20002	-13.7693687142062	13.8718616181426	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tenghory	30743	-16.2279679780342	12.8362438841789	0	0	0	0	0	0	0	0	0	0	0	0	0	

Séries Temporelles : Format

Repérer les erreurs :

« trous »

Cumuls faux

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	1	1	1	1	1	1	0	0	2
0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

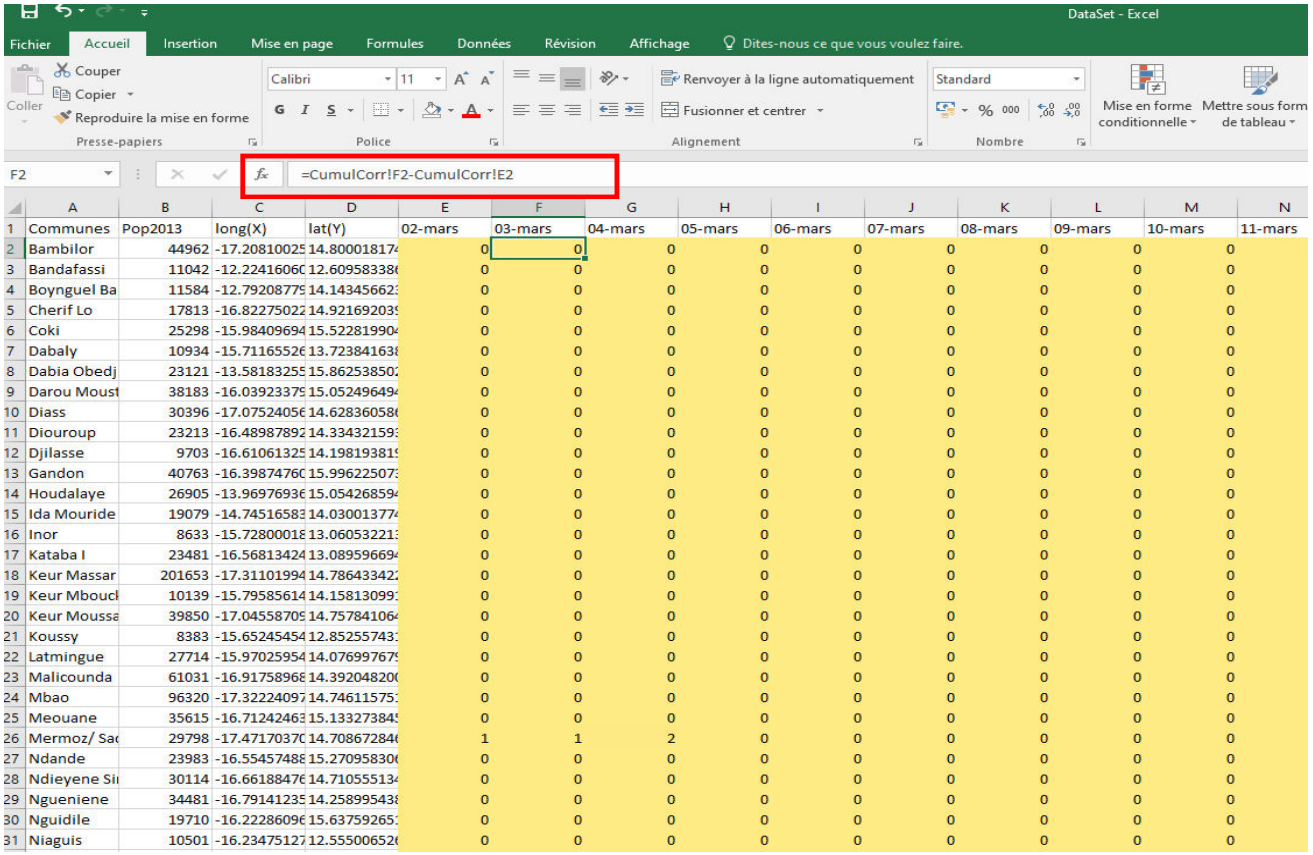
in	11-juin	12-juin	13-juin	14-juin
105	106	109		110
1	1	1		1
63	63	63		63
16	16	16		18
2	2	2		2
4	4	4		4
2	2	2		2
1	1	1		1
24	26	26		54
2	2	2		2
1	1	1		1
6	6	6		6
1	1	1		1
2	3	3		3
9	9	9		10
4	4	4		4
85	86	89		95
1	1	1		1
55	55	56		55
108	108	108		108
7	8	8		15
29	29	29		29
155	159	166		175
6	6	6		6
2609	2683	2727		2851
0	0	1		1
3	6	6		10
1	1	1		2
31	31	31		31
50	50	51		58
1	1	1		1
6	6	8		9
6	6	6		6
5	6	6		6
4	4	4	0	5
107	113	116		122
1	2	2		2
127	131	135		142

Séries Temporelles : Nombre de cas incidents

Calcul du nombre de cas incidents

= nouveaux cas par unité de temps (j)

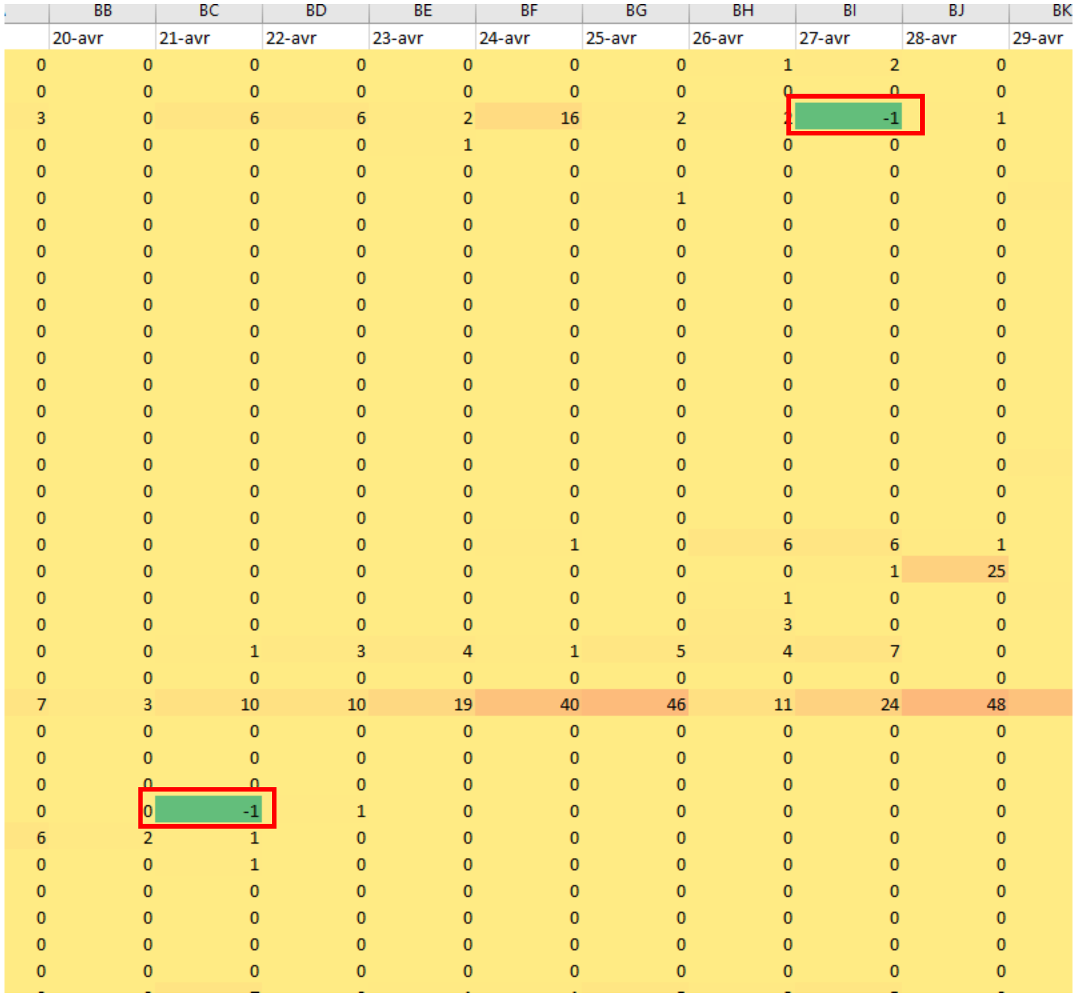
Cumul(Date2) – Cumul(Date1)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Communes	Pop2013	long(X)	lat(Y)	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars	08-mars	09-mars	10-mars	11-mars
2	Bambilor	44962	-17.20810025	14.80001817	0	0	0	0	0	0	0	0	0	
3	Bandafassi	11042	-12.22416060	12.60958338	0	0	0	0	0	0	0	0	0	
4	Boynguel Ba	11584	-12.79208779	14.14345662	0	0	0	0	0	0	0	0	0	
5	Cherif Lo	17813	-16.82275022	14.92169203	0	0	0	0	0	0	0	0	0	
6	Coki	25298	-15.98409694	15.52281990	0	0	0	0	0	0	0	0	0	
7	Dabaly	10934	-15.71165526	13.72384163	0	0	0	0	0	0	0	0	0	
8	Dabia Obedj	23121	-13.58183255	15.86253850	0	0	0	0	0	0	0	0	0	
9	Darou Moust	38183	-16.03923379	15.05249649	0	0	0	0	0	0	0	0	0	
10	Diass	30396	-17.07524056	14.62836058	0	0	0	0	0	0	0	0	0	
11	Diouroup	23213	-16.48987892	14.33432159	0	0	0	0	0	0	0	0	0	
12	Djilasse	9703	-16.61061325	14.19819381	0	0	0	0	0	0	0	0	0	
13	Gandon	40763	-16.39874760	15.99622507	0	0	0	0	0	0	0	0	0	
14	Houdalaye	26905	-13.96976936	15.05426859	0	0	0	0	0	0	0	0	0	
15	Ida Mouride	19079	-14.74516583	14.03001377	0	0	0	0	0	0	0	0	0	
16	Inor	8633	-15.72800018	13.06053221	0	0	0	0	0	0	0	0	0	
17	Kataba I	23481	-16.56813424	13.08959669	0	0	0	0	0	0	0	0	0	
18	Keur Massar	201653	-17.31101994	14.78643342	0	0	0	0	0	0	0	0	0	
19	Keur Mbouch	10139	-15.79585614	14.15813099	0	0	0	0	0	0	0	0	0	
20	Keur Moussa	39850	-17.04558709	14.75784106	0	0	0	0	0	0	0	0	0	
21	Koussy	8383	-15.65245454	12.85255743	0	0	0	0	0	0	0	0	0	
22	Latmingue	27714	-15.97025954	14.07699767	0	0	0	0	0	0	0	0	0	
23	Malicounda	61031	-16.91758968	14.39204820	0	0	0	0	0	0	0	0	0	
24	Mbao	96320	-17.32224097	14.74611575	0	0	0	0	0	0	0	0	0	
25	Meouane	35615	-16.71242463	15.13327384	0	0	0	0	0	0	0	0	0	
26	Mermoz/ Sac	29798	-17.47170370	14.70867284	1	1	2	0	0	0	0	0	0	
27	Ndande	23983	-16.55457488	15.27095830	0	0	0	0	0	0	0	0	0	
28	Ndieyene Si	30114	-16.66188476	14.71055513	0	0	0	0	0	0	0	0	0	
29	Ngueniene	34481	-16.79141235	14.25899543	0	0	0	0	0	0	0	0	0	
30	Nguidile	19710	-16.22286096	15.63759265	0	0	0	0	0	0	0	0	0	
31	Niaguis	10501	-16.23475127	12.55500652	0	0	0	0	0	0	0	0	0	

Séries Temporelles : Nombre de cas incidents

Repérage d'erreurs



	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK
	20-avr	21-avr	22-avr	23-avr	24-avr	25-avr	26-avr	27-avr	28-avr	29-avr
0	0	0	0	0	0	0	1	2	0	
0	0	0	0	0	0	0	0	0	0	
3	0	6	6	2	16	2	2	-1	1	
0	0	0	0	1	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	1	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	1	0	6	6	1	
0	0	0	0	0	0	0	0	1	25	
0	0	0	0	0	0	0	1	0	0	
0	0	0	0	0	0	0	3	0	0	
0	0	1	3	4	1	5	4	7	0	
0	0	0	0	0	0	0	0	0	0	
7	3	10	10	19	40	46	11	24	48	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	-1	1	0	0	0	0	0	0	
6	2	1	0	0	0	0	0	0	0	
0	0	1	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	

Séries Temporelles : Nombre de cas incidents

Vérification

Somme[Cas(Date1):Cas(DateFin)]

=SOMME(E2:DE2)

CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG
28-mai	29-mai	30-mai	31-mai	01-juin	02-juin	03-juin	04-juin	05-juin	06-juin	07-juin	08-juin	09-juin	10-juin	11-juin	12-juin	13-juin	14-juin		TotCommune
1	0	1	1	0	2	1	6	0	0	0	3	4	3	3	1	3	0	1	110
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	1	0	7	1	2	2	0	0	0	1	0	0	0	0	0	2	18
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	4	1	1	0	6	0	3	3	0	1	2	0	0	28	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
0	0	0	0	0	0	0	0	6	0	2	0	0	1	0	0	0	1	0	10
0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4
0	6	4	1	1	1	3	1	3	9	0	13	3	2	3	1	3	0	6	95

Séries Temporelles : Taux d'Incidences

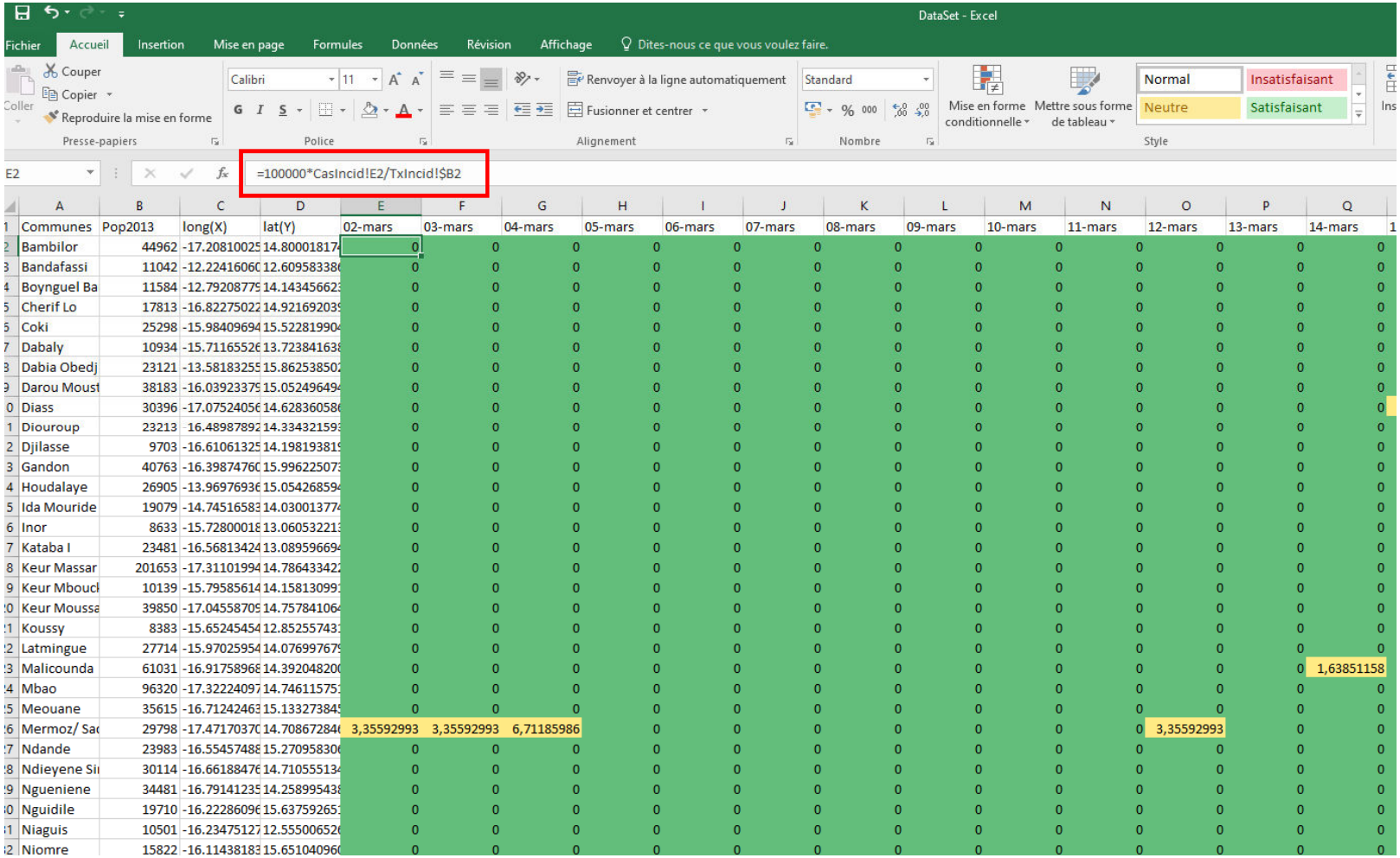
Définition : nouveaux cas pour N habitants x temps

$\Rightarrow$ vitesse

$$Taux\ Incidence = \frac{Cas\ Incidents}{Population \times Temps}$$

Séries Temporelles : Taux d'Incidences

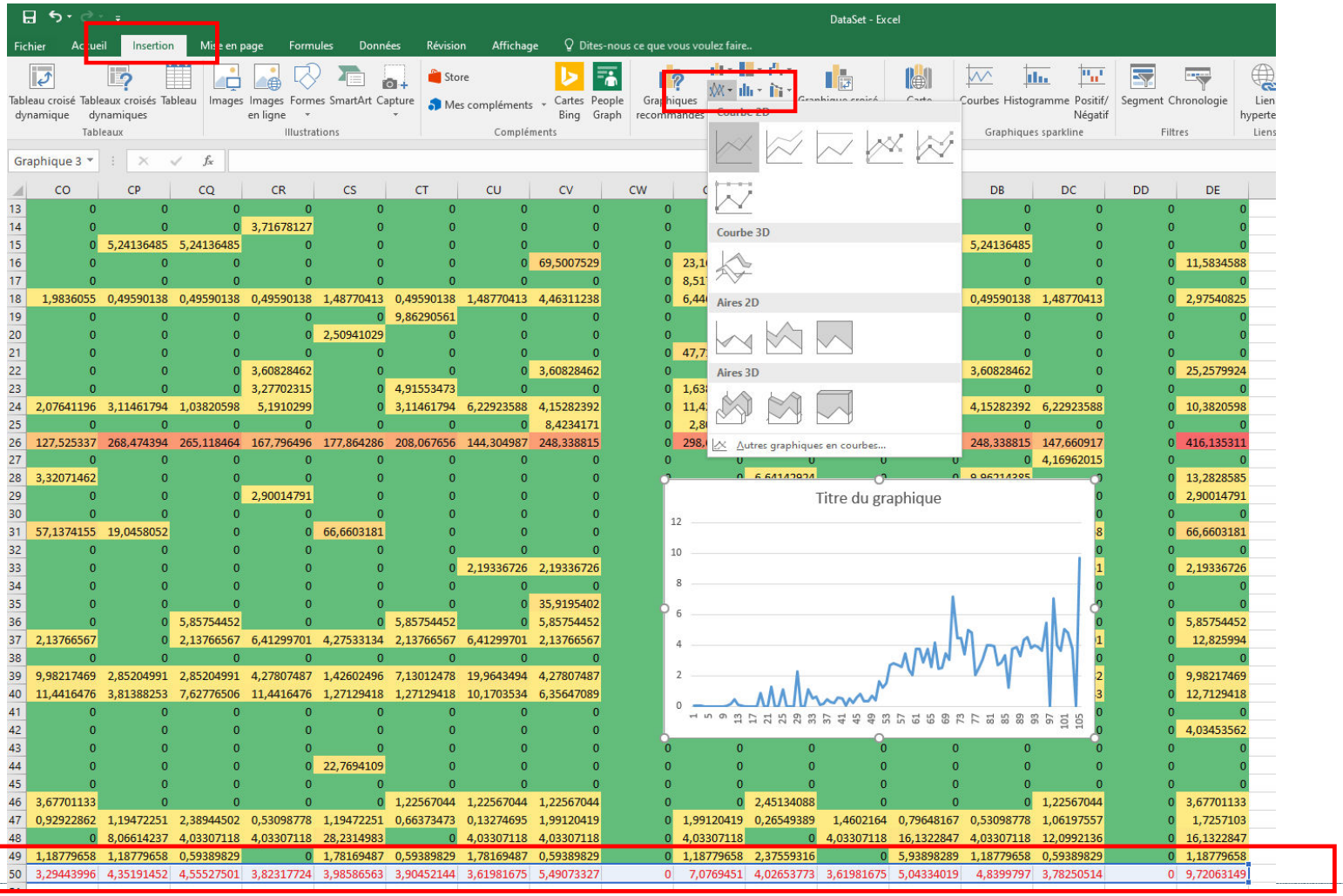
nouveaux cas pour N habitants x temps



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Communes	Pop2013	long(X)	lat(Y)	02-mars	03-mars	04-mars	05-mars	06-mars	07-mars	08-mars	09-mars	10-mars	11-mars	12-mars	13-mars	14-mars
2	Bambilor	44962	-17.20810025	14.80001817	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Bandafassi	11042	-12.22416060	12.60958338	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Boynguel Ba	11584	-12.79208779	14.14345662	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Cherif Lo	17813	-16.82275022	14.92169203	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Coki	25298	-15.98409694	15.52281990	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Dabaly	10934	-15.71165526	13.72384163	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Dabia Obedj	23121	-13.58183255	15.86253850	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Darou Moust	38183	-16.03923375	15.05249649	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Diass	30396	-17.07524056	14.62836058	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Diouroup	23213	16.48987892	14.33432159	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Djilasse	9703	-16.61061325	14.19819381	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Gandon	40763	-16.39874760	15.99622507	0	0	0	0	0	0	0	0	0	0	0	0	0
14	Houdalaye	26905	-13.96976936	15.05426859	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Ida Mouride	19079	-14.74516583	14.03001377	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Inor	8633	-15.72800018	13.06053221	0	0	0	0	0	0	0	0	0	0	0	0	0
17	Kataba I	23481	-16.56813424	13.08959669	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Keur Massar	201653	-17.31101994	14.78643342	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Keur Mbouc	10139	-15.79585614	14.15813099	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Keur Moussa	39850	-17.04558709	14.75784106	0	0	0	0	0	0	0	0	0	0	0	0	0
21	Koussy	8383	-15.65245454	12.85255743	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Latmingue	27714	-15.97025954	14.07699767	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Malicounda	61031	-16.91758968	14.39204820	0	0	0	0	0	0	0	0	0	0	0	0	1,63851158
24	Mbao	96320	-17.32224097	14.74611575	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Meouane	35615	-16.71242463	15.13327384	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Mermoz/ Sac	29798	-17.47170370	14.70867284	3,35592993	3,35592993	6,71185986	0	0	0	0	0	0	0	3,35592993	0	0
27	Ndande	23983	-16.55457488	15.27095830	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Ndieyene Si	30114	-16.66188476	14.71055513	0	0	0	0	0	0	0	0	0	0	0	0	0
29	Ngueniene	34481	-16.79141235	14.25899543	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Nguidile	19710	-16.22286096	15.63759265	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Niaguis	10501	-16.23475127	12.55500652	0	0	0	0	0	0	0	0	0	0	0	0	0
32	Niomre	15822	-16.11438183	15.65104096	0	0	0	0	0	0	0	0	0	0	0	0	0

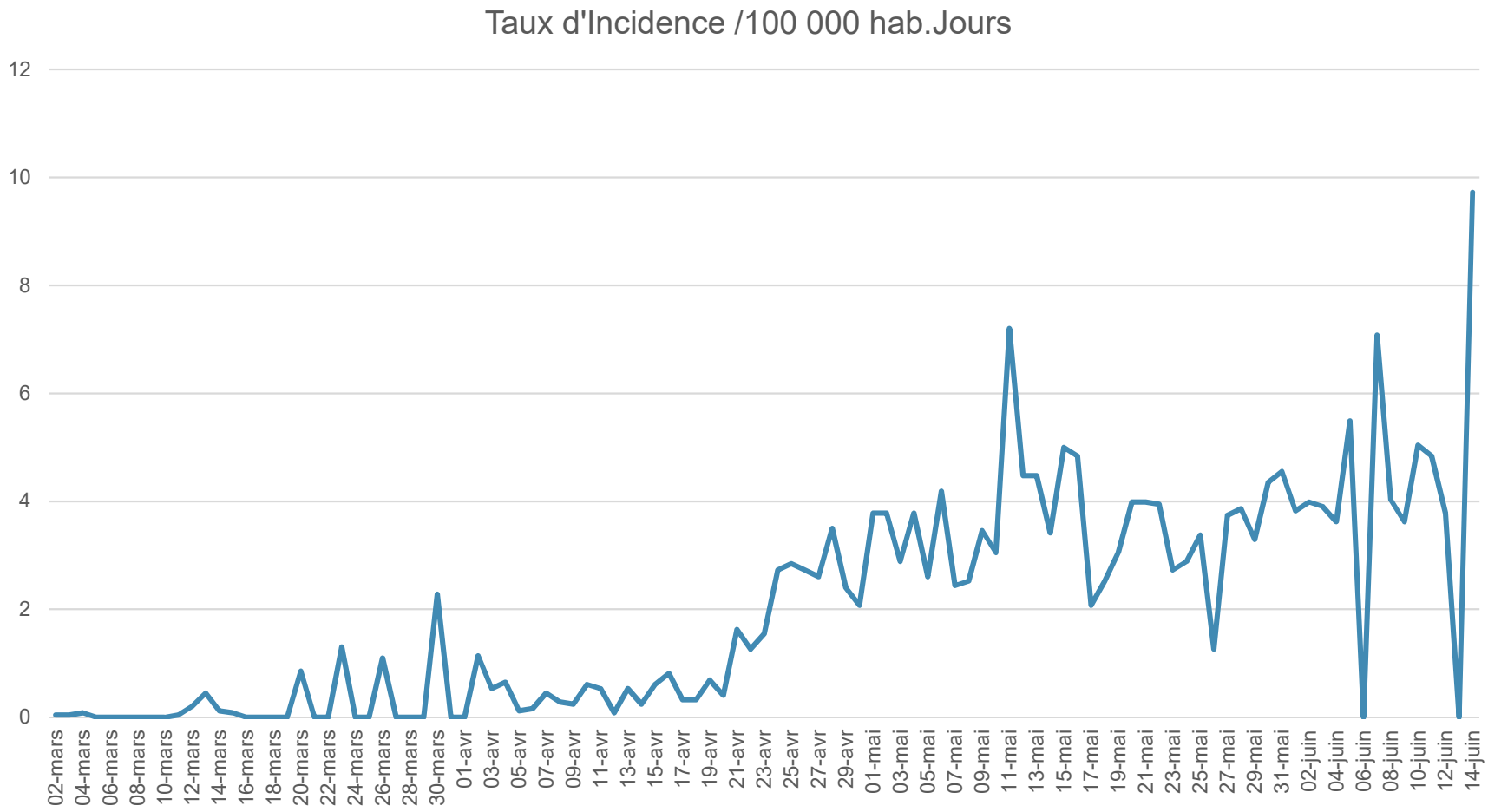
Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence



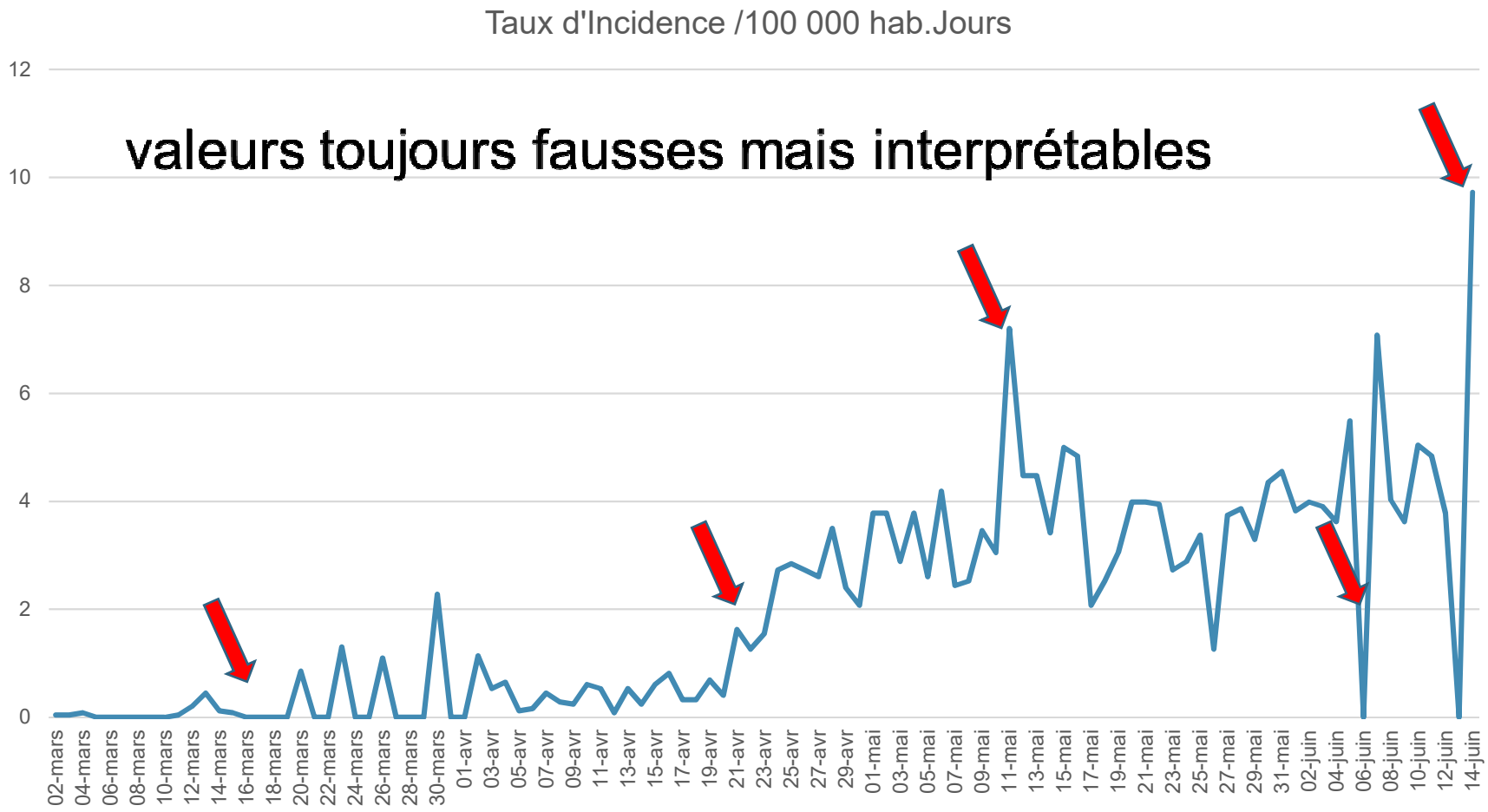
Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence



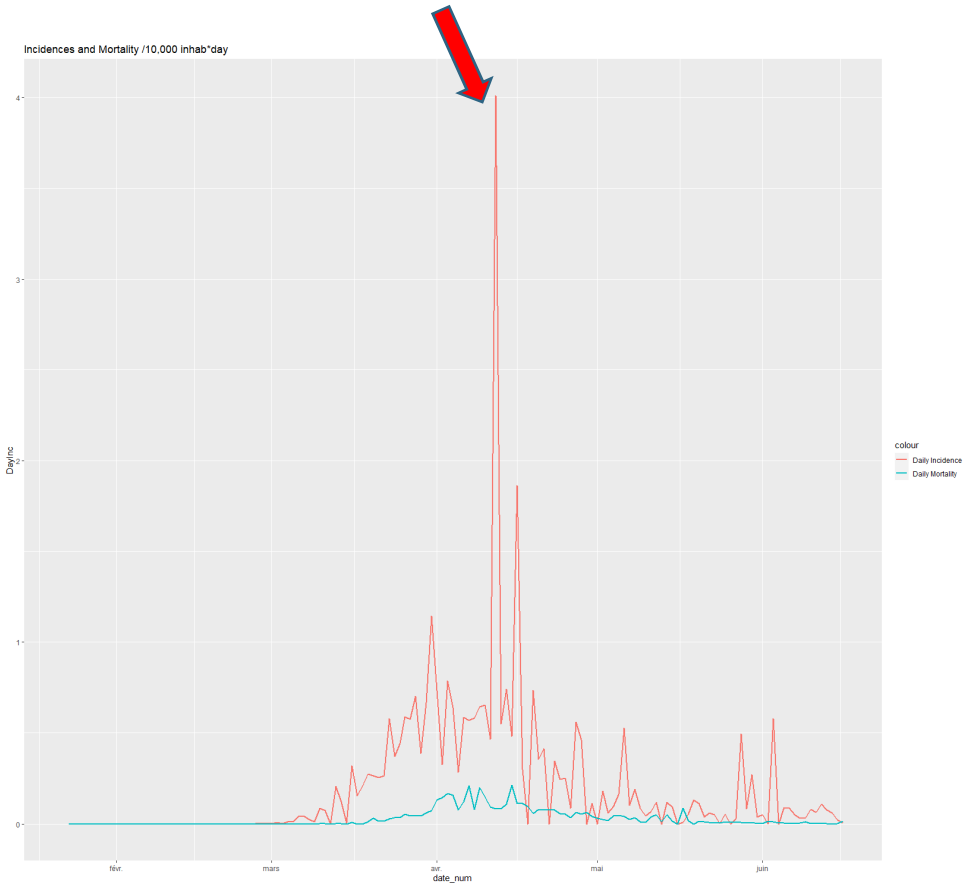
Séries Temporelles : Taux d'Incidences

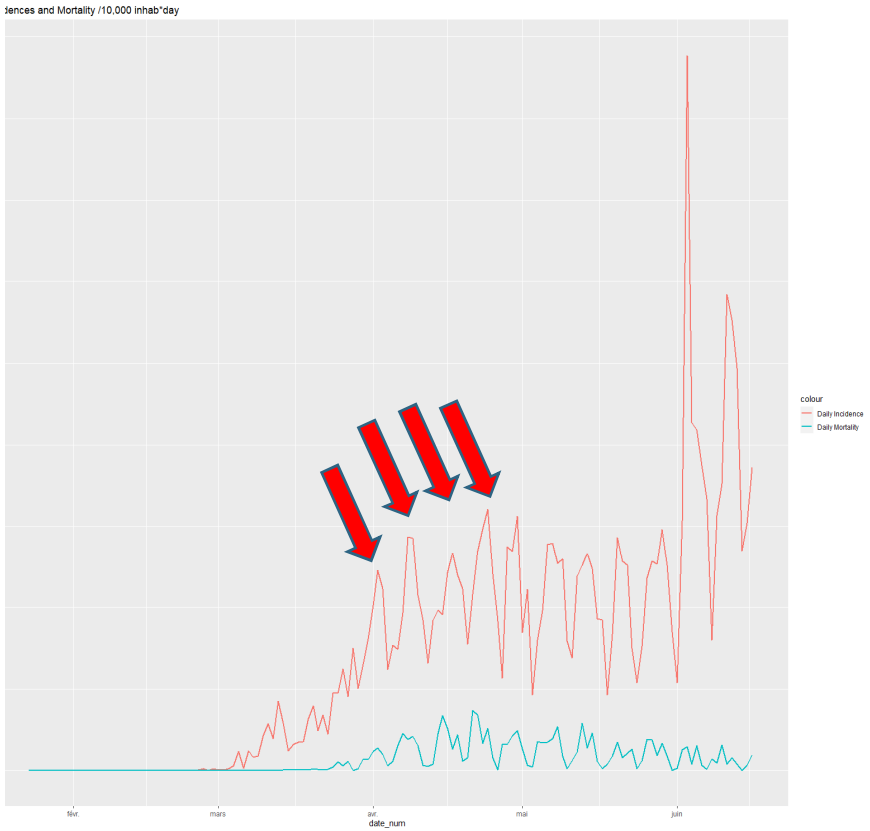
Courbe du taux d'incidence :



Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence : ex. France, Suède

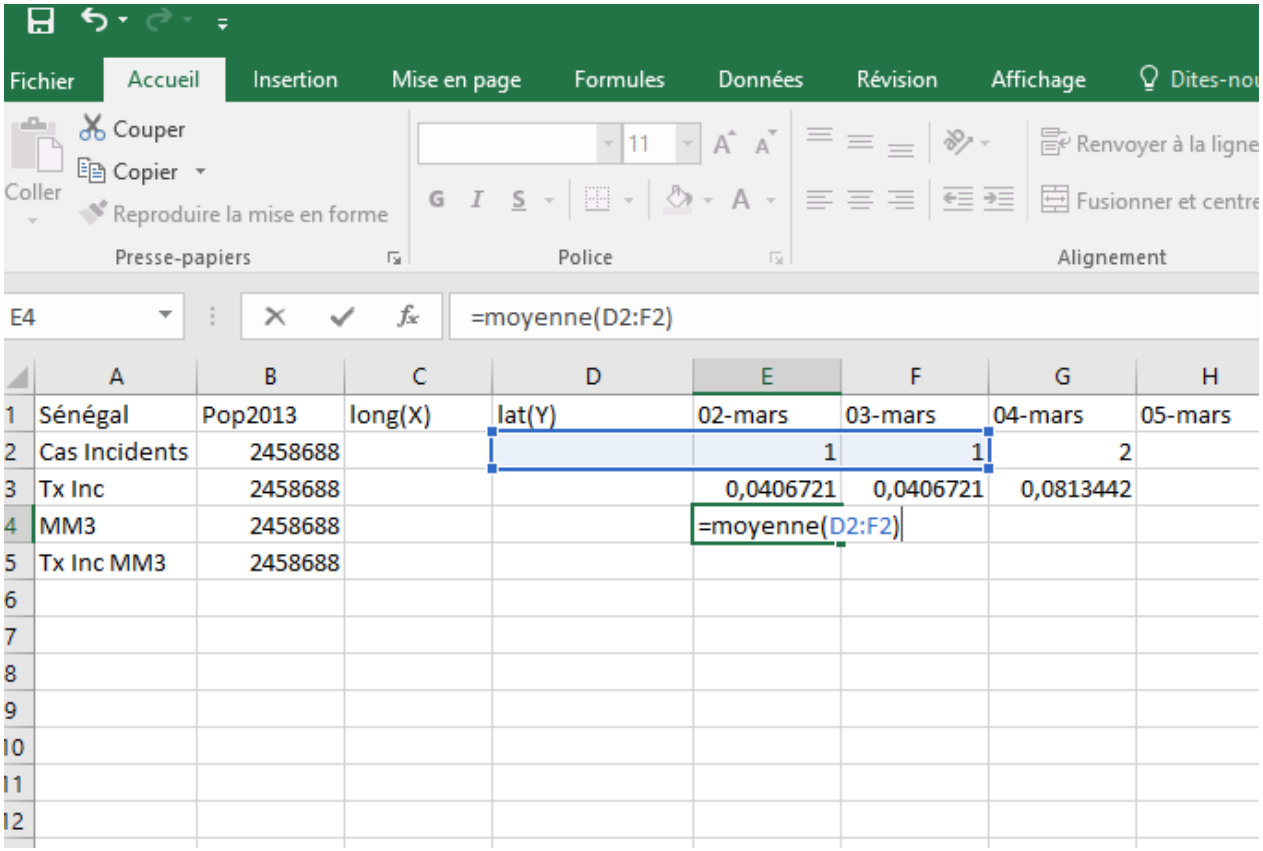




Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence : lissage moyenne mobile

MMCas(Date2) = moyenne [Cas(Date1), Cas(Date2), Cas(Date3)]

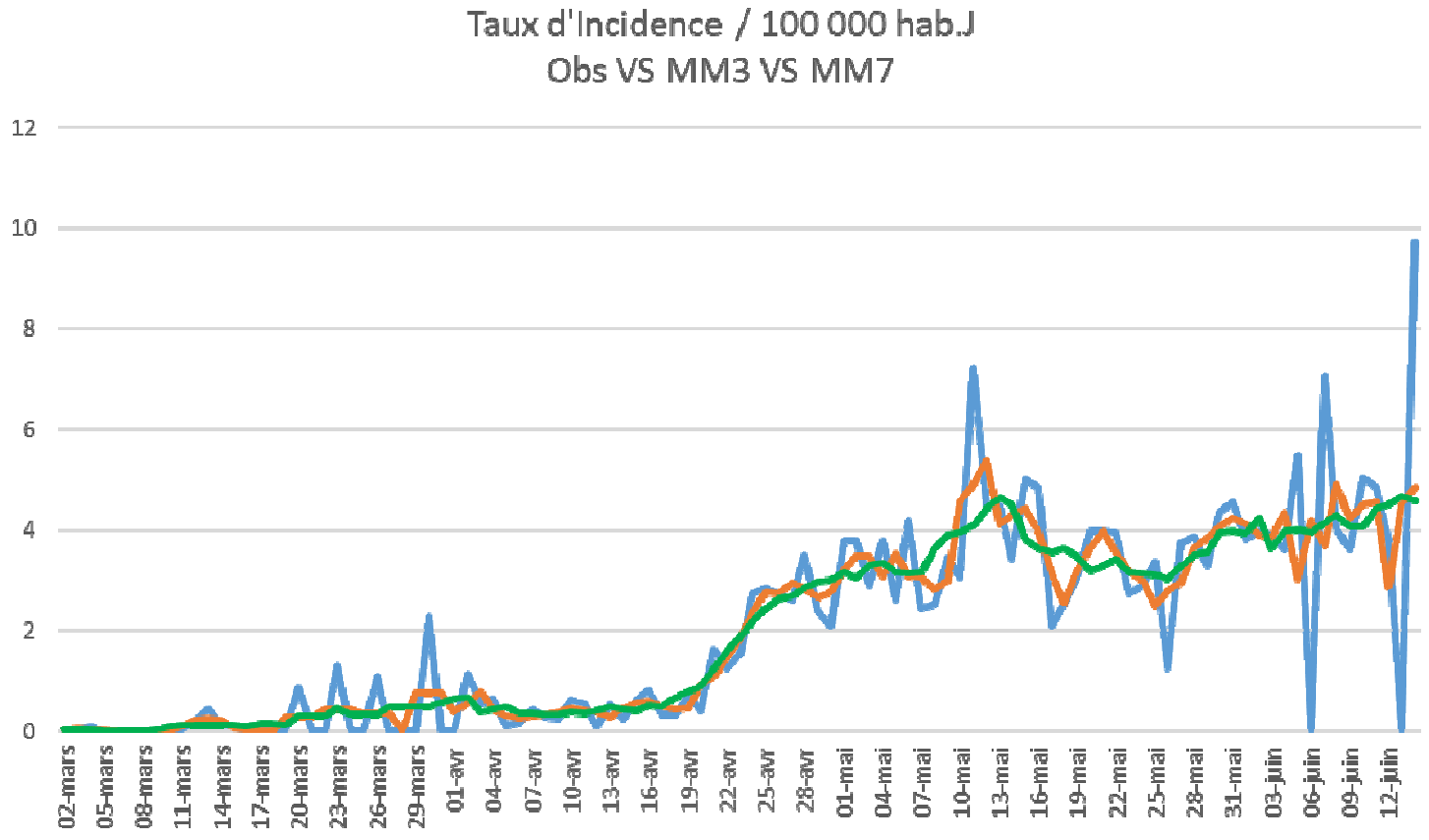


	A	B	C	D	E	F	G	H
1	Sénégal	Pop2013	long(X)	lat(Y)	02-mars	03-mars	04-mars	05-mars
2	Cas Incidents	2458688			1	1	2	
3	Tx Inc	2458688			0,0406721	0,0406721	0,0813442	
4	MM3	2458688			=moyenne(D2:F2)			
5	Tx Inc MM3	2458688						
6								
7								
8								
9								
10								
11								
12								

Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence : lissage moyenne mobile

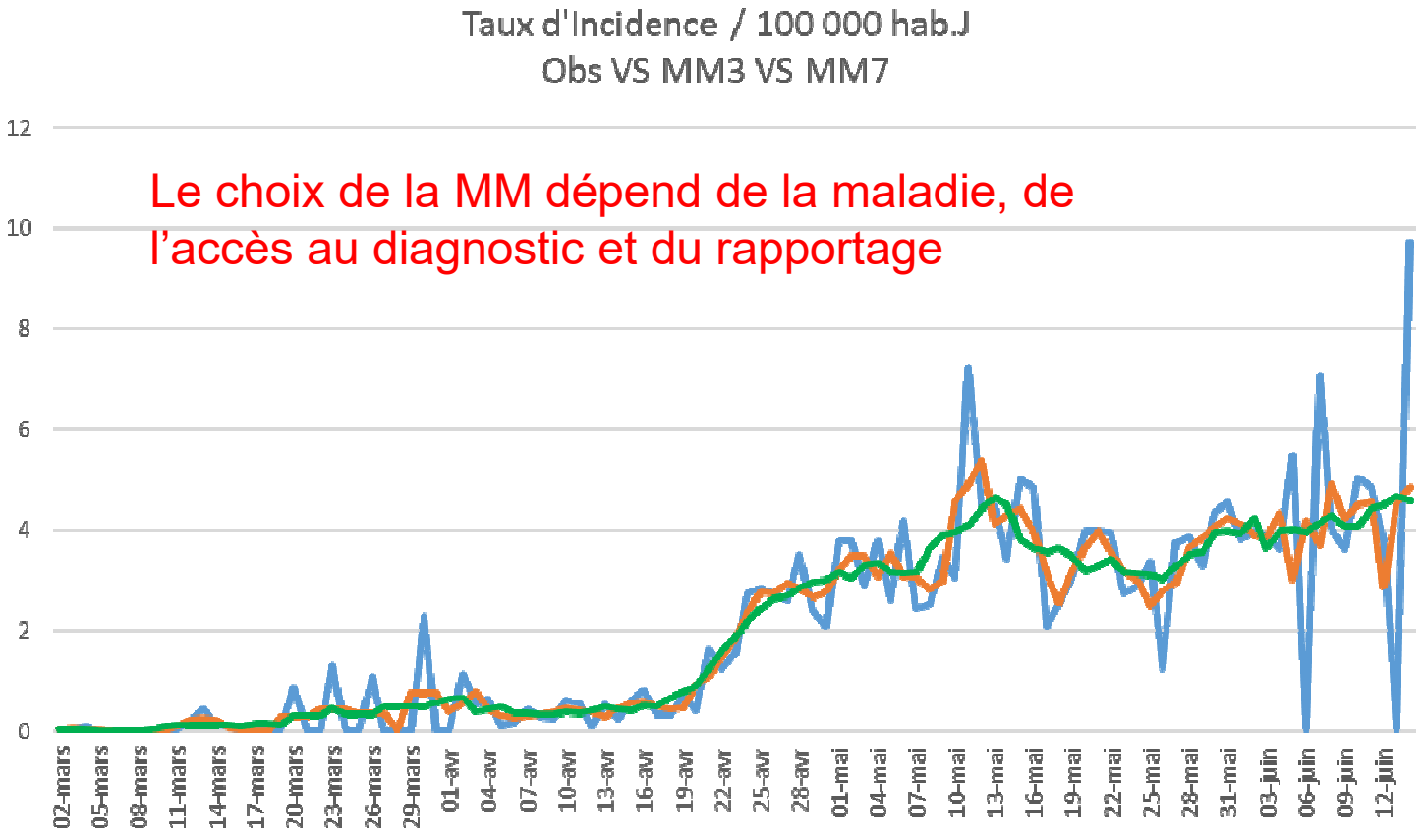
MMCas(Date2) = moyenne [Cas(Date1), Cas(Date2), Cas(Date3)]



Séries Temporelles : Taux d'Incidences

Courbe du taux d'incidence : lissage moyenne mobile

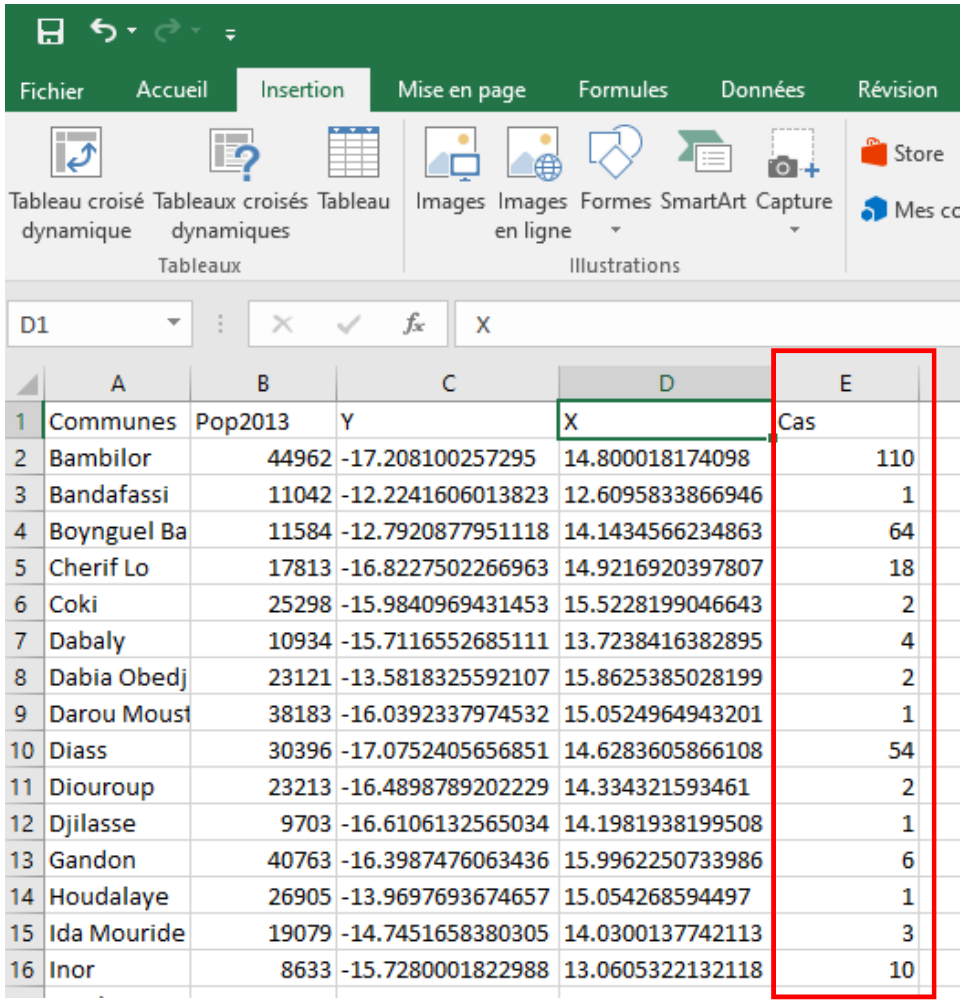
MMCas(Date2) = moyenne [Cas(Date1), Cas(Date2), Cas(Date3)]



Clusters Spatiaux : Format

Un outil simple : tableur (type Excel®, Open Office®…)

1 ligne / Commune
ID Commune +++
Population
Longitude et latitude
1 colonne total Cas



	A	B	C	D	E
1	Communes	Pop2013	Y	X	Cas
2	Bambilor	44962	-17.208100257295	14.800018174098	110
3	Bandafassi	11042	-12.2241606013823	12.6095833866946	1
4	Boynguel Ba	11584	-12.7920877951118	14.1434566234863	64
5	Cherif Lo	17813	-16.8227502266963	14.9216920397807	18
6	Coki	25298	-15.9840969431453	15.5228199046643	2
7	Dabaly	10934	-15.7116552685111	13.7238416382895	4
8	Dabia Obedj	23121	-13.5818325592107	15.8625385028199	2
9	Darou Moust	38183	-16.0392337974532	15.0524964943201	1
10	Diass	30396	-17.0752405656851	14.6283605866108	54
11	Diouroup	23213	-16.4898789202229	14.334321593461	2
12	Djilasse	9703	-16.6106132565034	14.1981938199508	1
13	Gandon	40763	-16.3987476063436	15.9962250733986	6
14	Houdalaye	26905	-13.9697693674657	15.054268594497	1
15	Ida Mouride	19079	-14.7451658380305	14.0300137742113	3
16	Inor	8633	-15.7280001822988	13.0605322132118	10

- Pas de « , » mais « . »
- Enregistrer au format « .csv »

Clusters Spatiaux : Méthode

Qu'est-ce qu'un « Cluster »

- Agrégat de cas
- Définitions variables = pragmatique VS statistique

$\Rightarrow$ Plus de Cas que le Nombre de Cas Attendu

Nombre de Cas Attendu = 0 (ex. Ebola)

Nombre de Cas Attendu = Seuil

Nombre de Cas Attendu = « moyenne nationale »

$\Rightarrow$ hypothèse du Risque Constant

Clusters Spatiaux : Méthode

Hypothèse du Risque Constant

$$E_i = \lambda n_i$$

Clusters Spatiaux : Méthode

Hypothèse du Risque Constant

nombre de
cas attendus
dans la région *i*

$$E_i = \lambda n_i$$

Effectif région ***i***

risque constant

Clusters Spatiaux : Méthode

Hypothèse du Risque Constant

$$E_i = \lambda n_i$$

risque constant

$$\tilde{\lambda} = \frac{O_+}{n_+}$$

Clusters Spatiaux : Méthode

Hypothèse du Risque Constant

$$E_i = \lambda n_i$$

risque constant

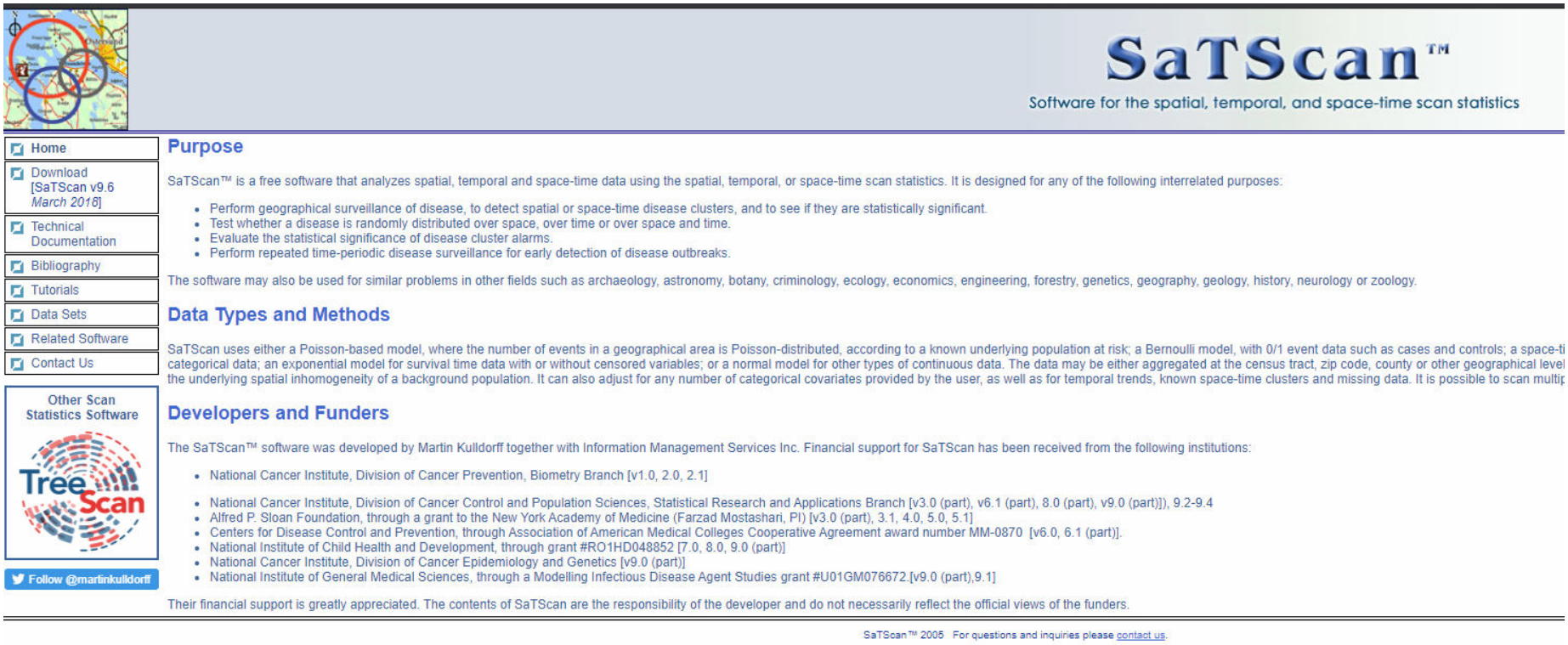
$$\tilde{\lambda} = \frac{O_+}{n_+}$$

nombre total de cas observés : $O_+ = \sum_{i=1}^{k} O_i$

effectif total : $n_+ = \sum_{i=1}^{k} n_i$

Clusters Spatiaux : Méthode

Logiciel SaTScan : www.satscan.org



SaTScan™

Software for the spatial, temporal, and space-time scan statistics

- Home
- Download [SaTScan v9.6 March 2018]
- Technical Documentation
- Bibliography
- Tutorials
- Data Sets
- Related Software
- Contact Us

Other Scan Statistics Software

Follow @martinkulldorff

Purpose

SaTScan™ is a free software that analyzes spatial, temporal and space-time data using the spatial, temporal, or space-time scan statistics. It is designed for any of the following interrelated purposes:

- Perform geographical surveillance of disease, to detect spatial or space-time disease clusters, and to see if they are statistically significant.
- Test whether a disease is randomly distributed over space, over time or over space and time.
- Evaluate the statistical significance of disease cluster alarms.
- Perform repeated time-periodic disease surveillance for early detection of disease outbreaks.

The software may also be used for similar problems in other fields such as archaeology, astronomy, botany, criminology, ecology, economics, engineering, forestry, genetics, geography, geology, history, neurology or zoology.

Data Types and Methods

SaTScan uses either a Poisson-based model, where the number of events in a geographical area is Poisson-distributed, according to a known underlying population at risk; a Bernoulli model, with 0/1 event data such as cases and controls; a space-ti categorical data; an exponential model for survival time data with or without censored variables; or a normal model for other types of continuous data. The data may be either aggregated at the census tract, zip code, county or other geographical level the underlying spatial inhomogeneity of a background population. It can also adjust for any number of categorical covariates provided by the user, as well as for temporal trends, known space-time clusters and missing data. It is possible to scan multip

Developers and Funders

The SaTScan™ software was developed by Martin Kulldorff together with Information Management Services Inc. Financial support for SaTScan has been received from the following institutions:

- National Cancer Institute, Division of Cancer Prevention, Biometry Branch [v1.0, 2.0, 2.1]
- National Cancer Institute, Division of Cancer Control and Population Sciences, Statistical Research and Applications Branch [v3.0 (part), v6.1 (part), 8.0 (part), v9.0 (part)]), 9.2-9.4
- Alfred P. Sloan Foundation, through a grant to the New York Academy of Medicine (Farzad Mostashari, PI) [v3.0 (part), 3.1, 4.0, 5.0, 5.1]
- Centers for Disease Control and Prevention, through Association of American Medical Colleges Cooperative Agreement award number MM-0870 [v6.0, 6.1 (part)].
- National Institute of Child Health and Development, through grant #RO1HD048852 [7.0, 8.0, 9.0 (part)]
- National Cancer Institute, Division of Cancer Epidemiology and Genetics [v9.0 (part)]
- National Institute of General Medical Sciences, through a Modelling Infectious Disease Agent Studies grant #U01GM076672.[v9.0 (part),9.1]

Their financial support is greatly appreciated. The contents of SaTScan are the responsibility of the developer and do not necessarily reflect the official views of the funders.

SaTScan™ 2005 For questions and inquiries please contact us.

Clusters Spatiaux : Méthode

Logiciel SaTScan : www.satscan.org

Principe :

- Fenêtre circulaire
- Rayon variable, centre variable (point ou centre)
- Balaye le plan

=> clusters potentiels => statistique

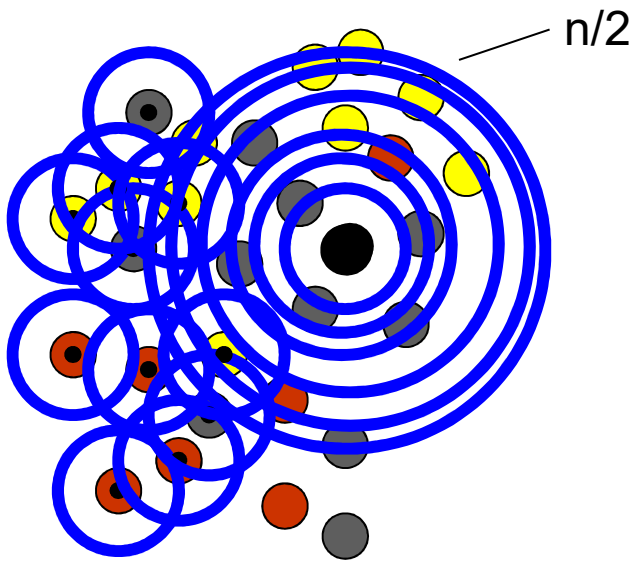
$$T_k \propto max \left(\frac{O_{int}}{E_{int}}\right)^{O_{int}} \left(\frac{O_{ext}}{E_{ext}}\right)^{O_{ext}}$$

avec

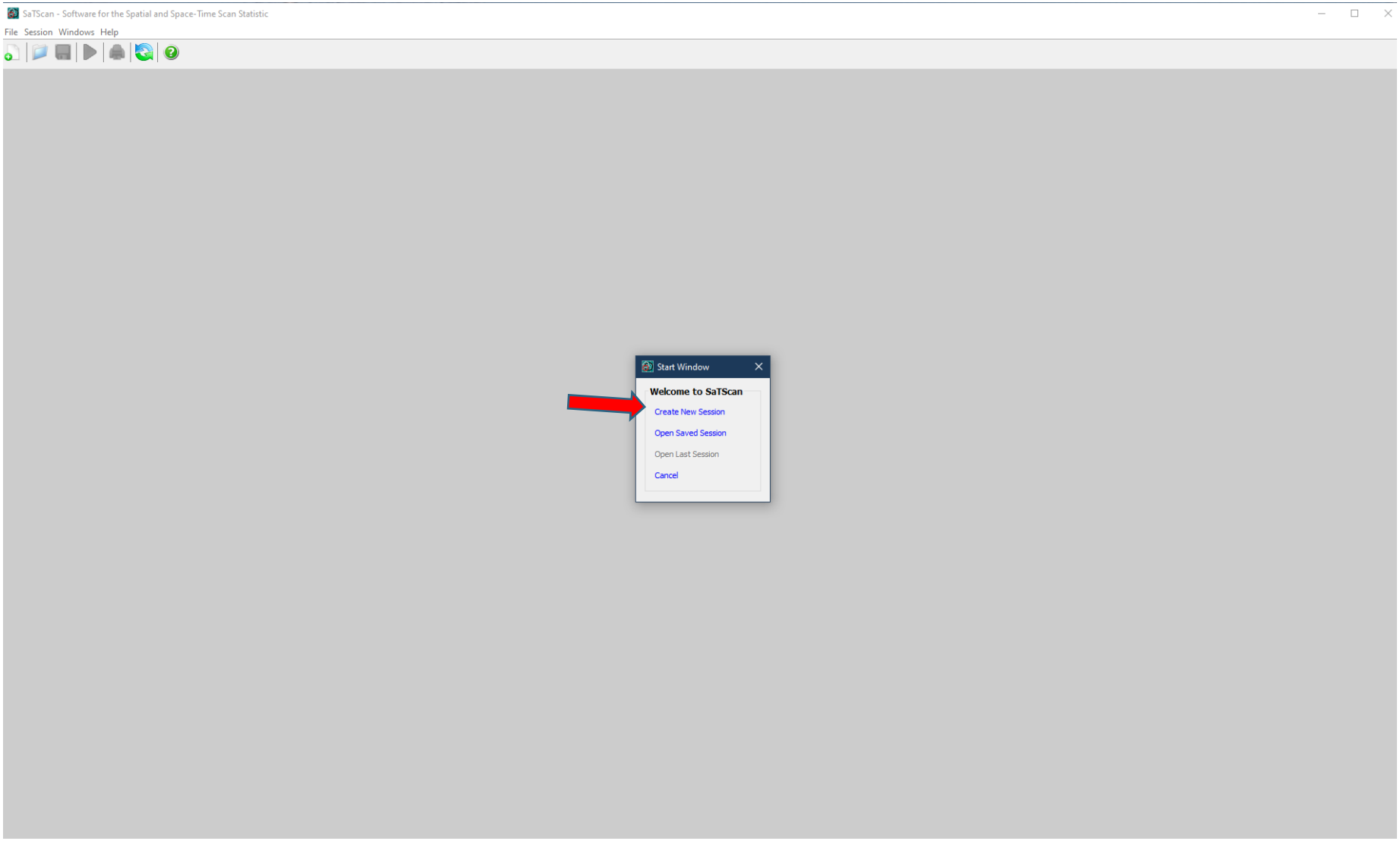
$$E_{int} = \lambda n_{int}$$
$$E_{ext} = \lambda n_{ext}$$

Clusters Spatiaux : Méthode

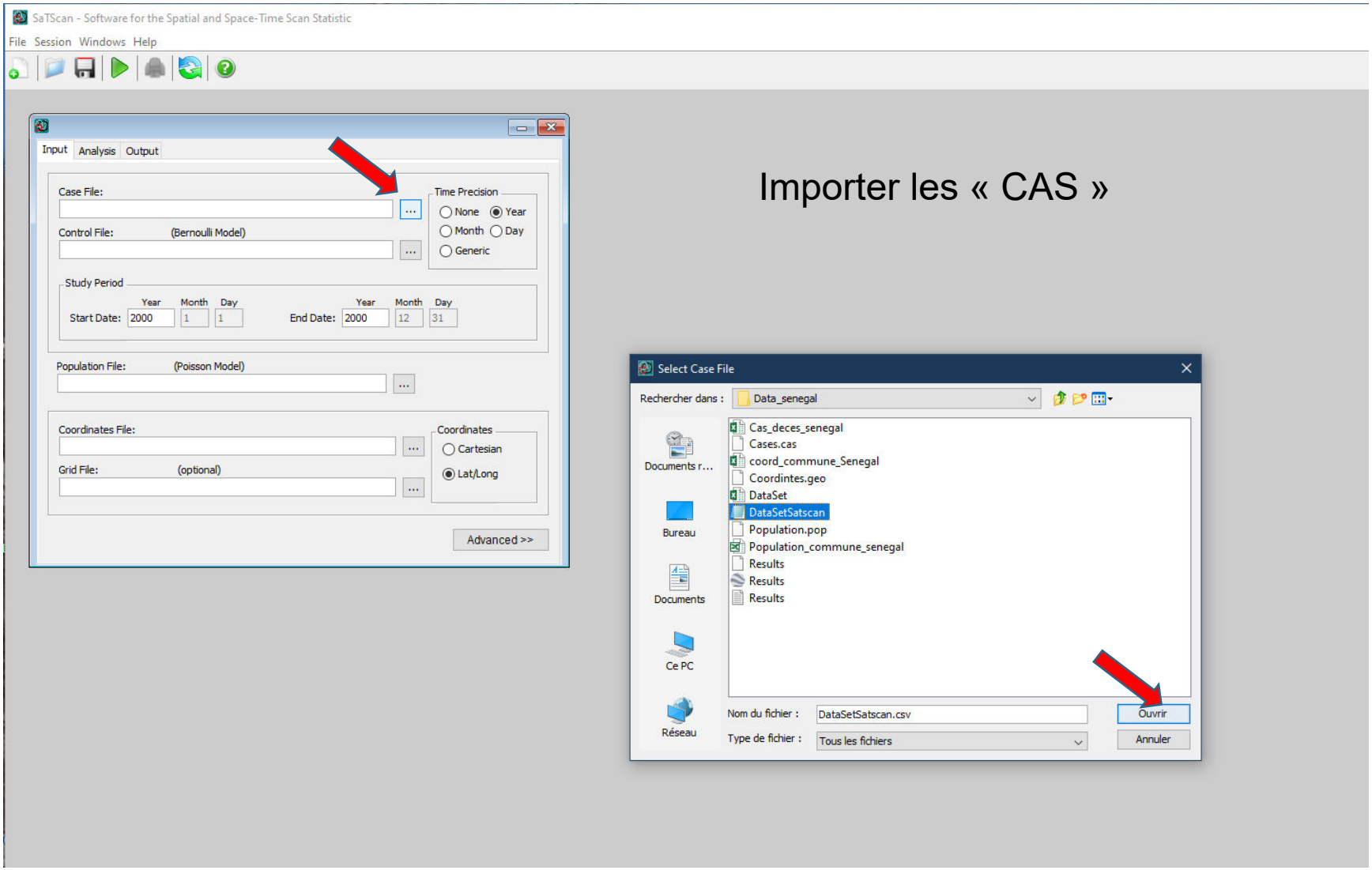
Logiciel SaTScan : www.satscan.org



Clusters Spatiaux : Pratique

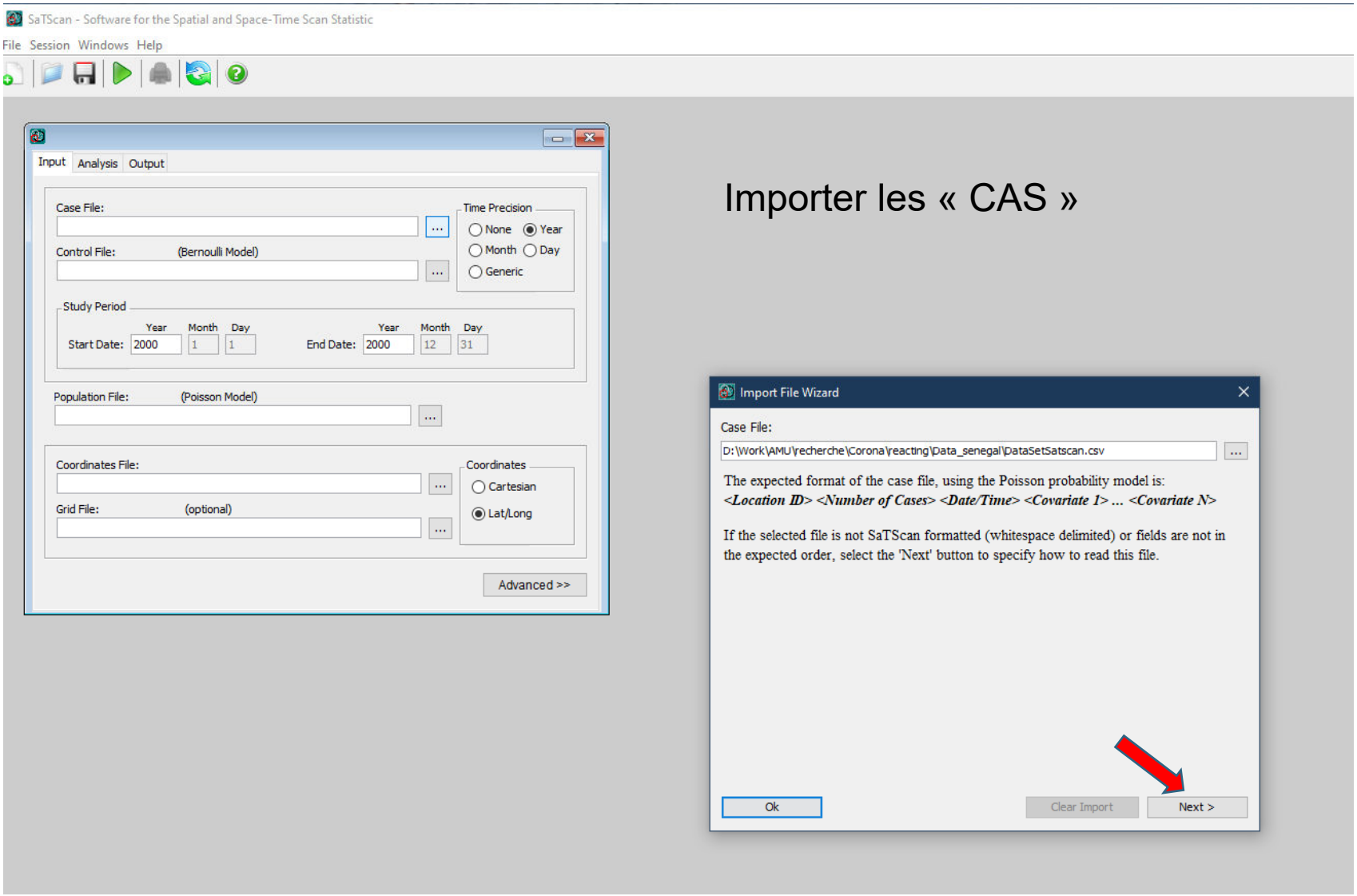


Clusters Spatiaux : Pratique



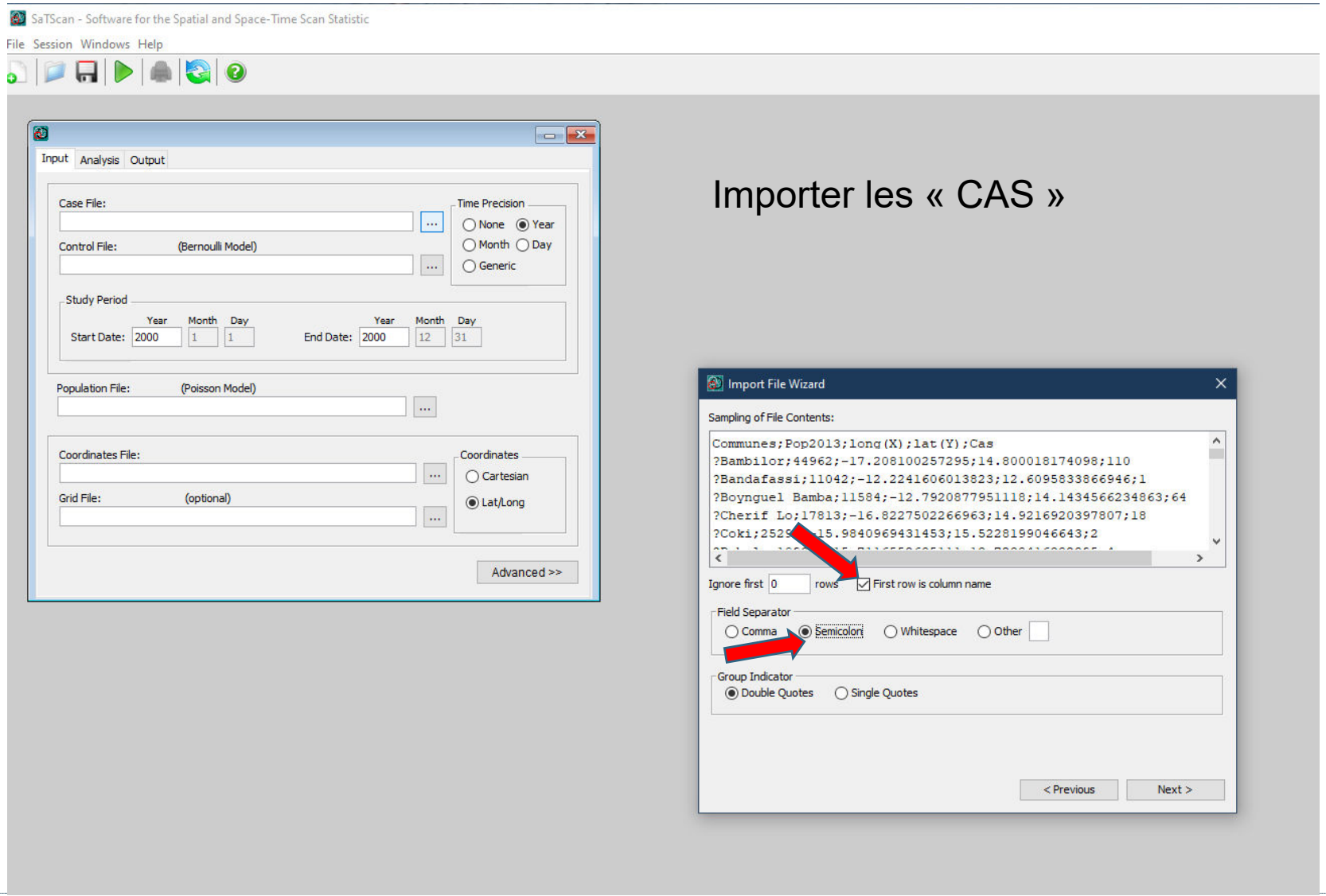
Importer les « CAS »

Clusters Spatiaux : Pratique



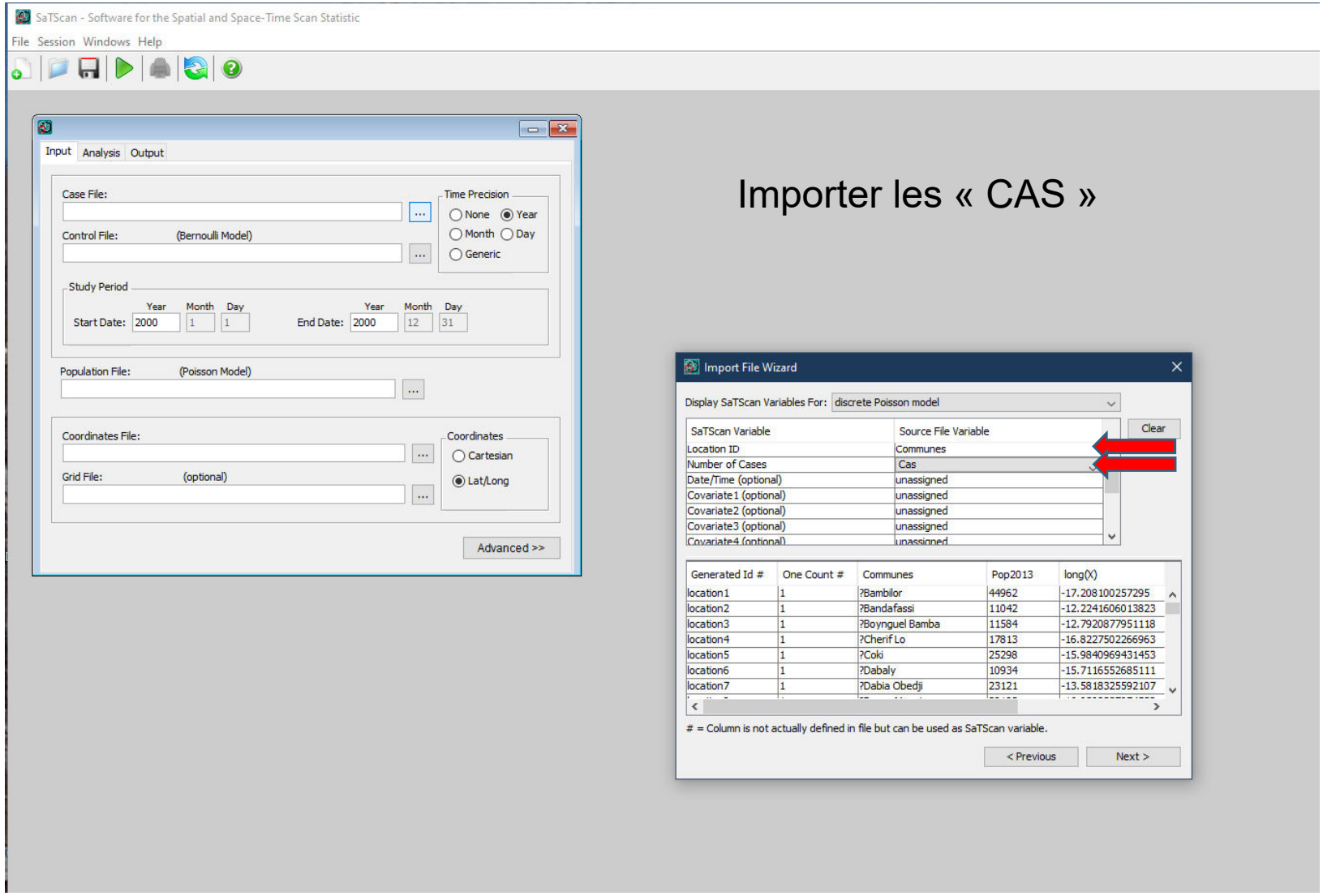
Importer les « CAS »

Clusters Spatiaux : Pratique



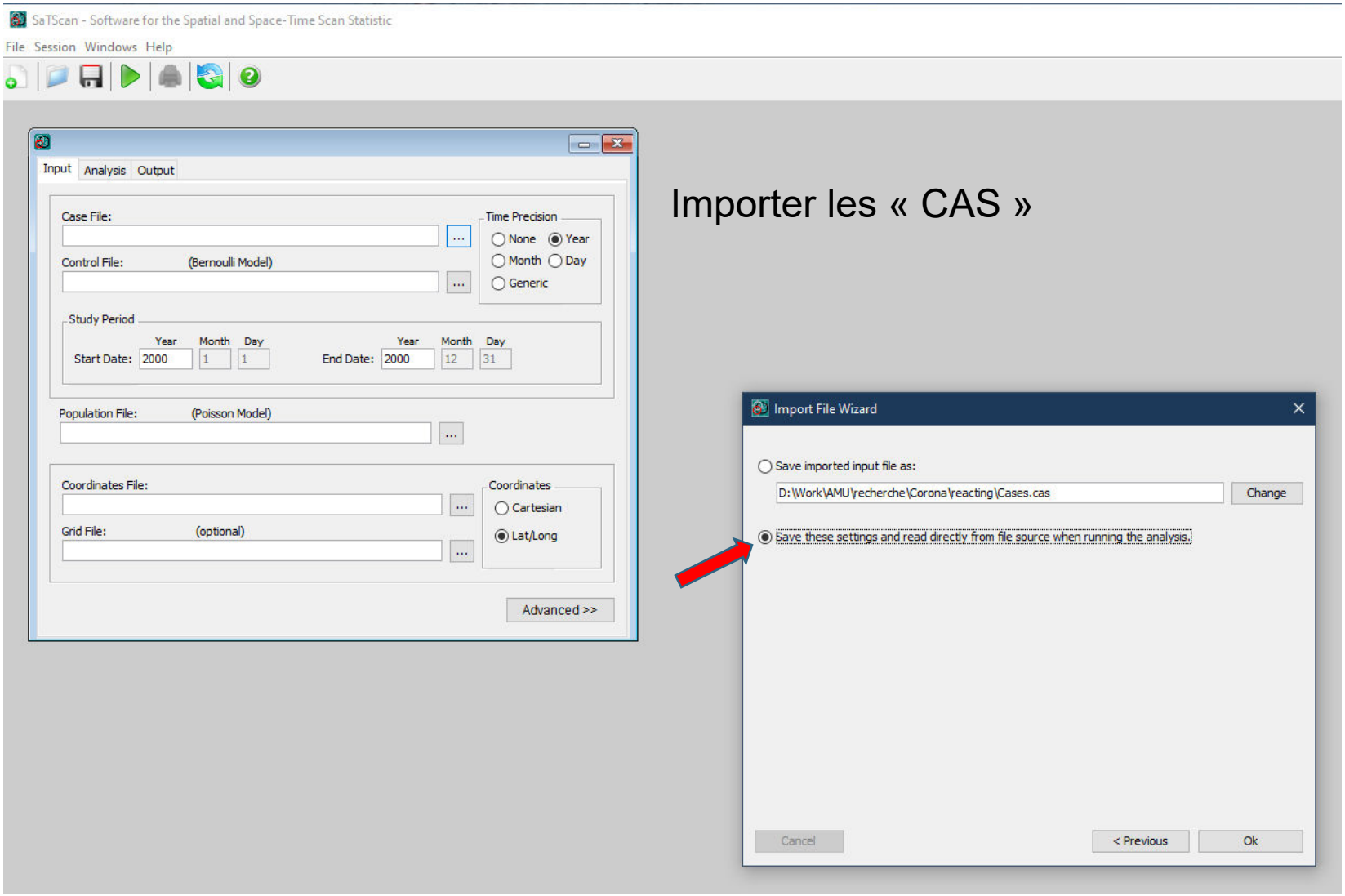
Importer les « CAS »

Clusters Spatiaux : Pratique



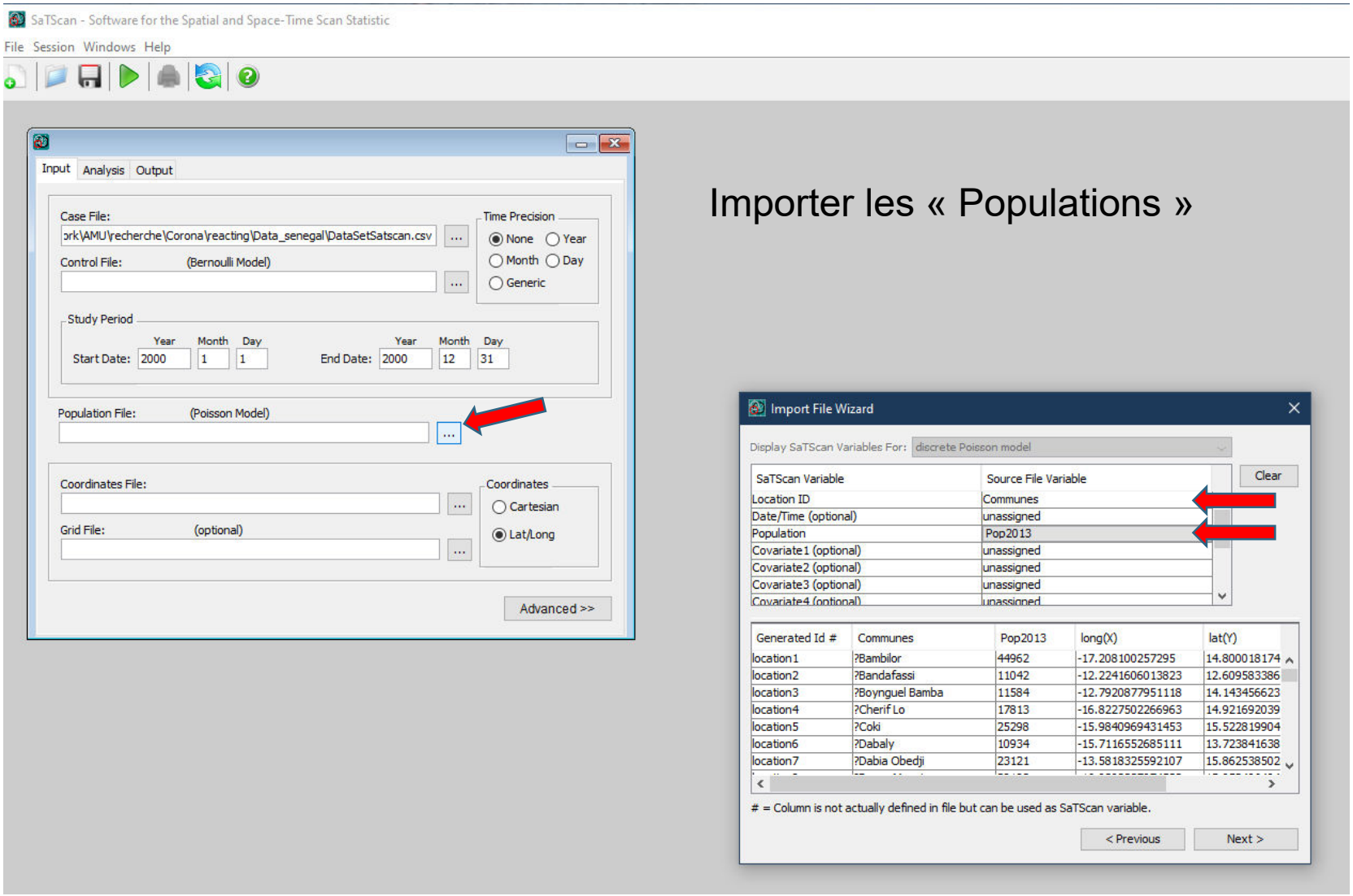
Importer les « CAS »

Clusters Spatiaux : Pratique



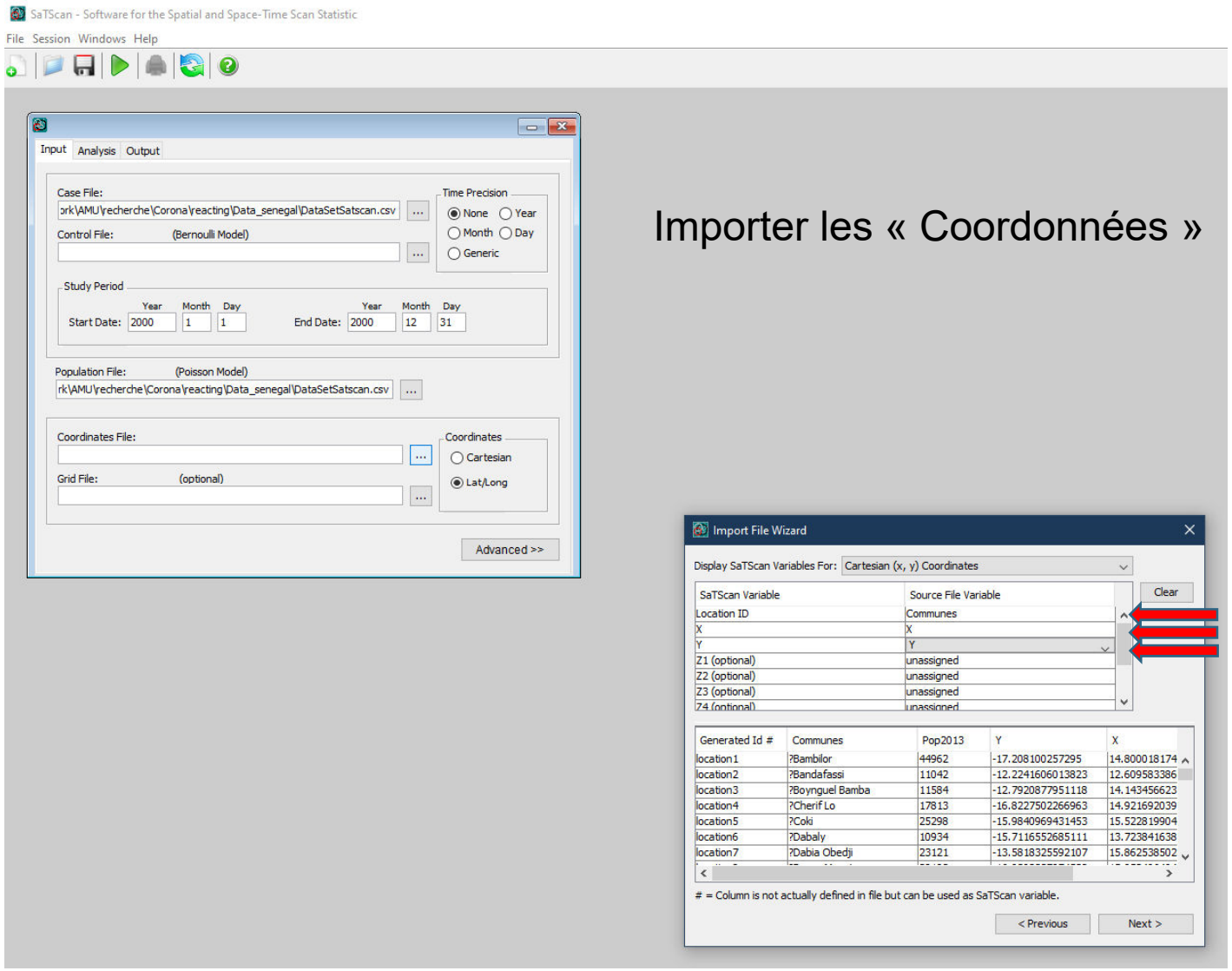
Importer les « CAS »

Clusters Spatiaux : Pratique



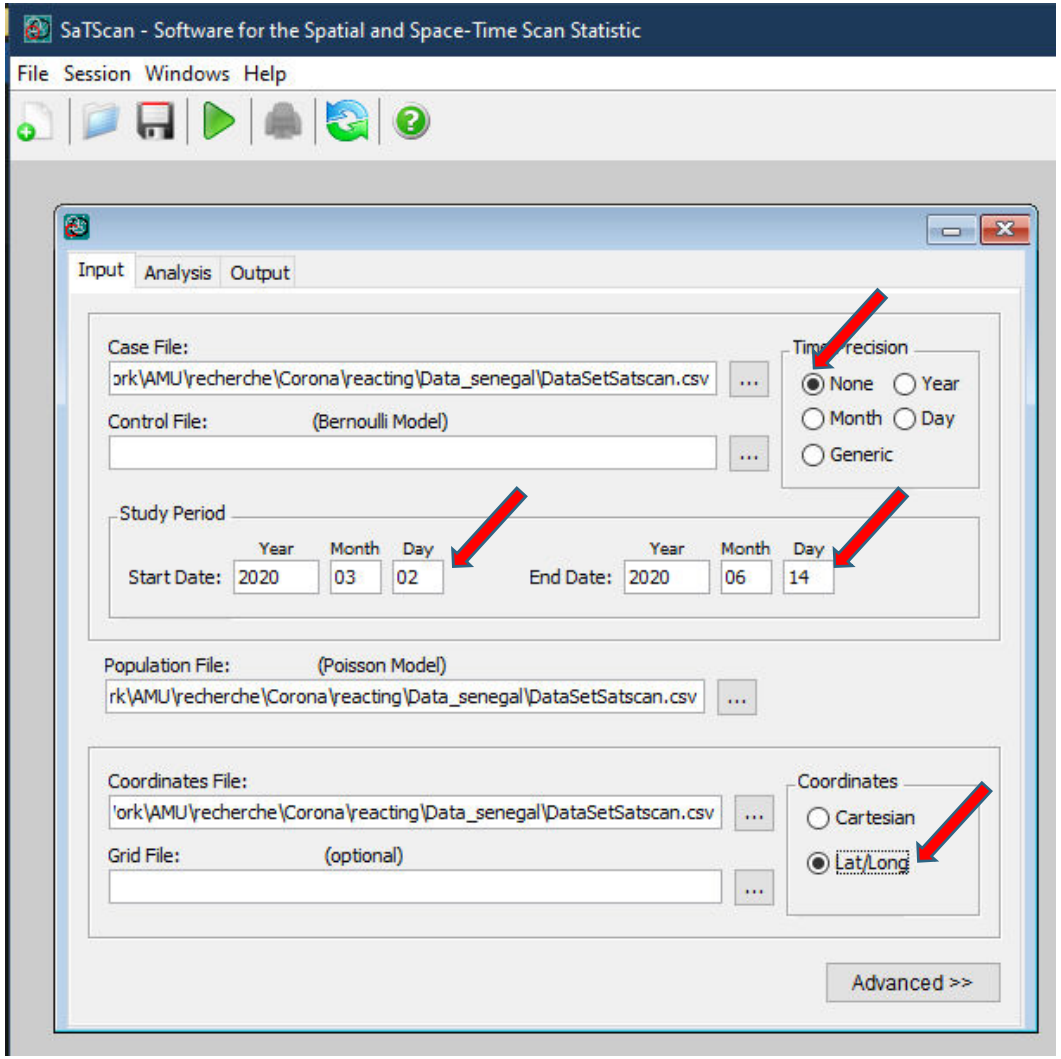
Importer les « Populations »

Clusters Spatiaux : Pratique

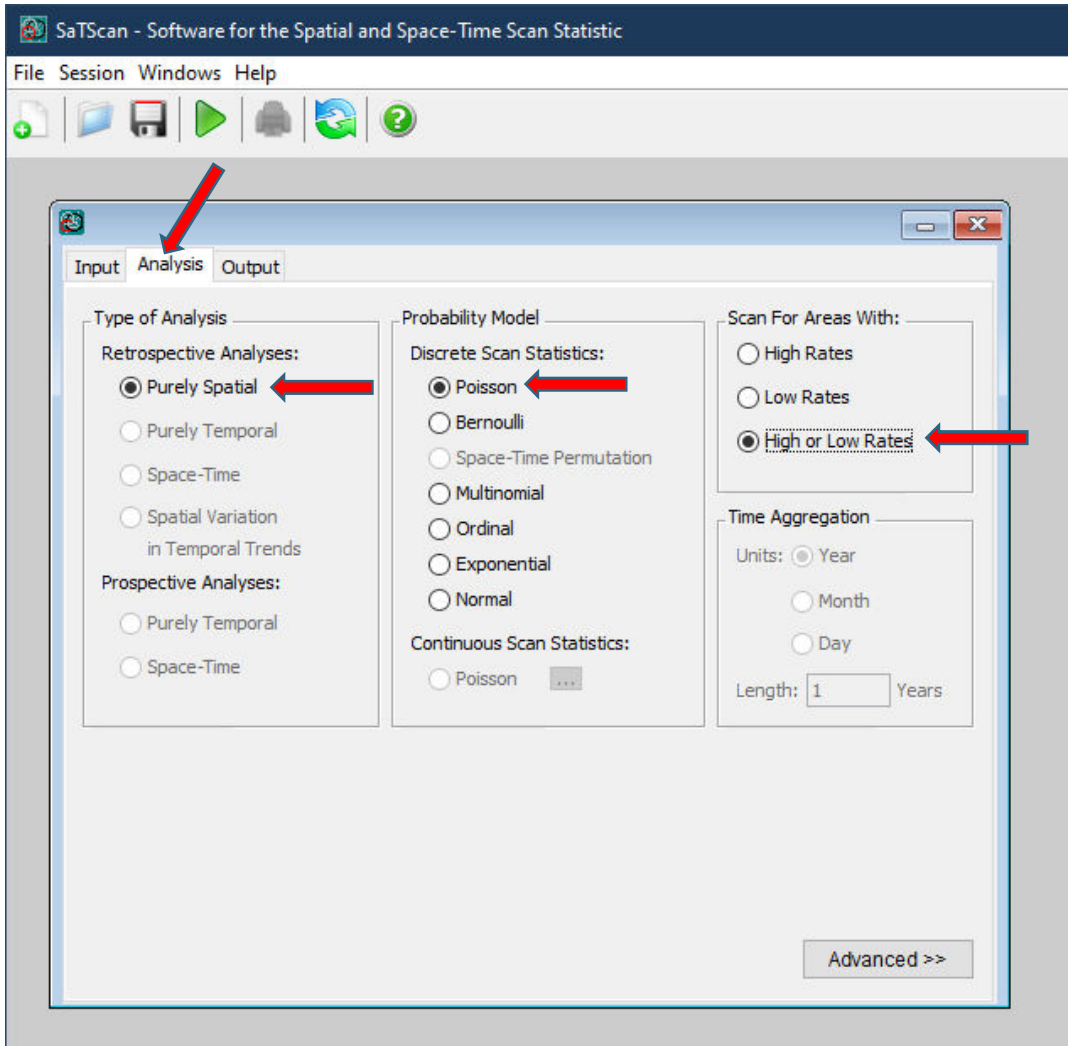


Importer les « Coordonnées »

Clusters Spatiaux : Pratique

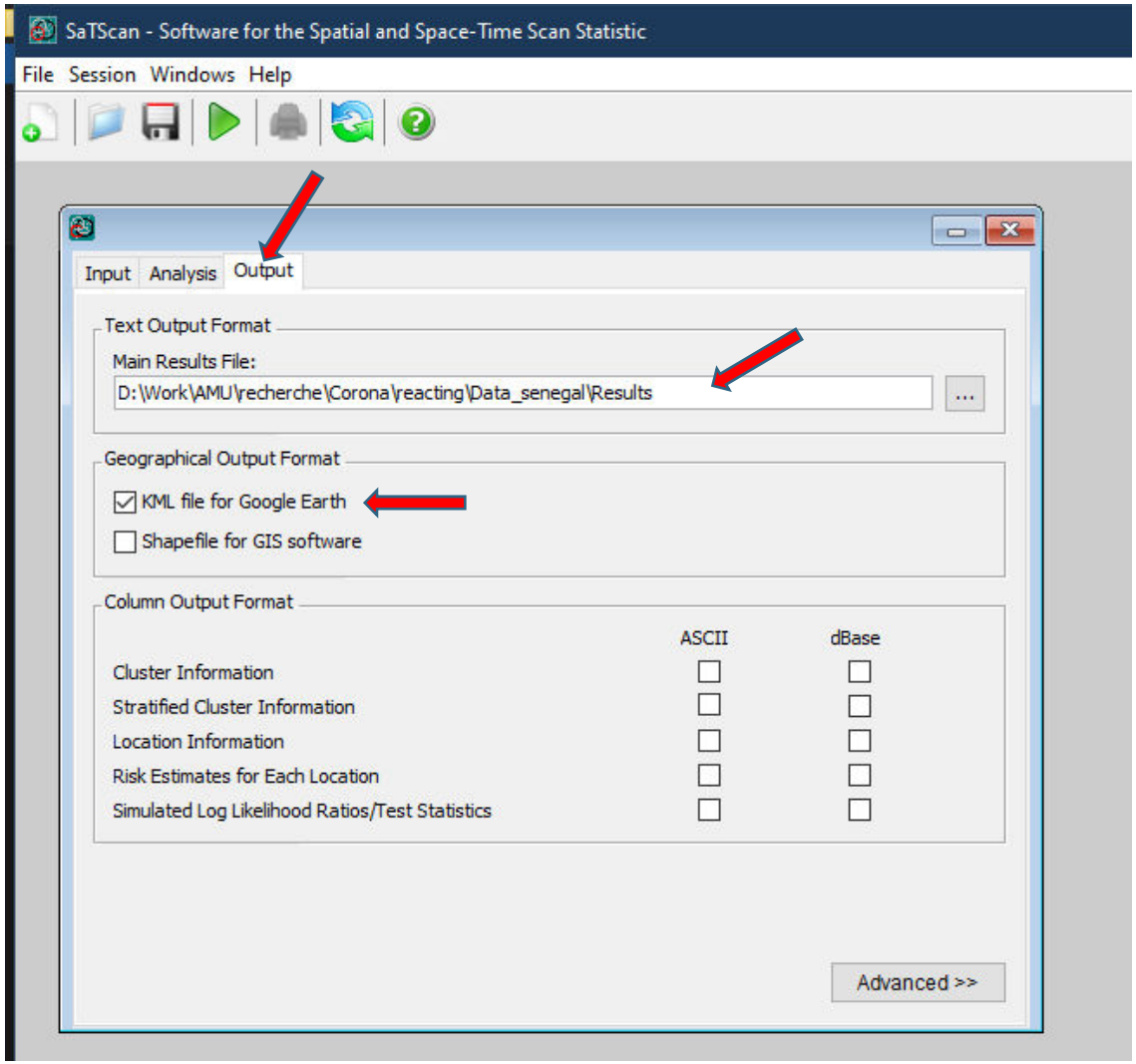


Clusters Spatiaux : Pratique



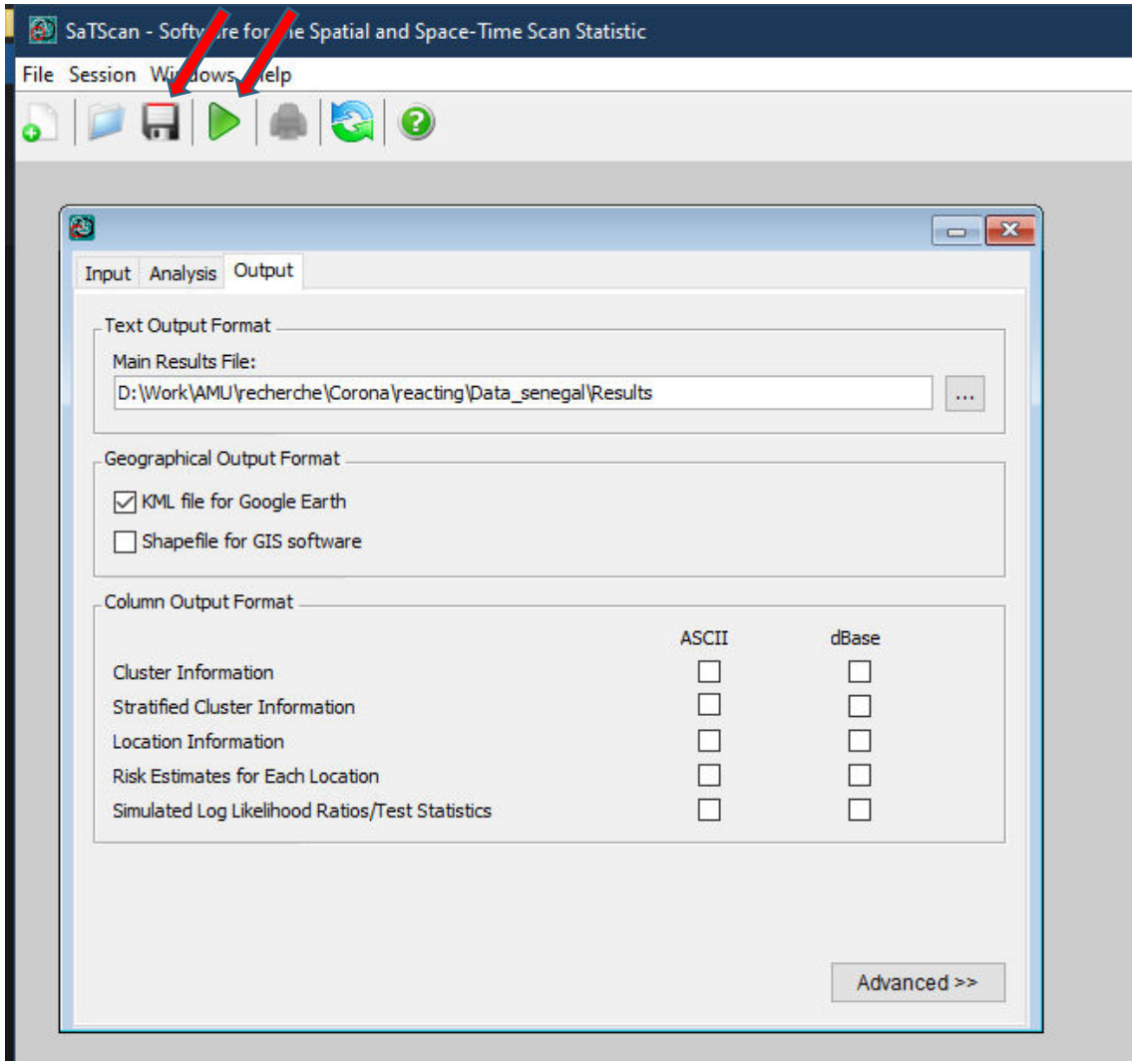
Type d'Analyse

Clusters Spatiaux : Pratique



Type de Résultats

Clusters Spatiaux : Pratique



Clusters Spatiaux : Résultats

D:\Work\AMU\recherche\Corona\reacting\Data_senegal\Results

```
                                  ________________________

                                        SaTScan v9.4.2

                                  ________________________


Program run on: Thu Jun 18 11:22:16 2020

Purely Spatial analysis
scanning for clusters with high or low rates
using the Discrete Poisson model.
____________________________________________________________________________________

SUMMARY OF DATA

Study period........................: 2020/03/02 to 2020/06/14
Number of locations.................: 48
Total population....................: 2458688
Total number of cases...............: 5141
Annual cases / 100000...............: 727.3
____________________________________________________________________________________

CLUSTERS DETECTED

1.Location IDs included.: ?Mermoz/ Sacre -Coeur
  Overlap with clusters.: No Overlap
  Coordinates / radius..: (14.708673 N, 17.471704 W) / 0 km
  Gini Cluster..........: Yes
  Population............: 29798
  Number of cases.......: 2851
  Expected cases........: 62.31
  Annual cases / 100000.: 33281.4
  Observed / expected...: 45.76
  Relative risk.........: 101.48
  Log likelihood ratio..: 9076.420742
  P-value...............: < 0.00000000000000001

2.Location IDs included.: ?Ouarkhokh, ?Coki, Touba Mosquee, ?Darou Mousty, ?Niomre, ?Nguidile,
                          ?Ronkh, ?Patar, ?Houdalaye, ?Gandon, ?Ndande, ?Keur Mboucki, ?Thiare
                          Ndialgui, ?Ida Mouride, ?Meouane, ?Latmingue, ?Ogo, ?Dabia Obedji,
                          ?Ndieyene Sirakh
  Overlap with clusters.: 3, 4, 9
  Coordinates / radius..: (15.435086 N, 15.182791 W) / 177.96 km
  Gini Cluster..........: No
  Population............: 1211700
  Number of cases.......: 639
  Expected cases........: 2533.61
  Annual cases / 100000.: 183.4
  Observed / expected...: 0.25
  Relative risk.........: 0.15
  Log likelihood ratio..: 1578.642425
  P-value...............: < 0.00000000000000001
```

Warnings/Errors:

```
Notice: Logging run history failed.
```

Email Close

Clusters Spatiaux : Résultats

```
Program run on: Thu Jun 18 11:22:16 2020

Purely Spatial analysis
scanning for clusters with high or low rates
using the Discrete Poisson model.
------------------------------------------------------------

SUMMARY OF DATA

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------------------------------------------------------------

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  Overlap with clusters.: No Overlap
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  Gini Cluster..........: Yes
  Population............: 29798
  Number of cases.......: 2851
  Expected cases........: 62.31
  Annual cases / 100000.: 33281.4
  Observed / expected...: 45.76
  Relative risk.........: 101.48
  Log likelihood ratio..: 9076.420742
  P-value...............: < 0.00000000000000001
```
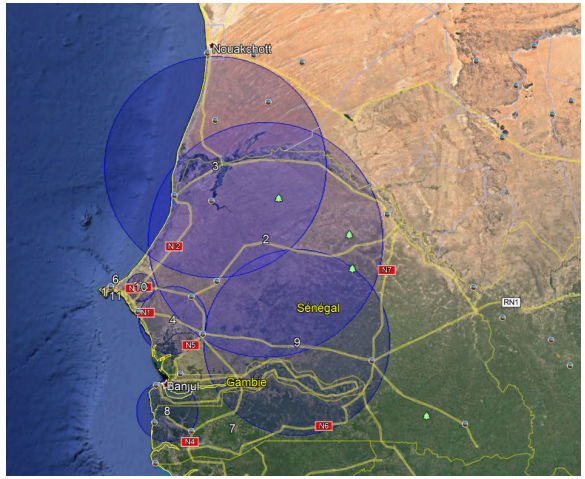

« HotSpot »

Clusters Spatiaux : Résultats



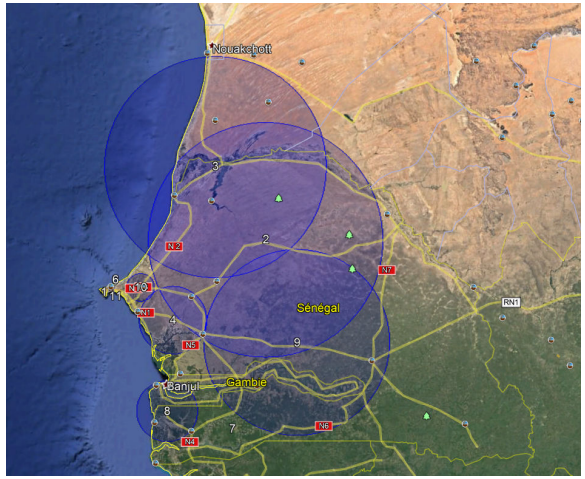
Importation dans *Google Earth*

Clusters Spatiaux : Résultats

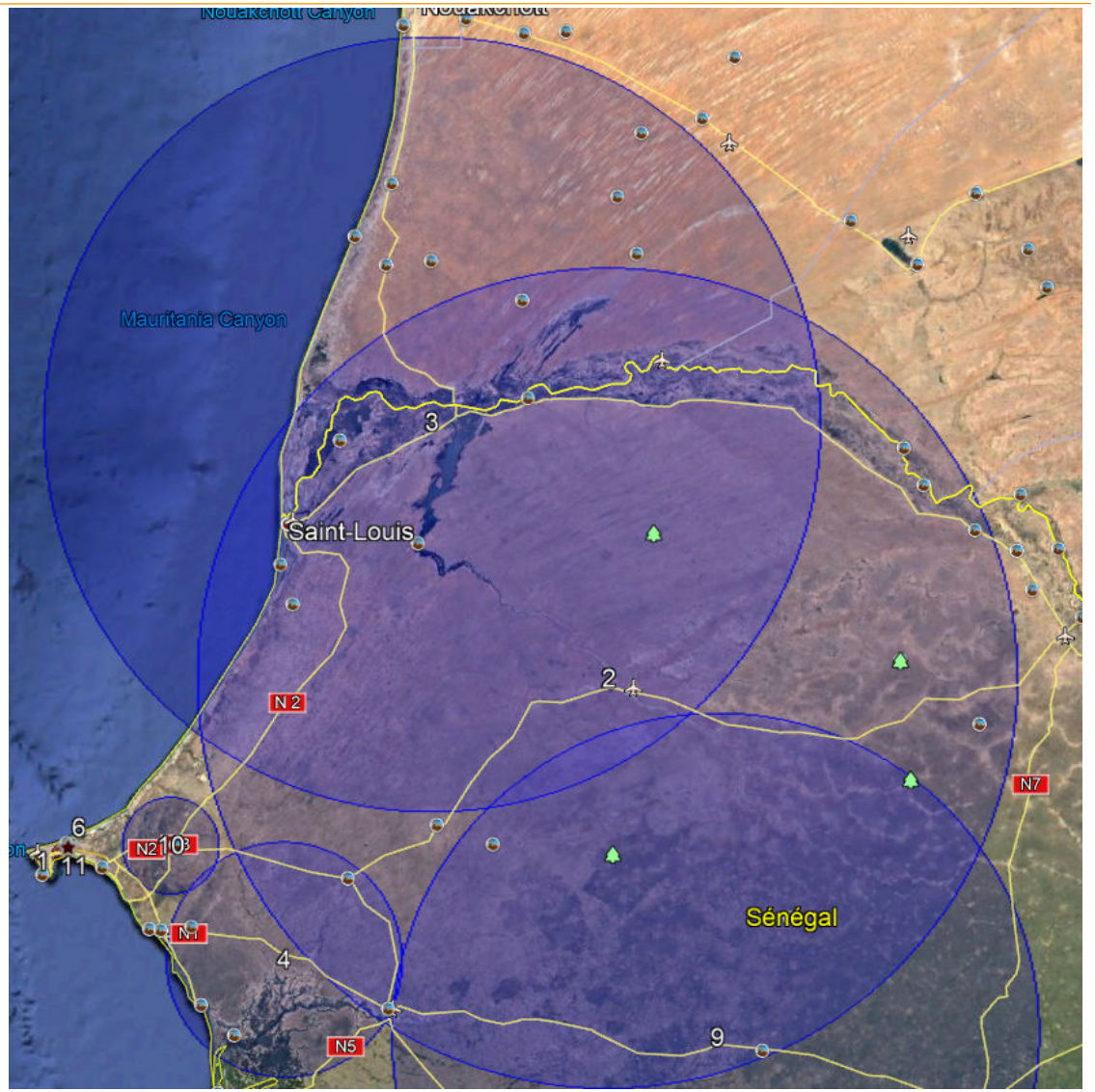
```
2.Location IDs included.: ?Ouarkhokh, ?Coki, Touba Mosquee, ?Darou Mousty, ?Niomre, ?Nguidile,
                          ?Ronkh, ?Patar, ?Houdalaye, ?Gandon, ?Ndande, ?Keur Mboucki, ?Thiare
                          Ndialgui, ?Ida Mouride, ?Meouane, ?Latmingue, ?Ogo, ?Dabia Obedji,
                          ?Ndieyene Sirakh
  Overlap with clusters.: 3, 4, 9
  Coordinates / radius..: (15.435086 N, 15.182791 W) / 177.96 km
  Gini Cluster..........: No
  Population............: 1211700
  Number of cases.......: 639
  Expected cases........: 2533.61
  Annual cases / 100000.: 183.4
  Observed / expected...: 0.25
  Relative risk.........: 0.15
  Log likelihood ratio..: 1578.642425
  P-value...............: < 0.00000000000000001

3.Location IDs included.: ?Ronkh, ?Gandon, ?Niomre, ?Nguidile, ?Coki, ?Ouarkhokh, ?Ndande,
                          ?Darou Mousty, ?Meouane
  Overlap with clusters.: 2
  Coordinates / radius..: (16.431740 N, 15.899664 W) / 168.45 km
  Gini Cluster..........: Yes
  Population............: 237518
  Number of cases.......: 56
  Expected cases........: 496.64
  Annual cases / 100000.: 82.0
  Observed / expected...: 0.11
  Relative risk.........: 0.10
  Log likelihood ratio..: 338.689894
  P-value...............: < 0.00000000000000001
```

« ColdSpots »

Clusters Spatiaux : Résultats



Importation dans *Google Earth*



Clusters Spatiaux

Attention :

Les résultats doivent être interprétés en fonction de la définition de « cluster ».

HotSpot $\Rightarrow$ > « moyenne »

ColdSpot $\Rightarrow$ < « moyenne »

Que la moyenne soit Haute ou Basse

Merci de votre attention

Tuto Video :

https://amupod.univ-amu.fr/video/0105-detection-de-clusters-spatiaux-application-a-lepidemie-de-cholera-haiti-2010/