

# Quelles certitudes contient le hasard?

Raphaël Lachièze-Rey



# Des certitudes dans le hasard?



# Ces choses qui devraient vous surprendre

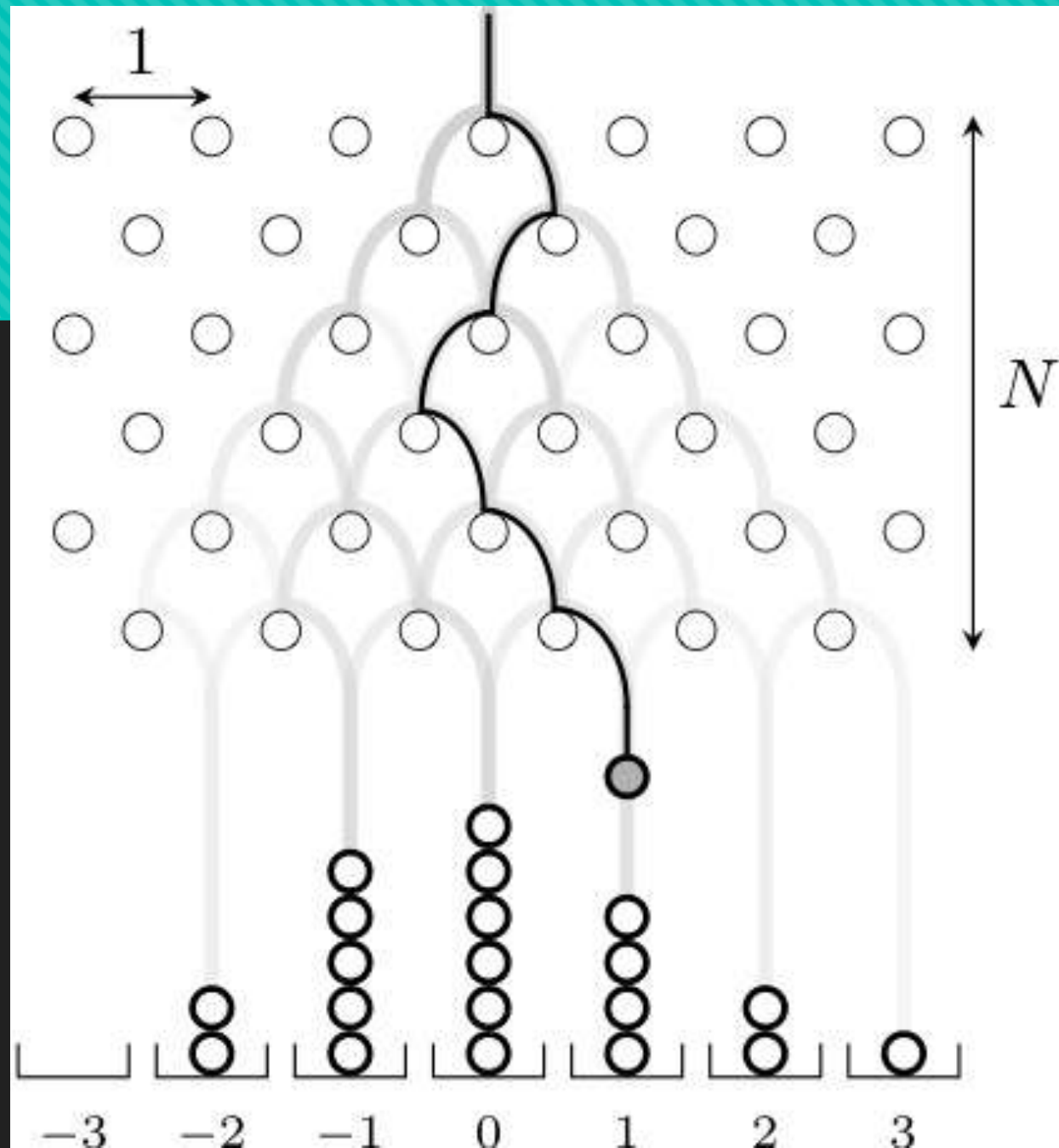
|             | Total   | Filles  | Garçons | Filles pour 100 garçons |
|-------------|---------|---------|---------|-------------------------|
| <b>2014</b> | 781 167 | 399 284 | 381 883 | 104,6                   |
| <b>2015</b> | 760 421 | 389 181 | 371 240 | 104,8                   |
| <b>2016</b> | 744 697 | 381 310 | 363 387 | 104,9                   |
| <b>2017</b> | 730 242 | 373 716 | 356 526 | 104,8                   |
| <b>2018</b> | 719 737 | 369 121 | 350 616 | 105,3                   |
| <b>2019</b> | 714 029 | 364 924 | 349 105 | 104,5                   |



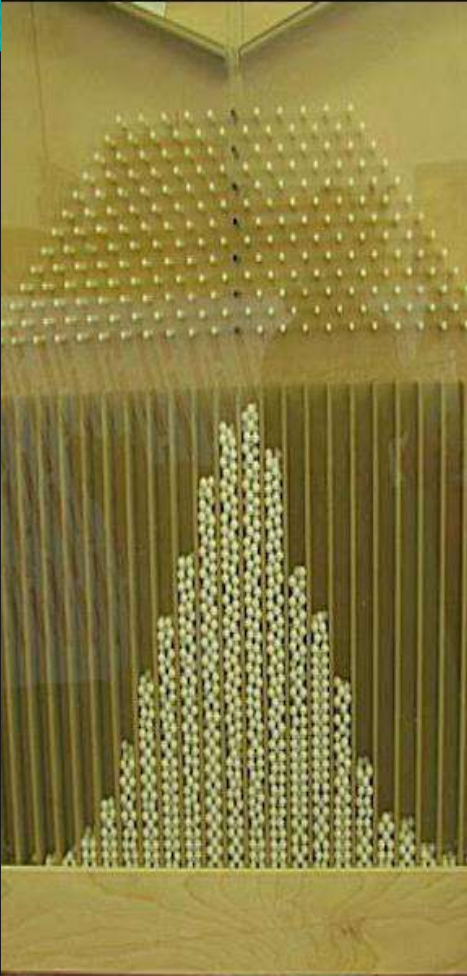
# Le chant des foules



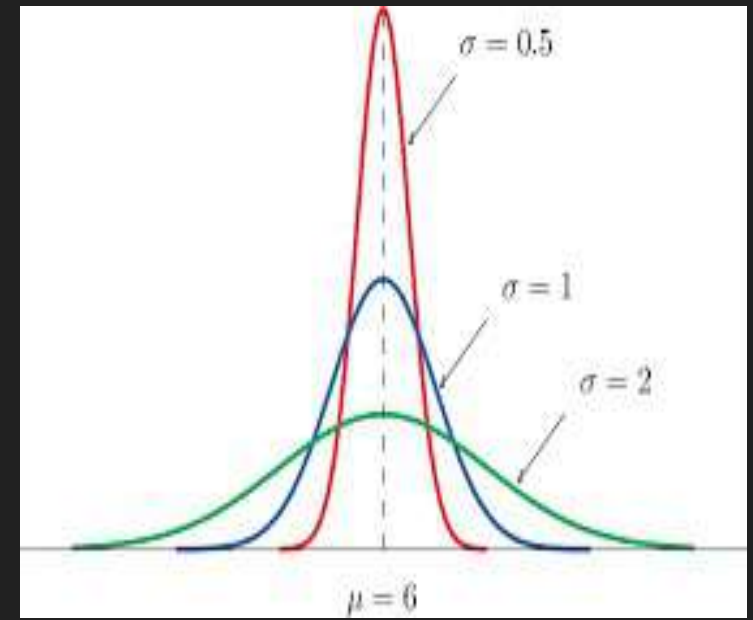
# La planche de Galton



# Théorème central limite



Plus de billes



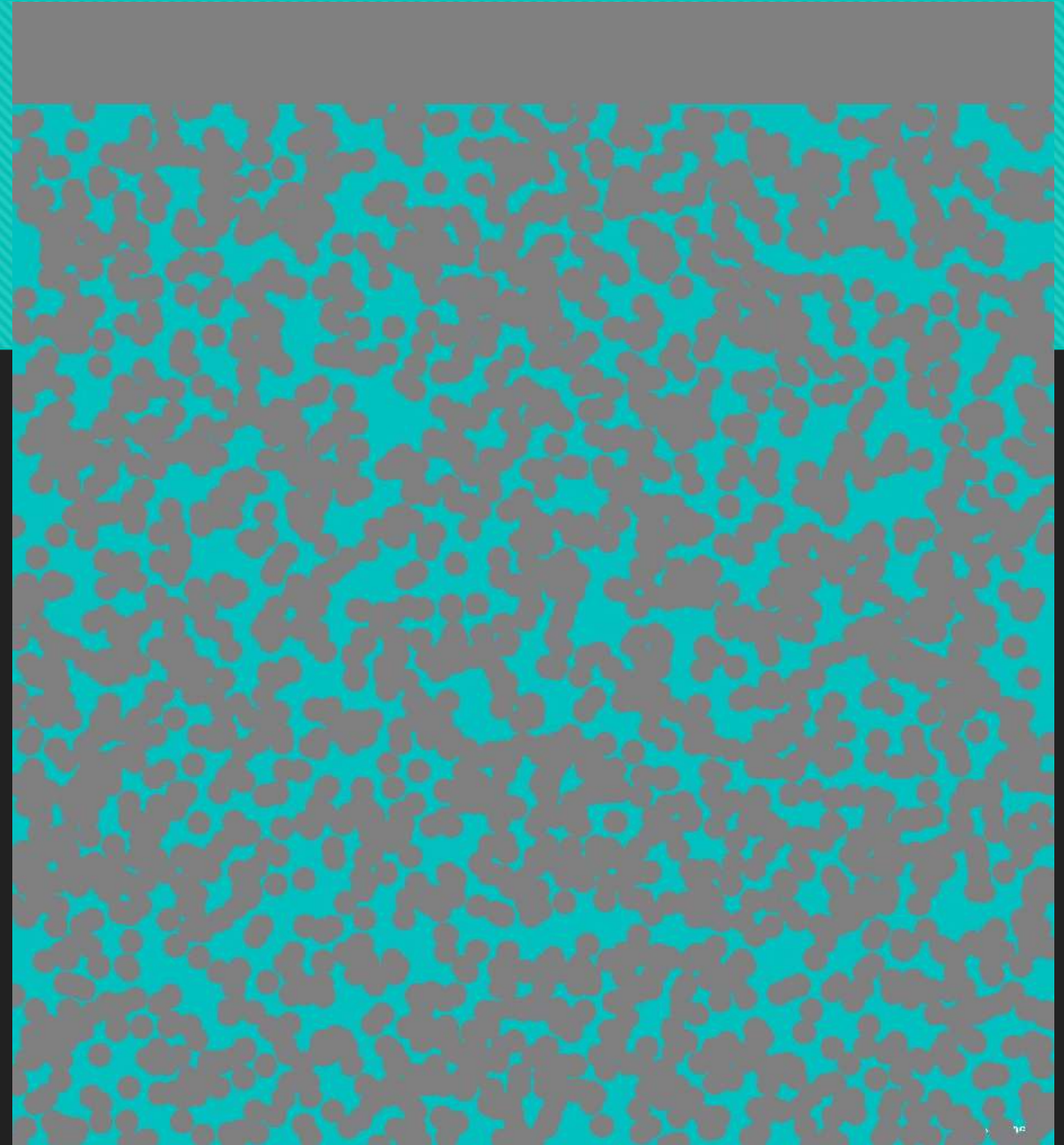


# Des conséquences concrètes!

- Dépouillement de **250 bureaux** (sur 85000 en tout!)
- Le résultat se stabilise au bout de **40 bureaux**
- Même pas 0,01% des votants!

| Année | Estimation du score du vainqueur à 20 heures | Score définitif du vainqueur |
|-------|--|------------------------------|
| 1974  | 50,9% (Sofres)                               | 50,81%                       |
| 1981  | 51,7% (C2I Bull)                             | 51,76%                       |
| 1988  | 53,9% (Bull BVA)                             | 54,02%                       |
| 1995  | 52% (CSA)                                    | 52,64%                       |
| 2002  | 82,1% (Ipsos)                                | 82,21%                       |
| 2007  | 53% (Ipsos)                                  | 53,06%                       |

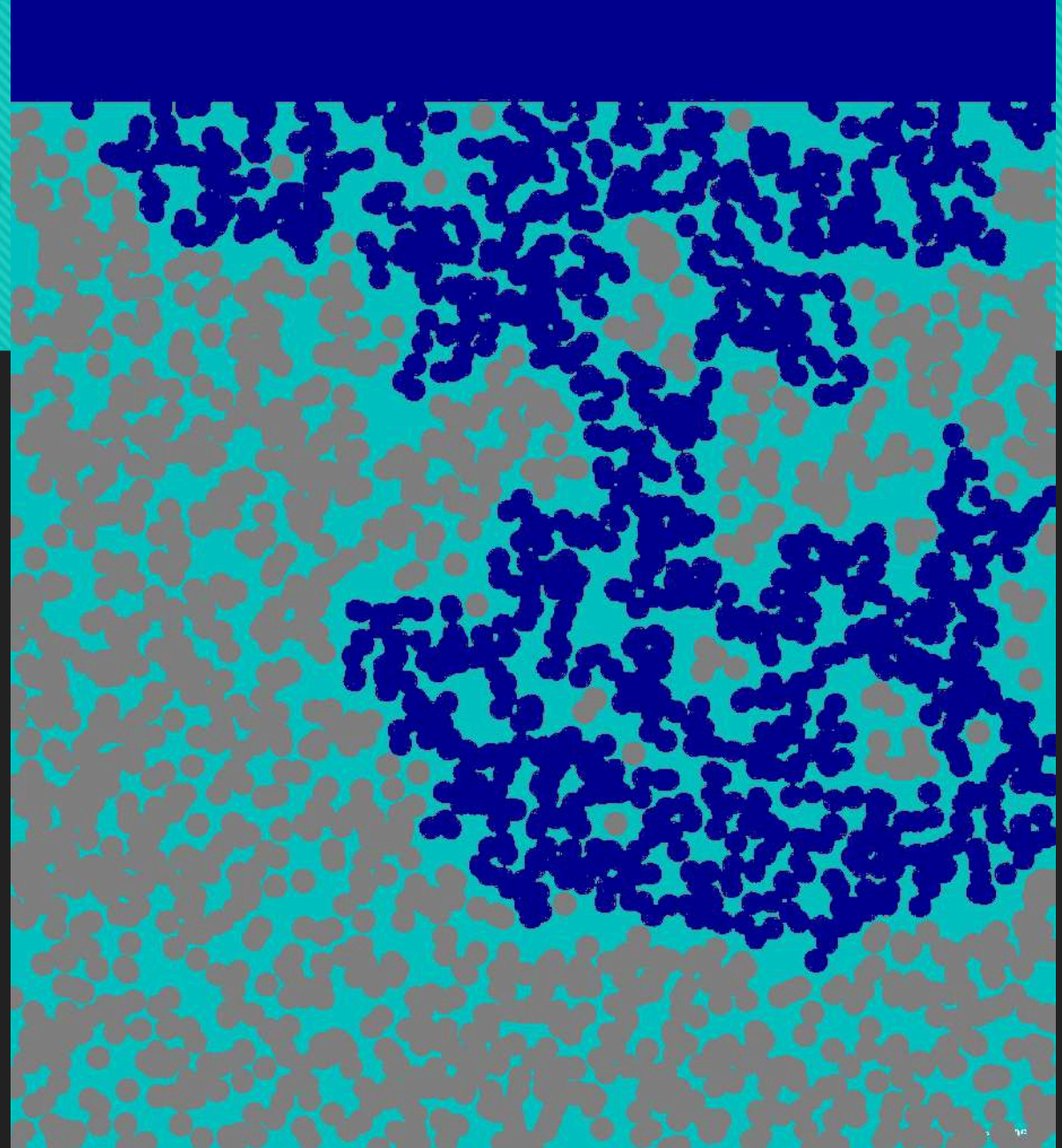
# Imperméabilité





# Matériau imperméable?

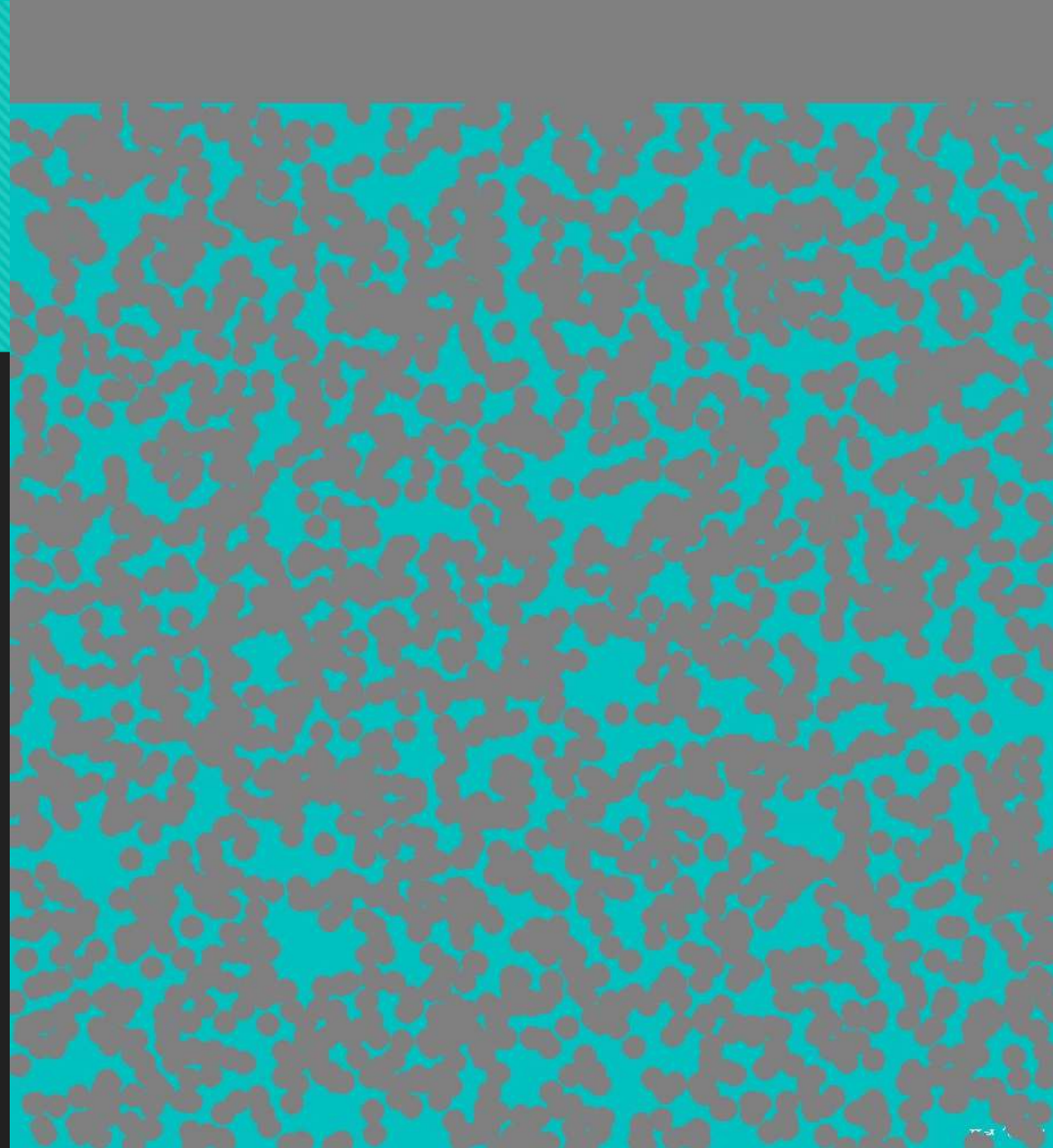
Oui!





# Matériau imperméable

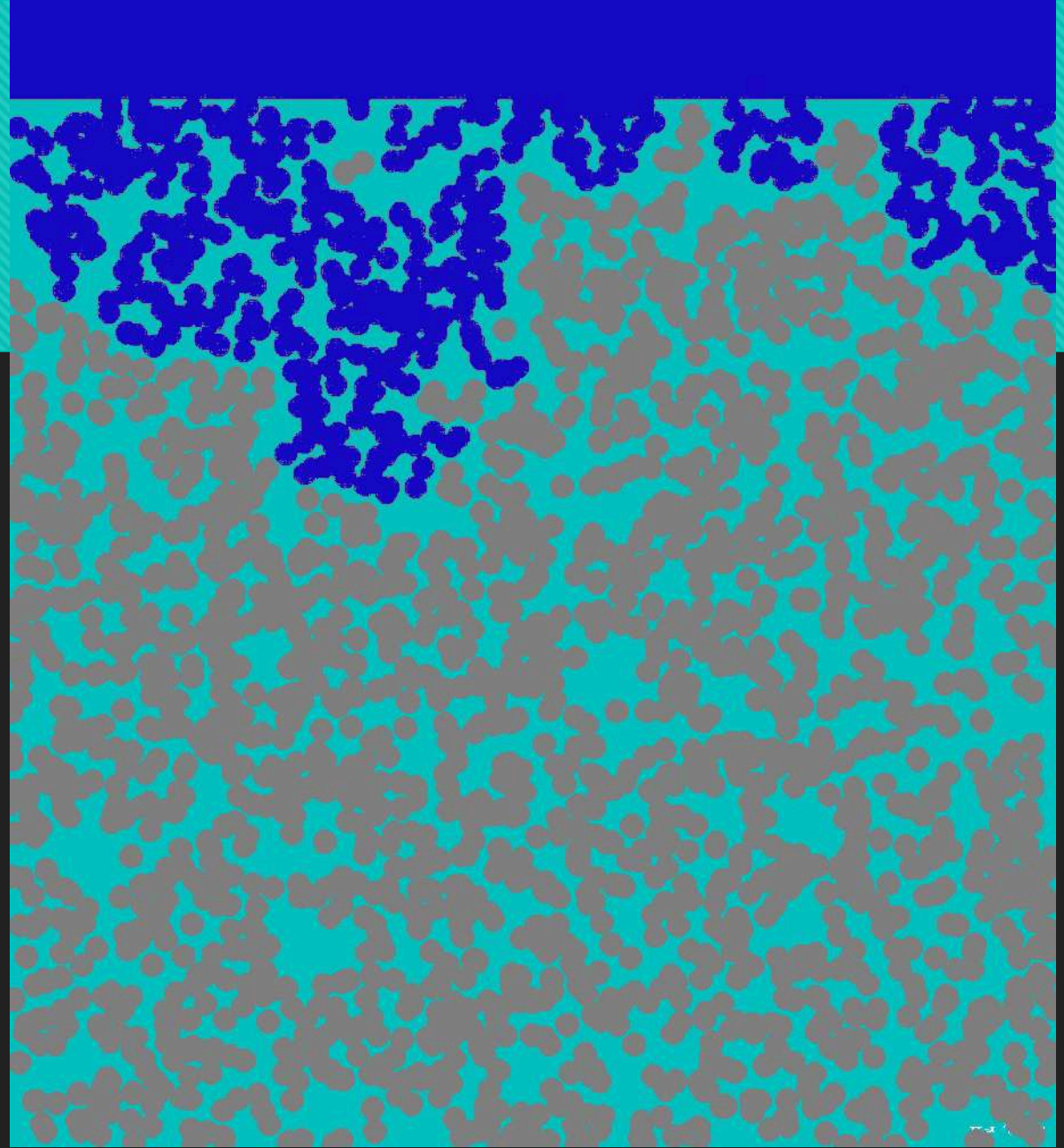
- Nouvelle tentative





# Matériau imperméable?

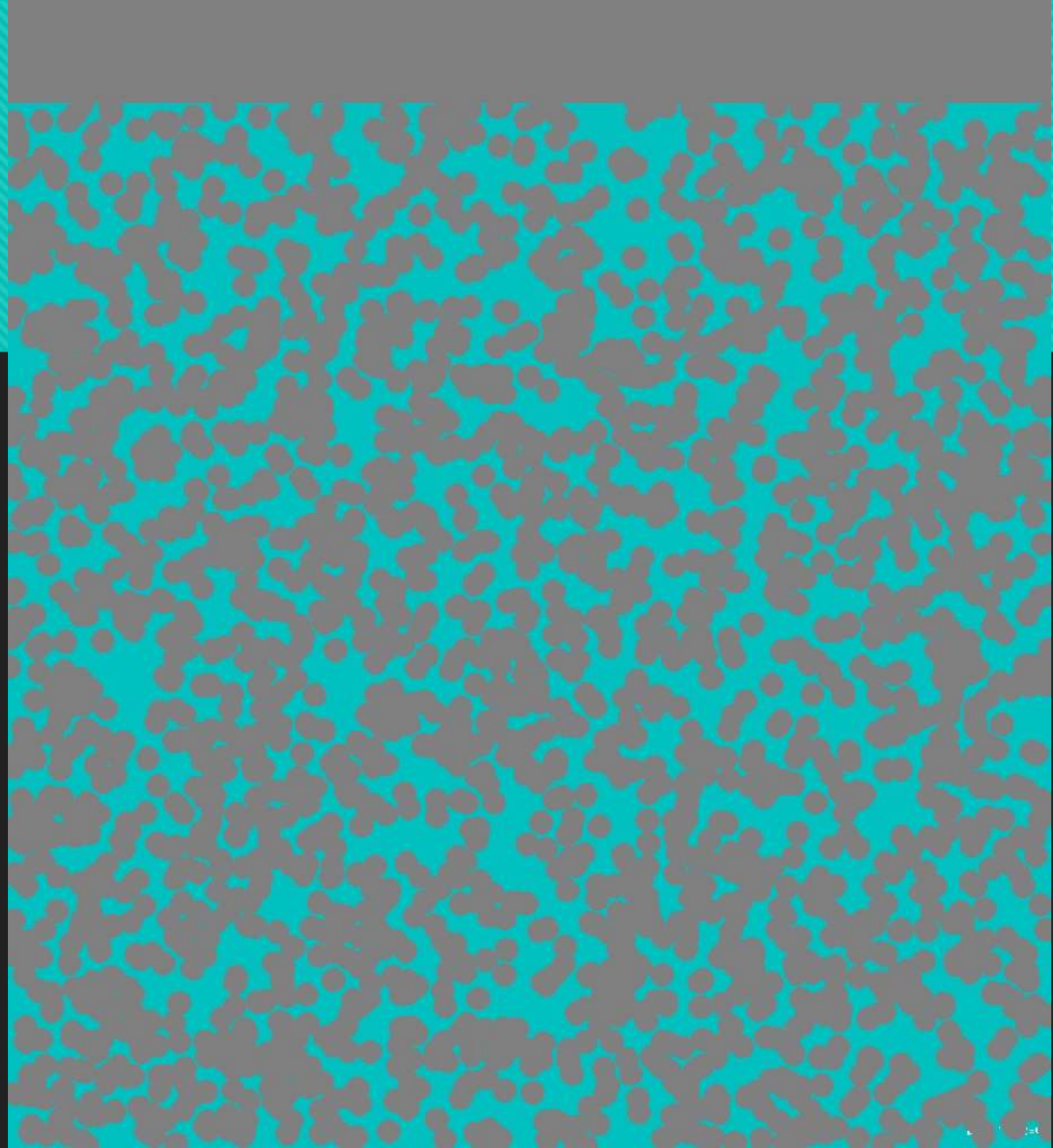
- Oui!





# Matériau imperméable

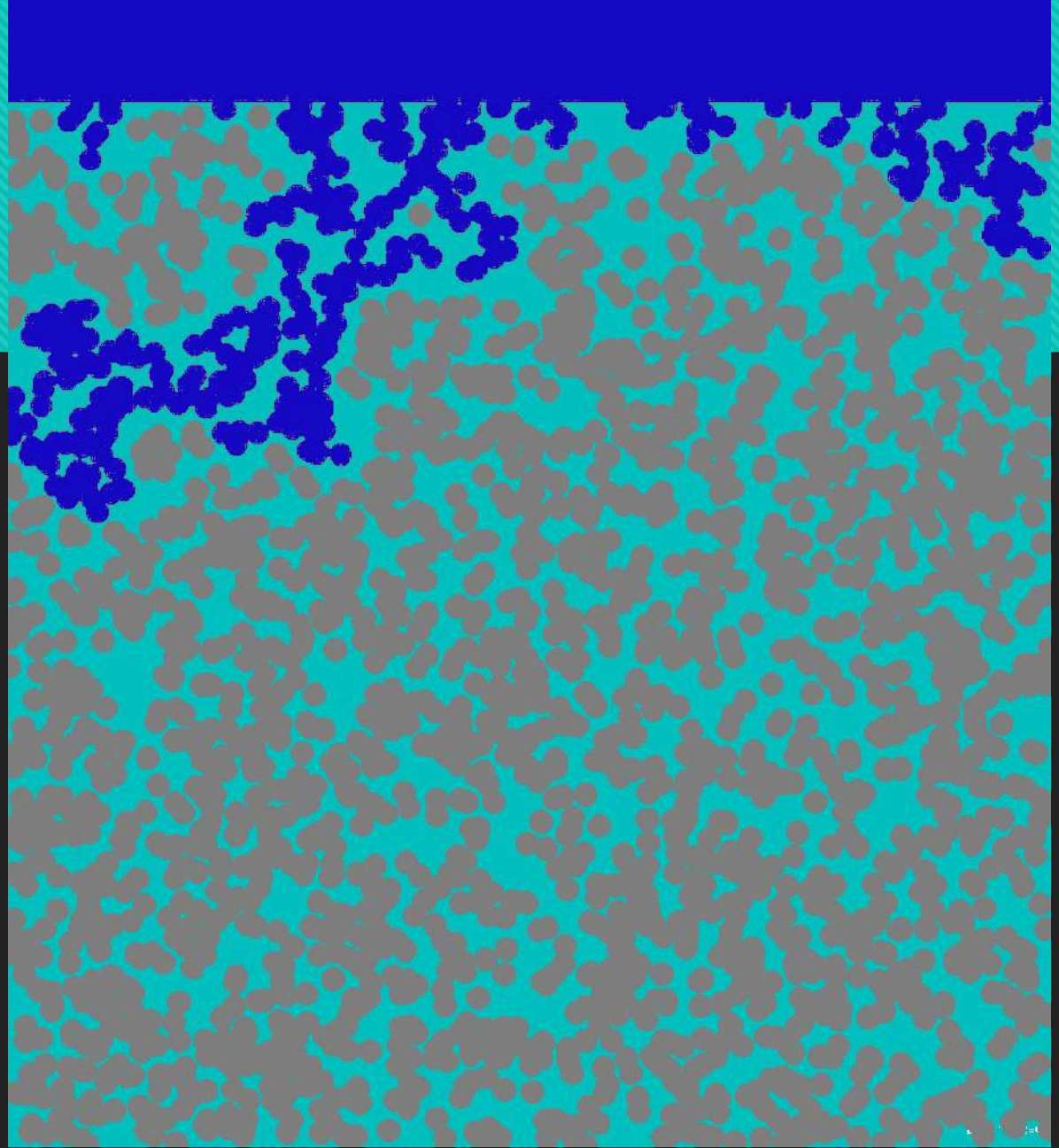
- Nouvelle tentative





# Matériau imperméable?

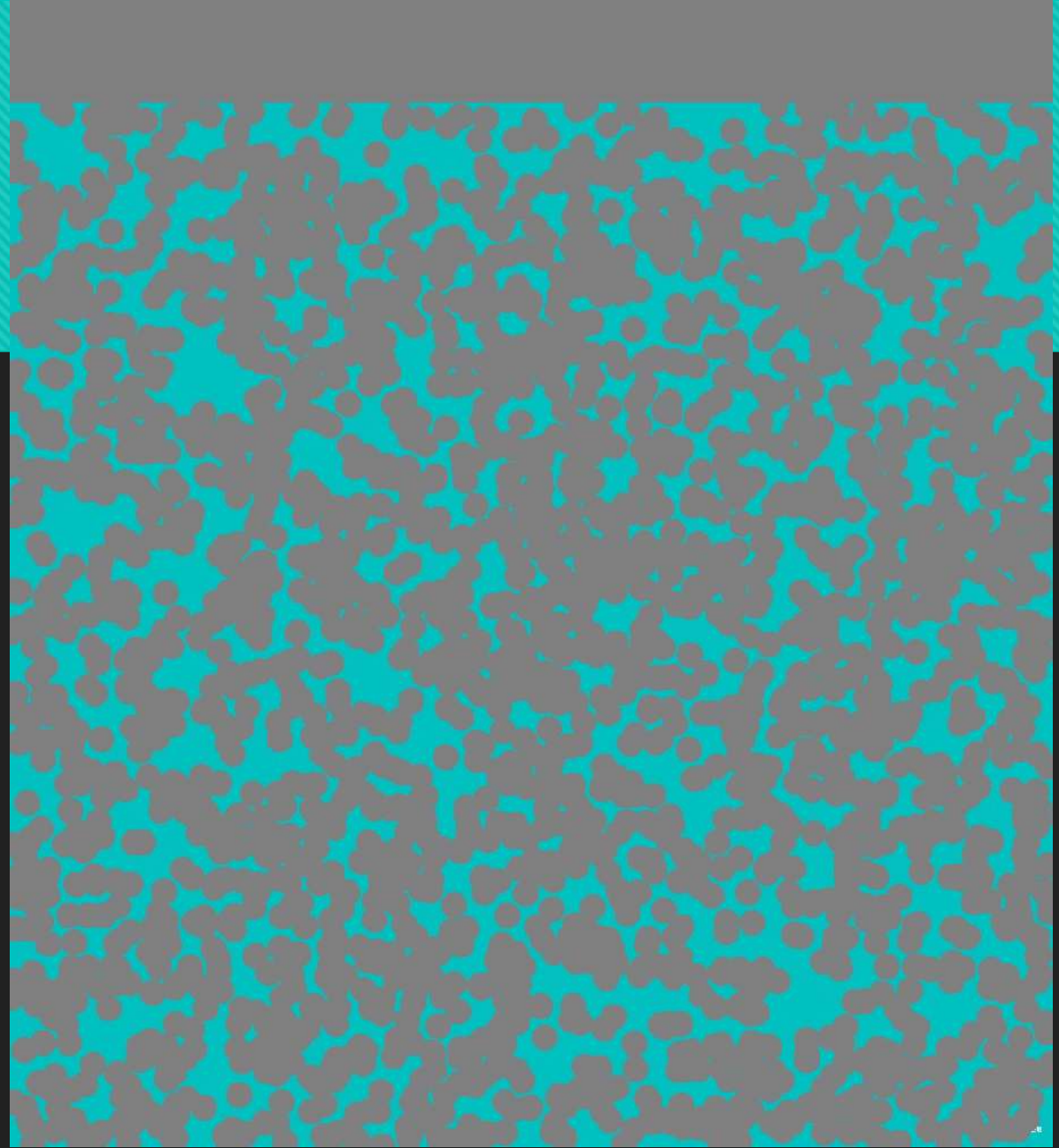
- Oui!





# Matériau imperméable

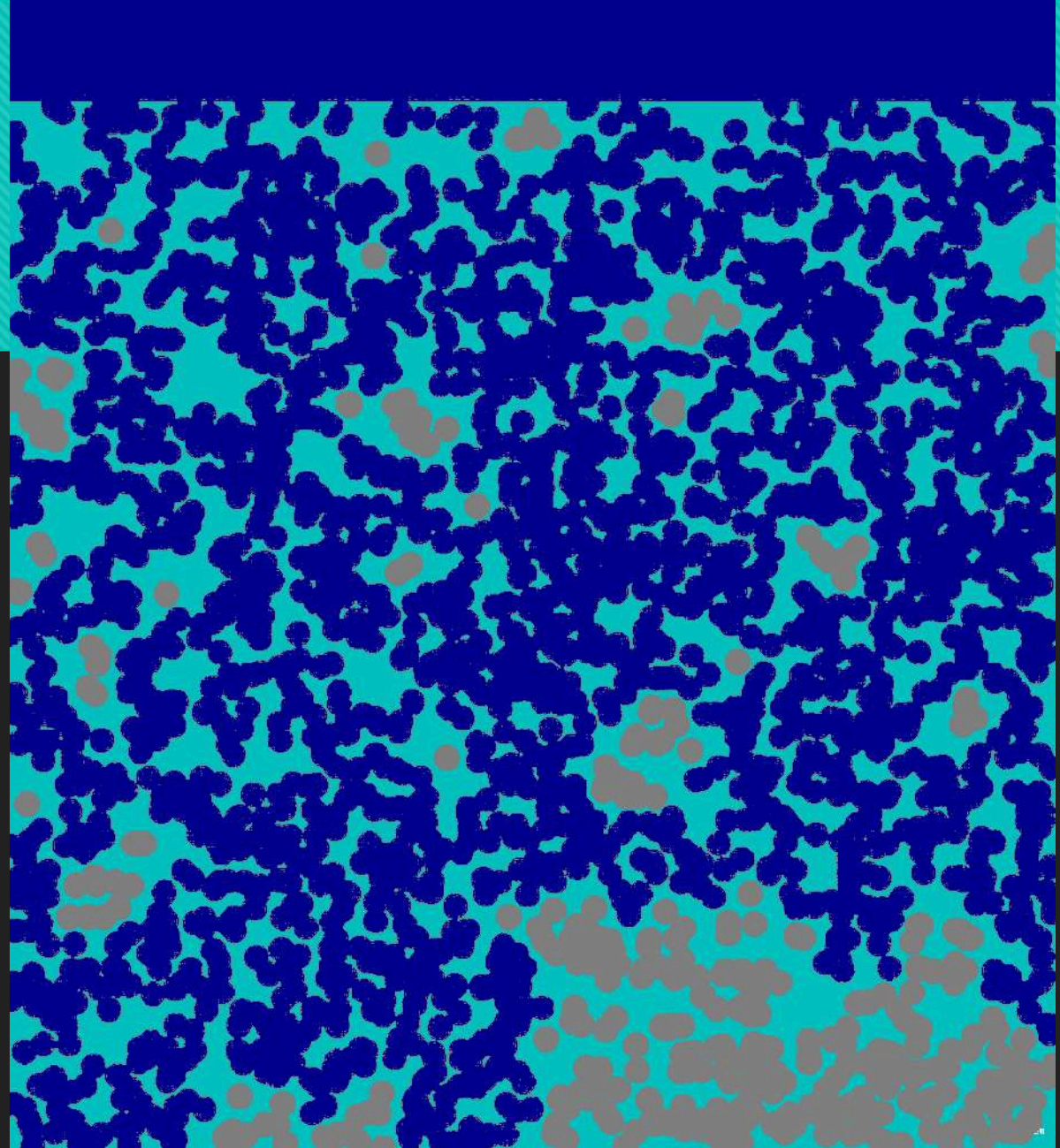
- Et si j'augmente un tout petit peu le rayon des trous?





# Matériau imperméable?

Non!



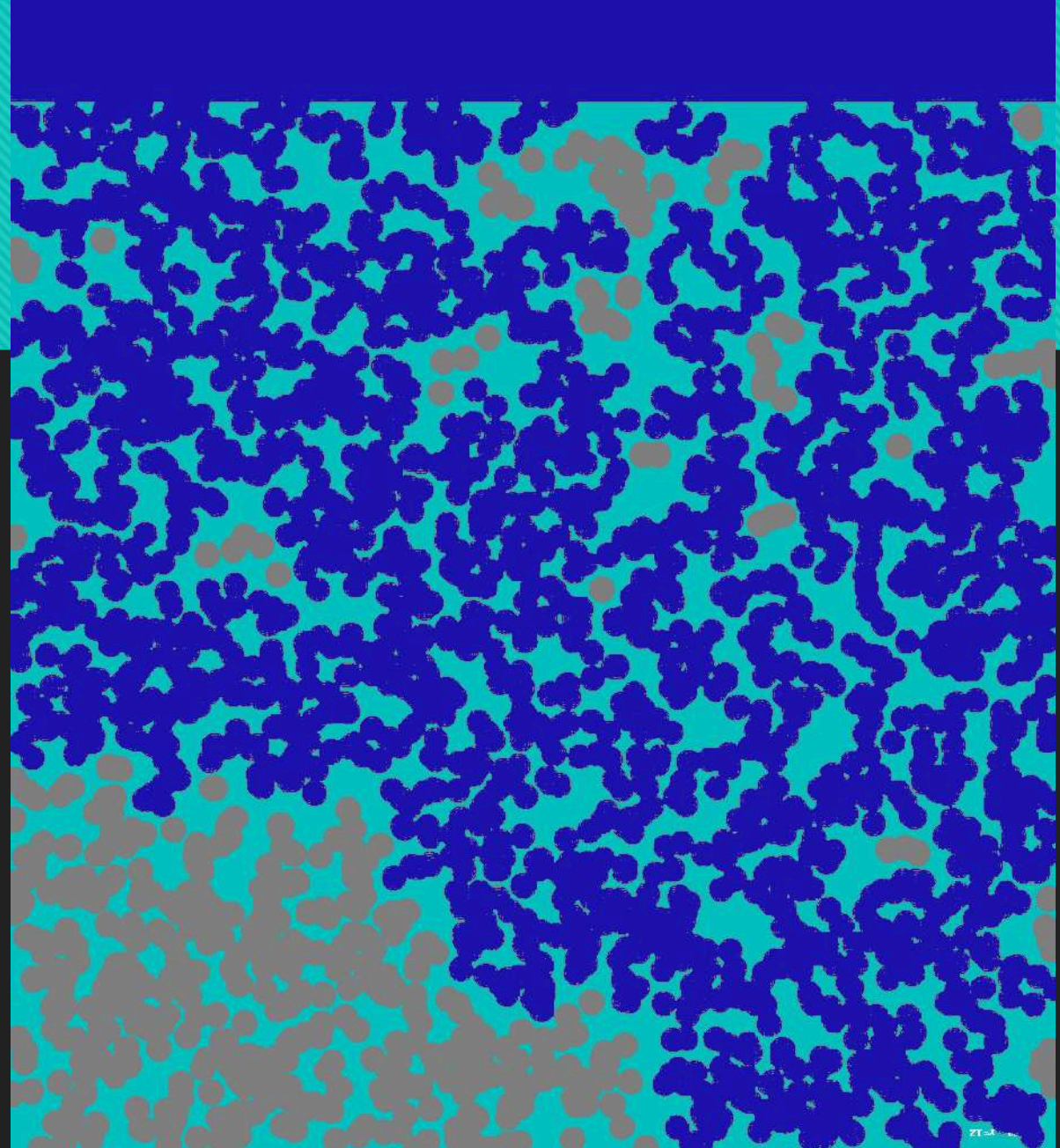


# Nouvelle tentative



# Matériau imperméable?

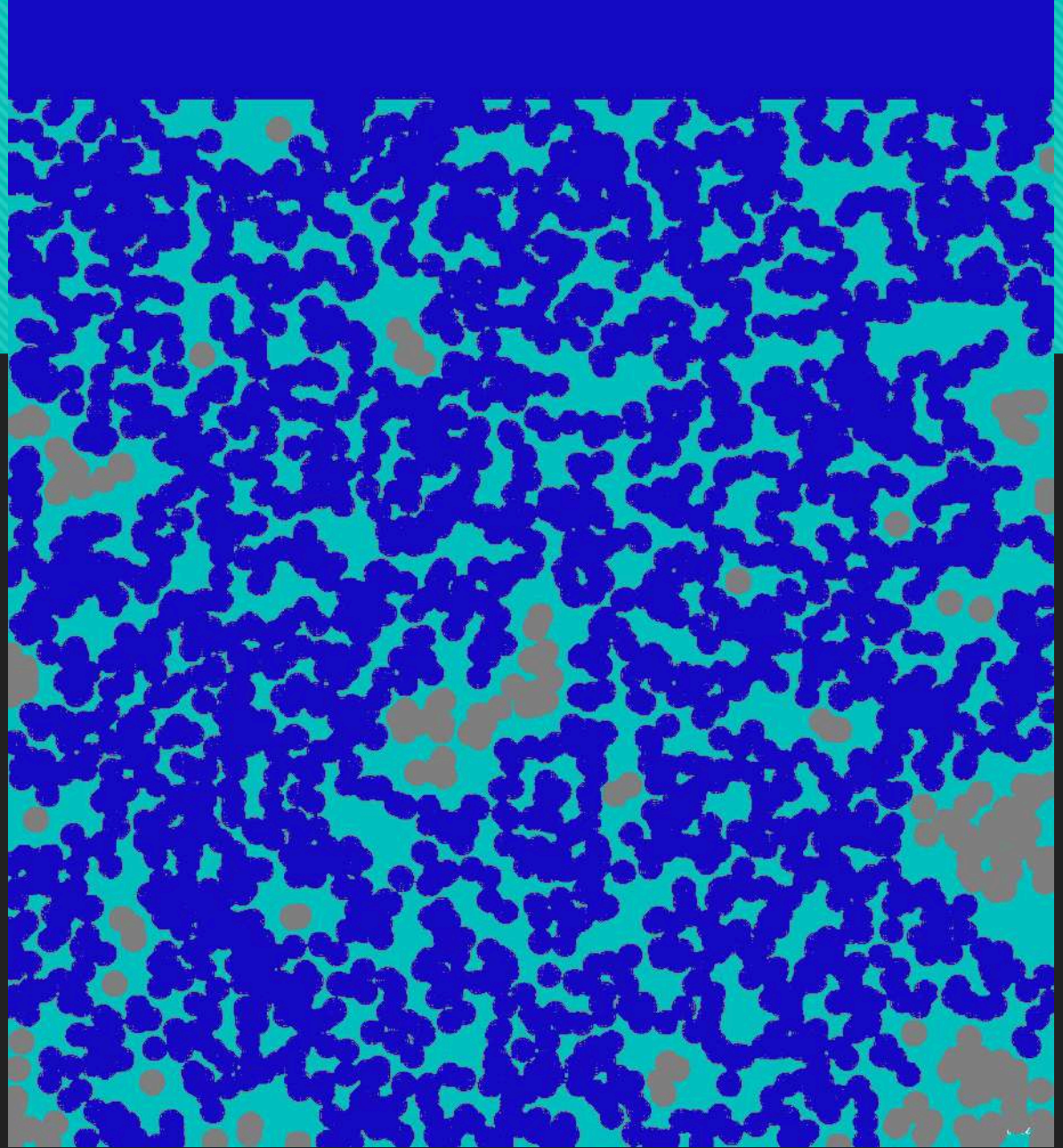
Non!





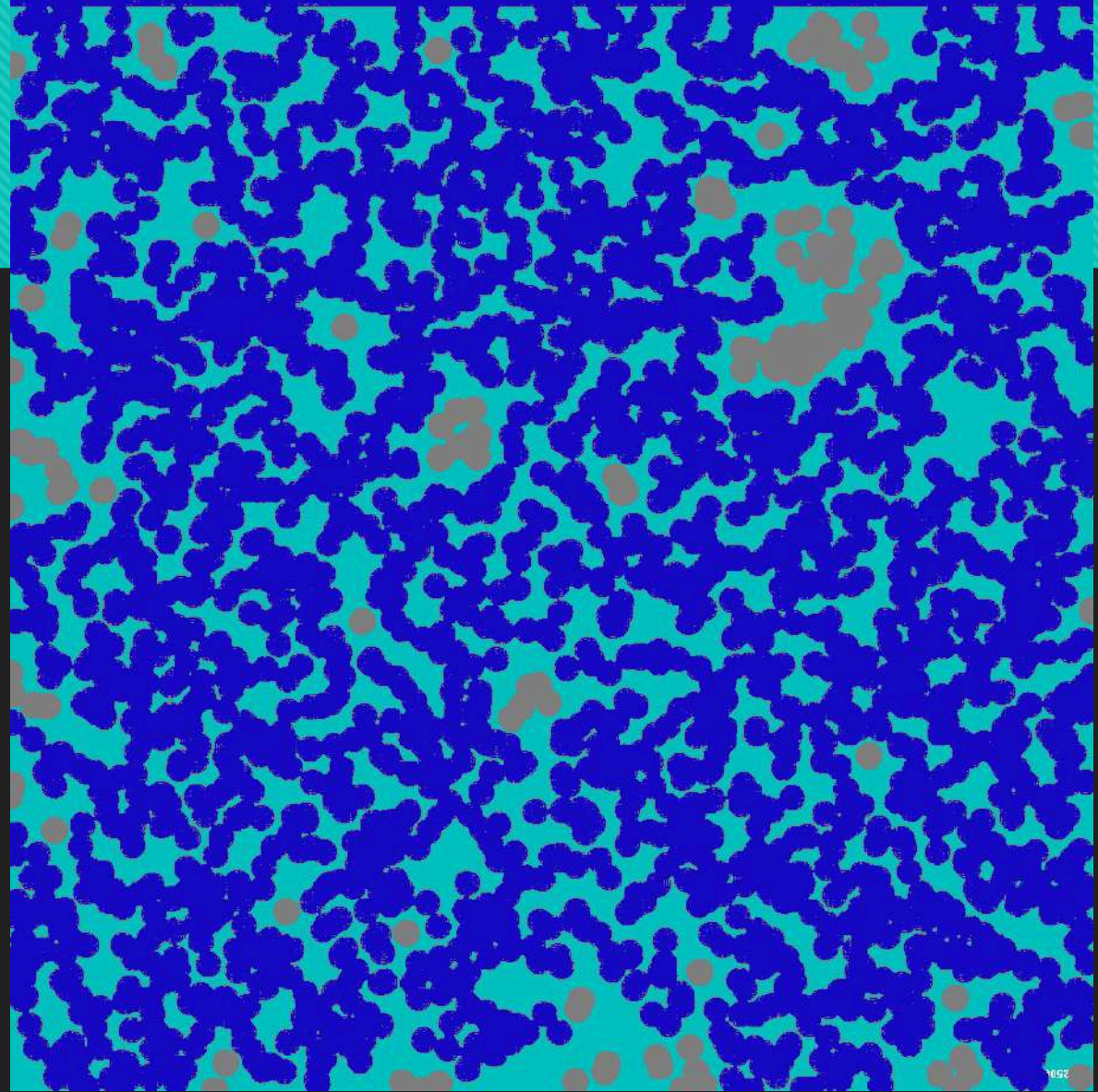
# Matériau imperméable

Non!



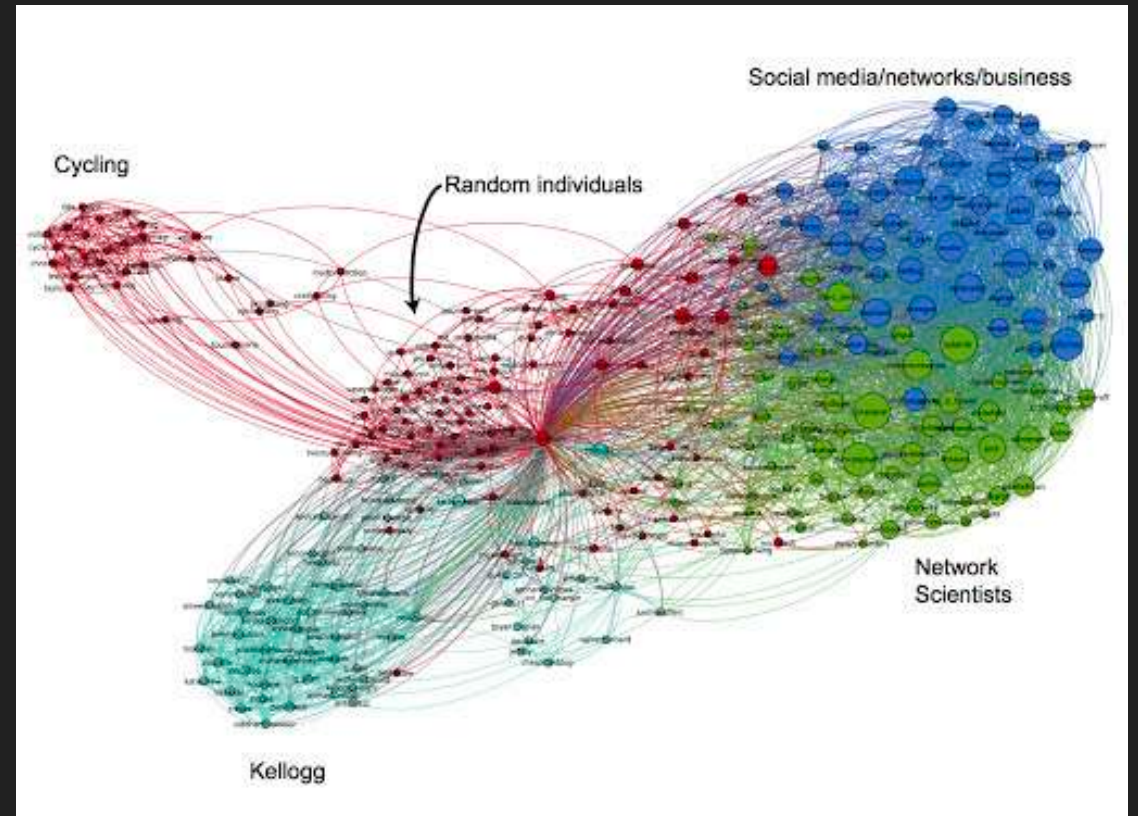
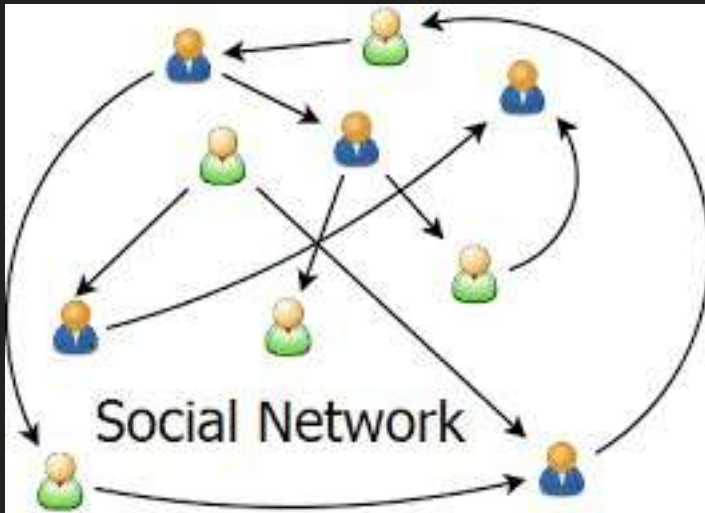


Etc...etc...





# Des certitudes dans les réseaux sociaux?





# Comment se construit un réseau social?

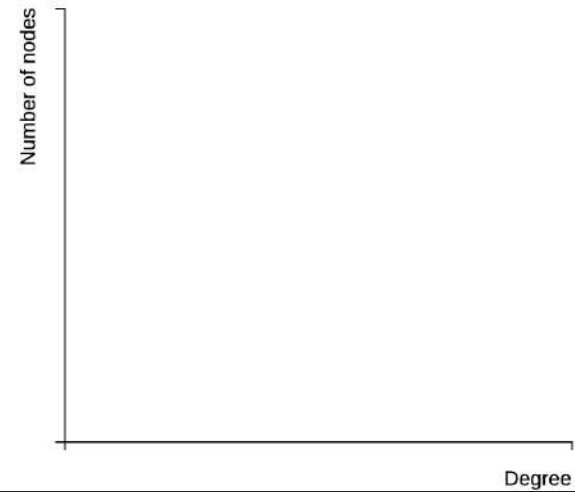


New connections:

Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

1 individus





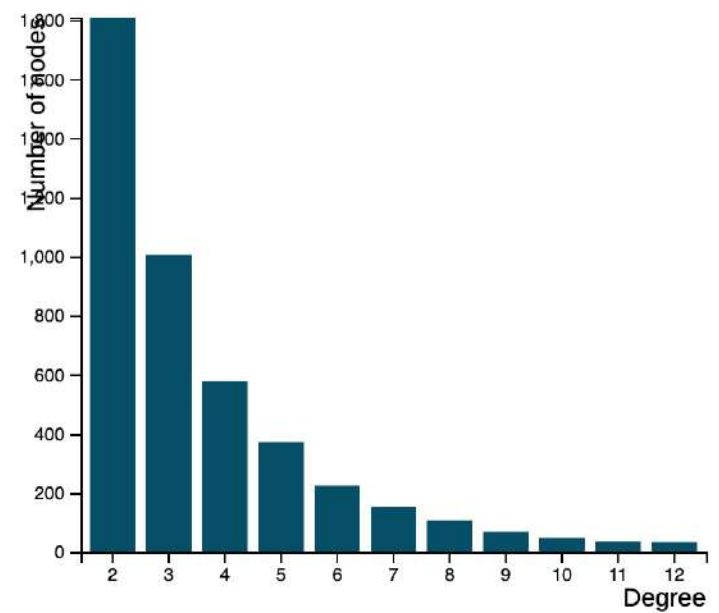


New connections:   
Rumor starters (%)   
Envoyer

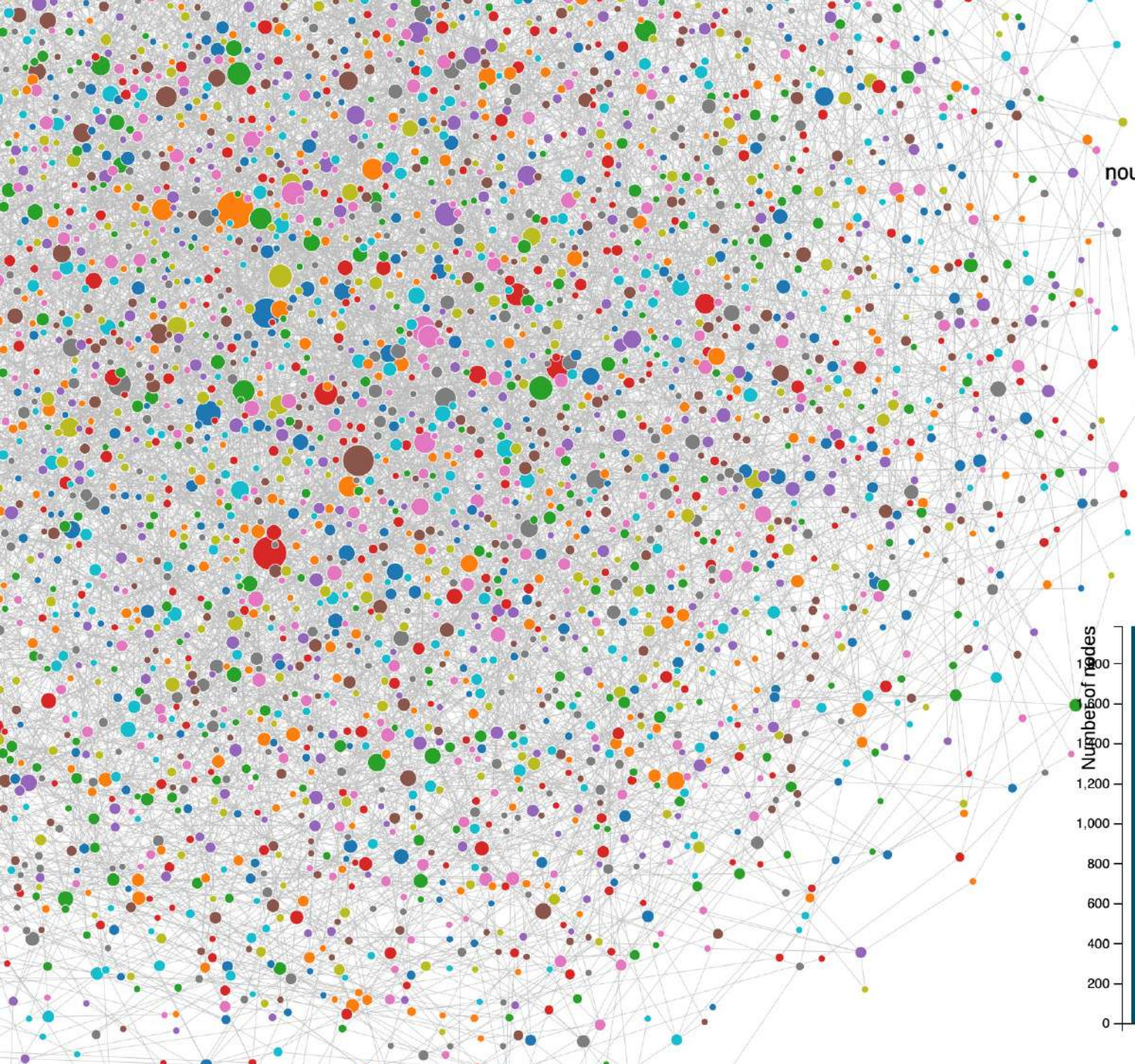
nouvelles connections: 2, starters proportion: 0.02

4554 individus

Next step



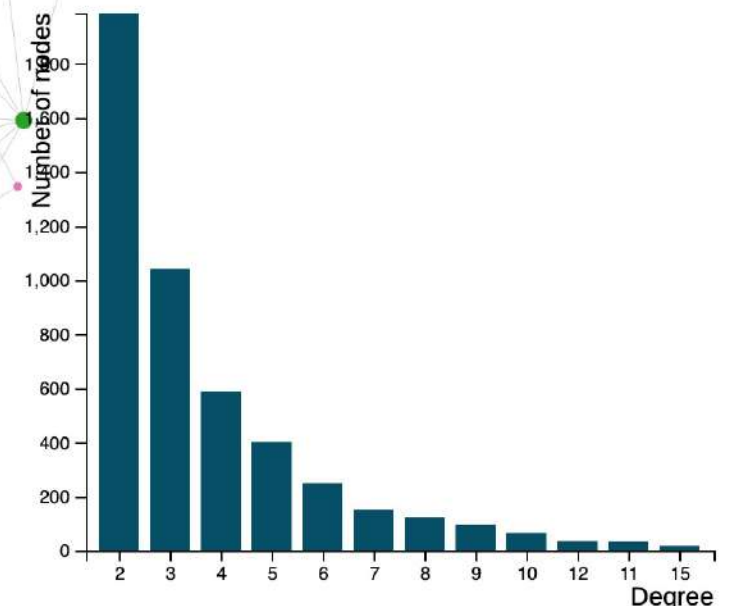




New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4892 individus



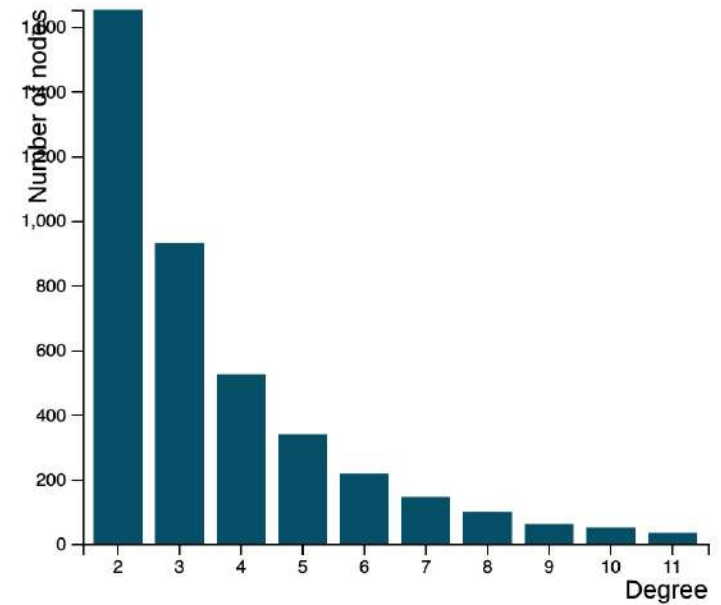




New connections:   
Rumor starters (%)

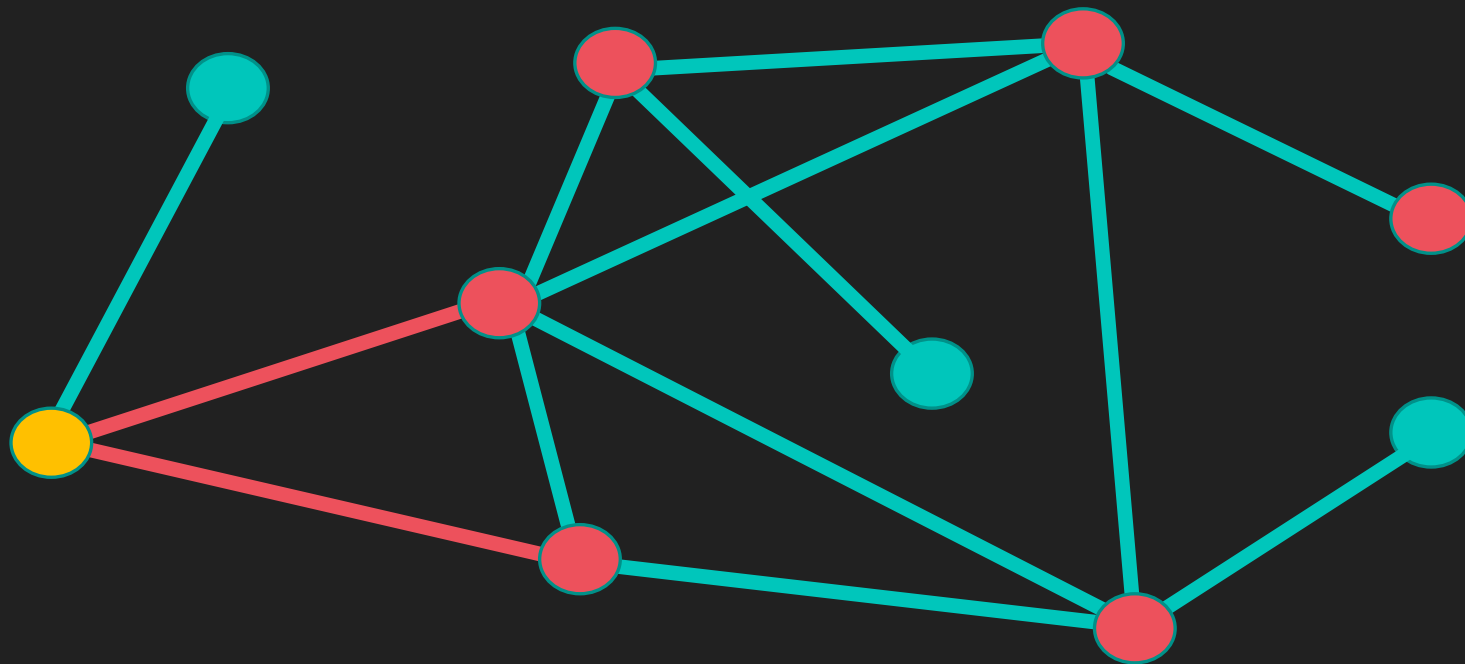
New connections: 2, starters proportion: 0.01

4192 individus



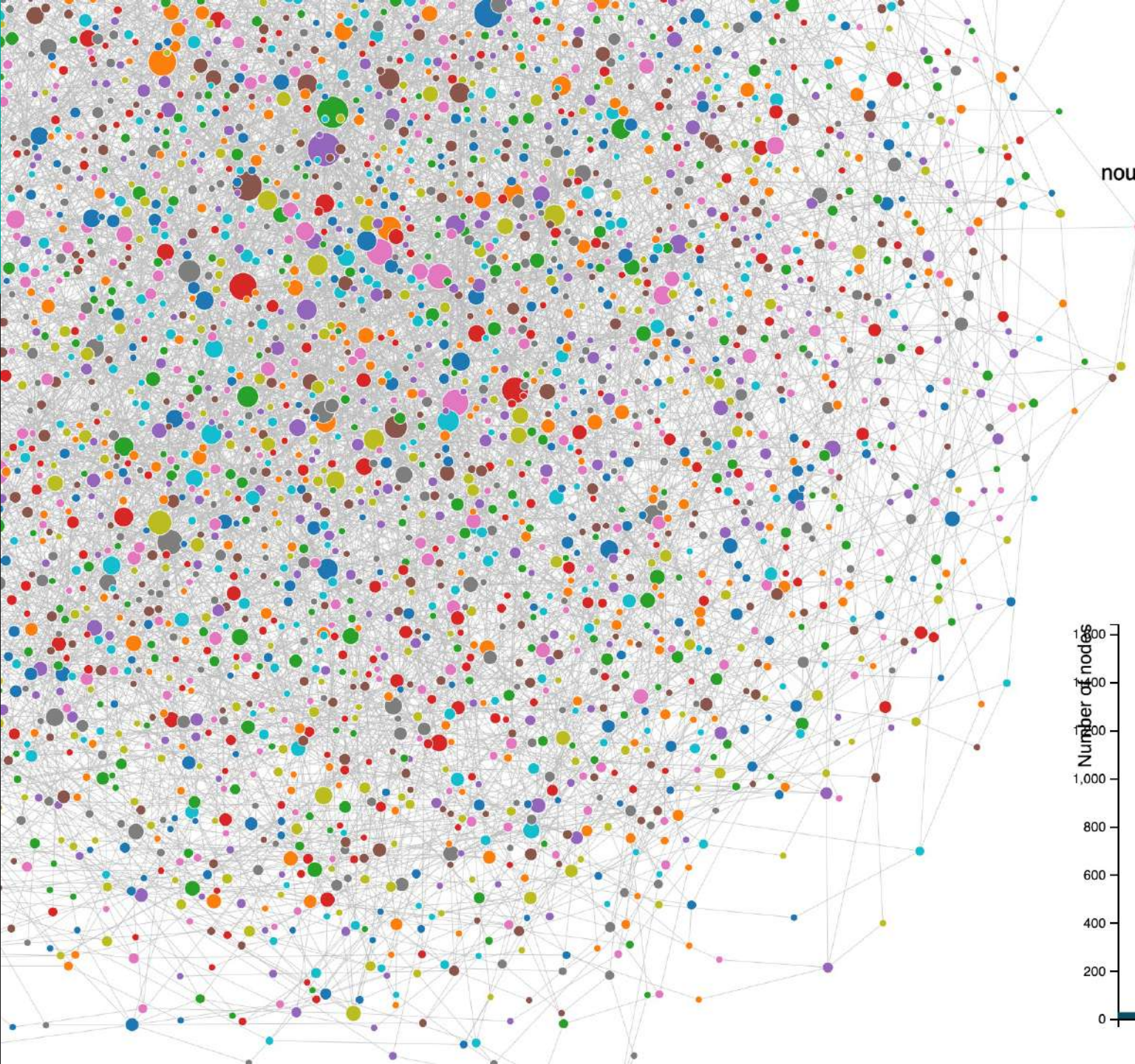


# Comment se propage une rumeur?



<https://helios.mi.parisdescartes.fr/~rlachiez//vulga/timeworld21/barabasi/index.html>

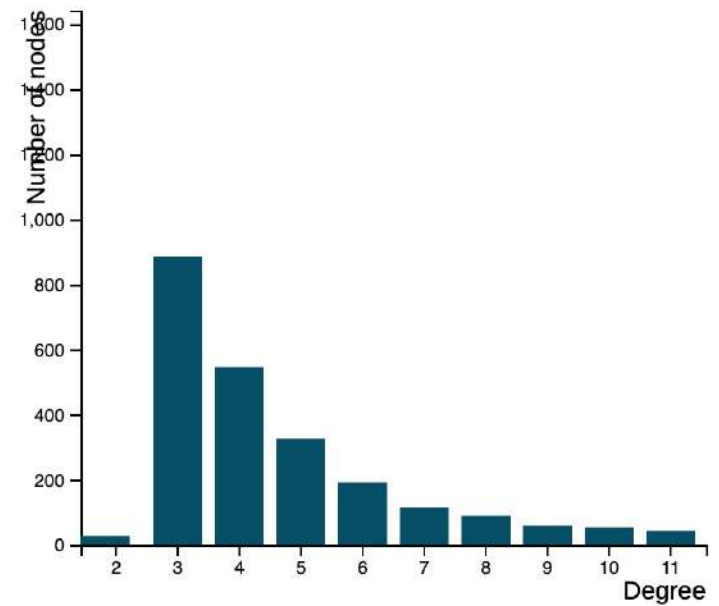




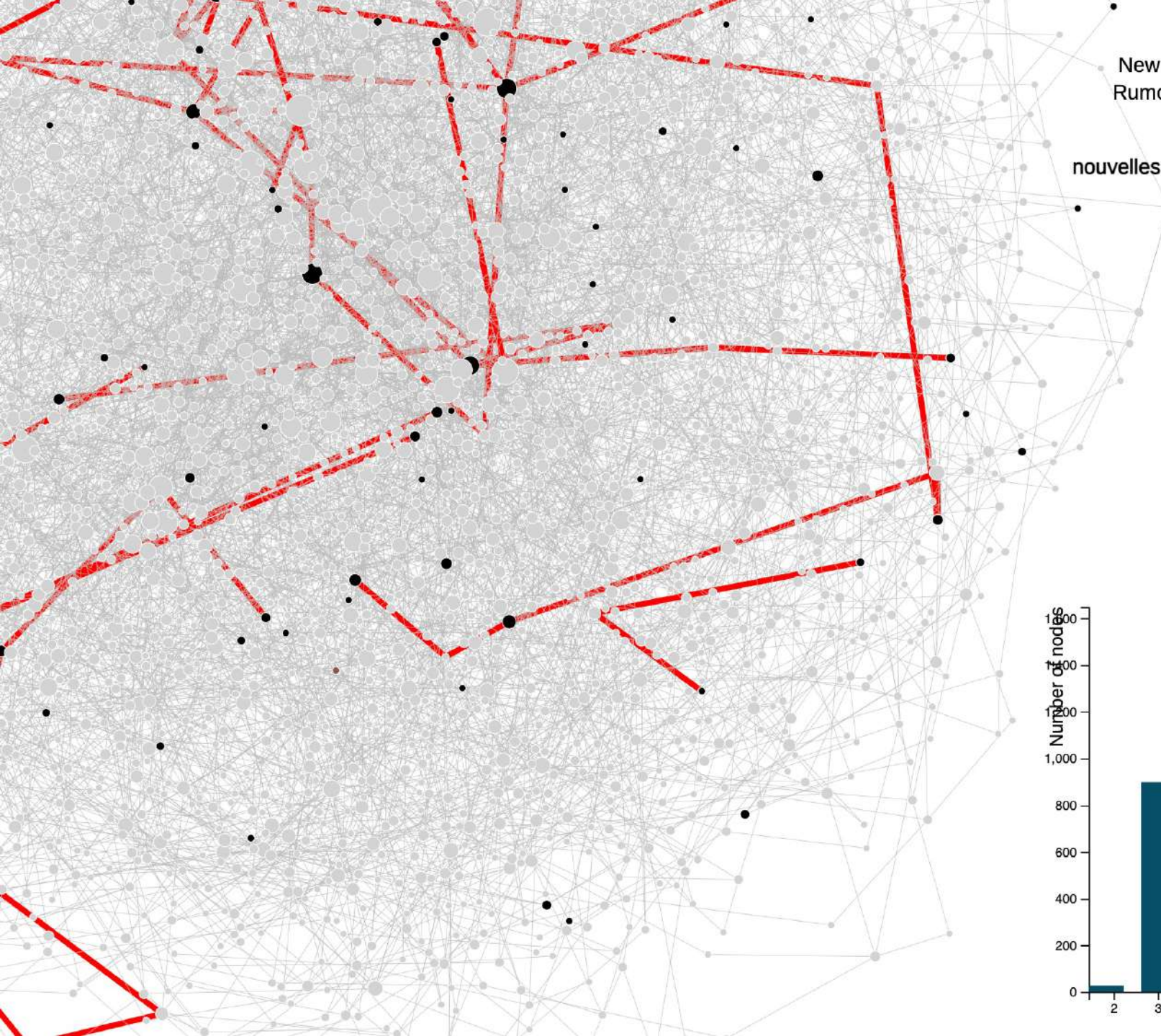
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4086 individus



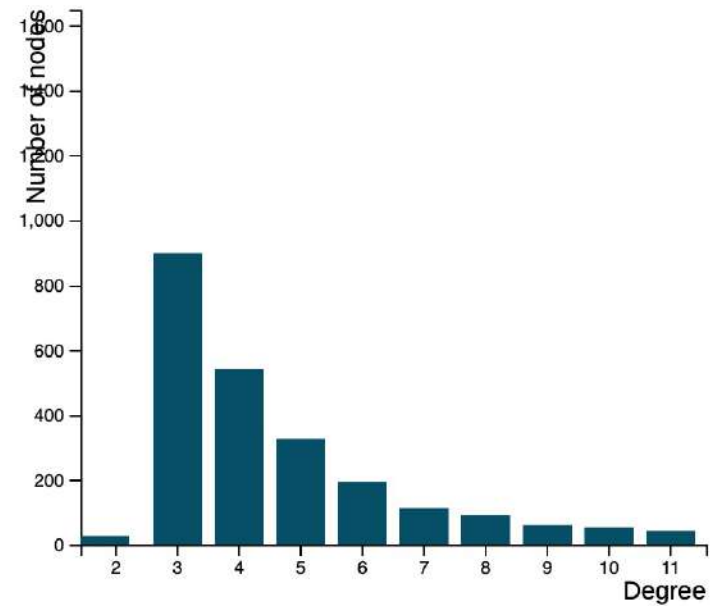




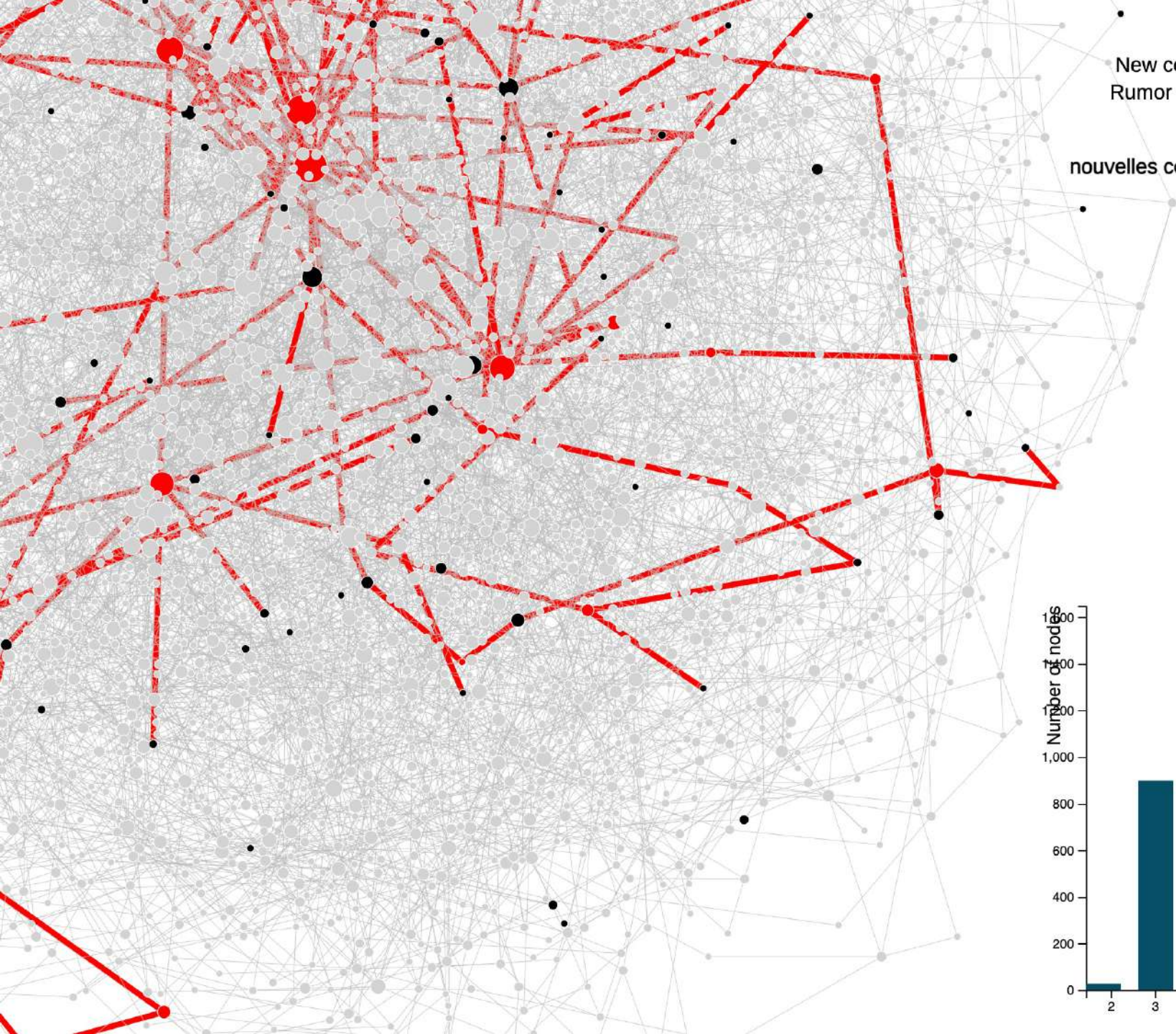
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4106 individus  
3978 sains  
25 incubent  
102 infectés



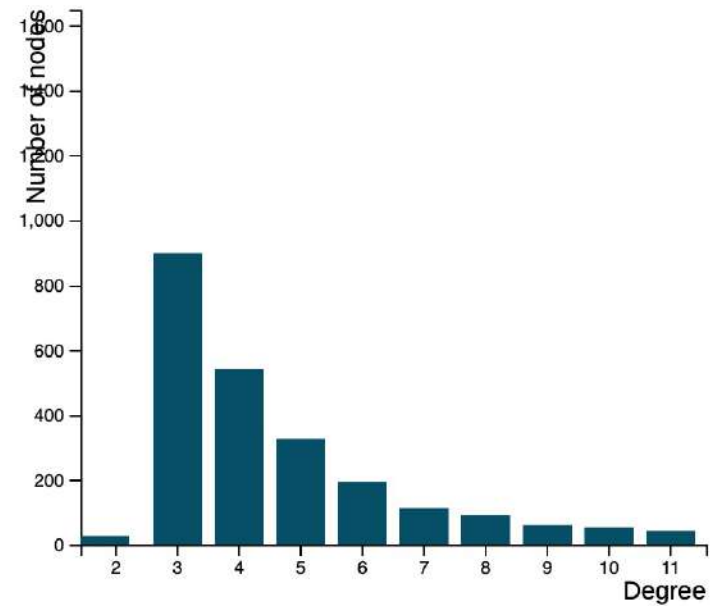




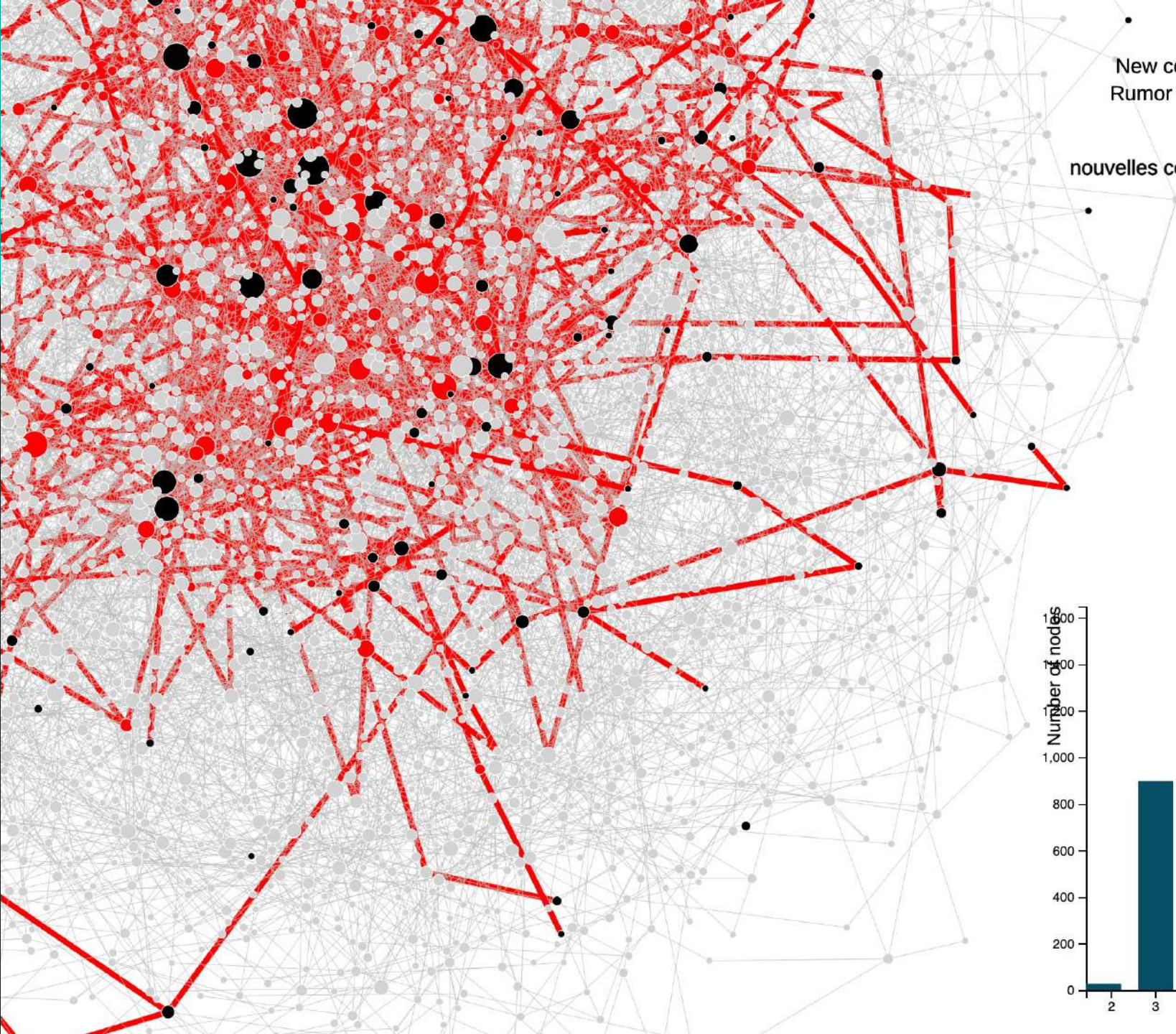
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4106 individus  
3949 sains  
30 incubent  
127 infectés



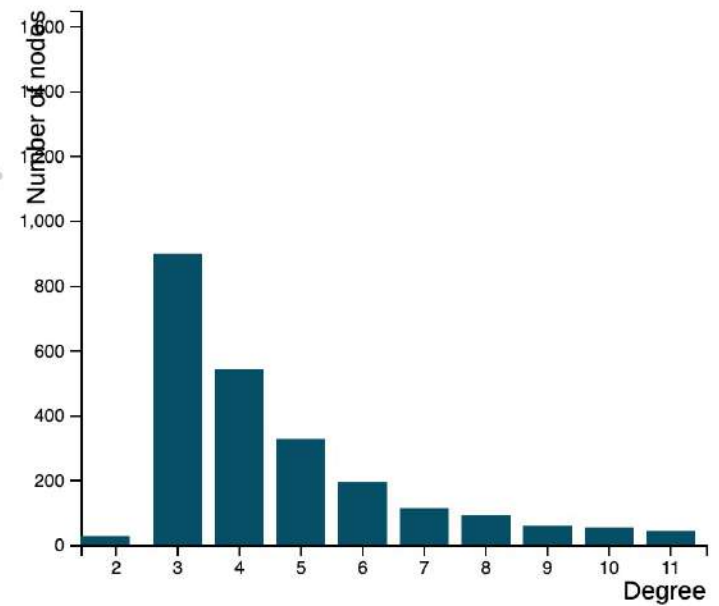




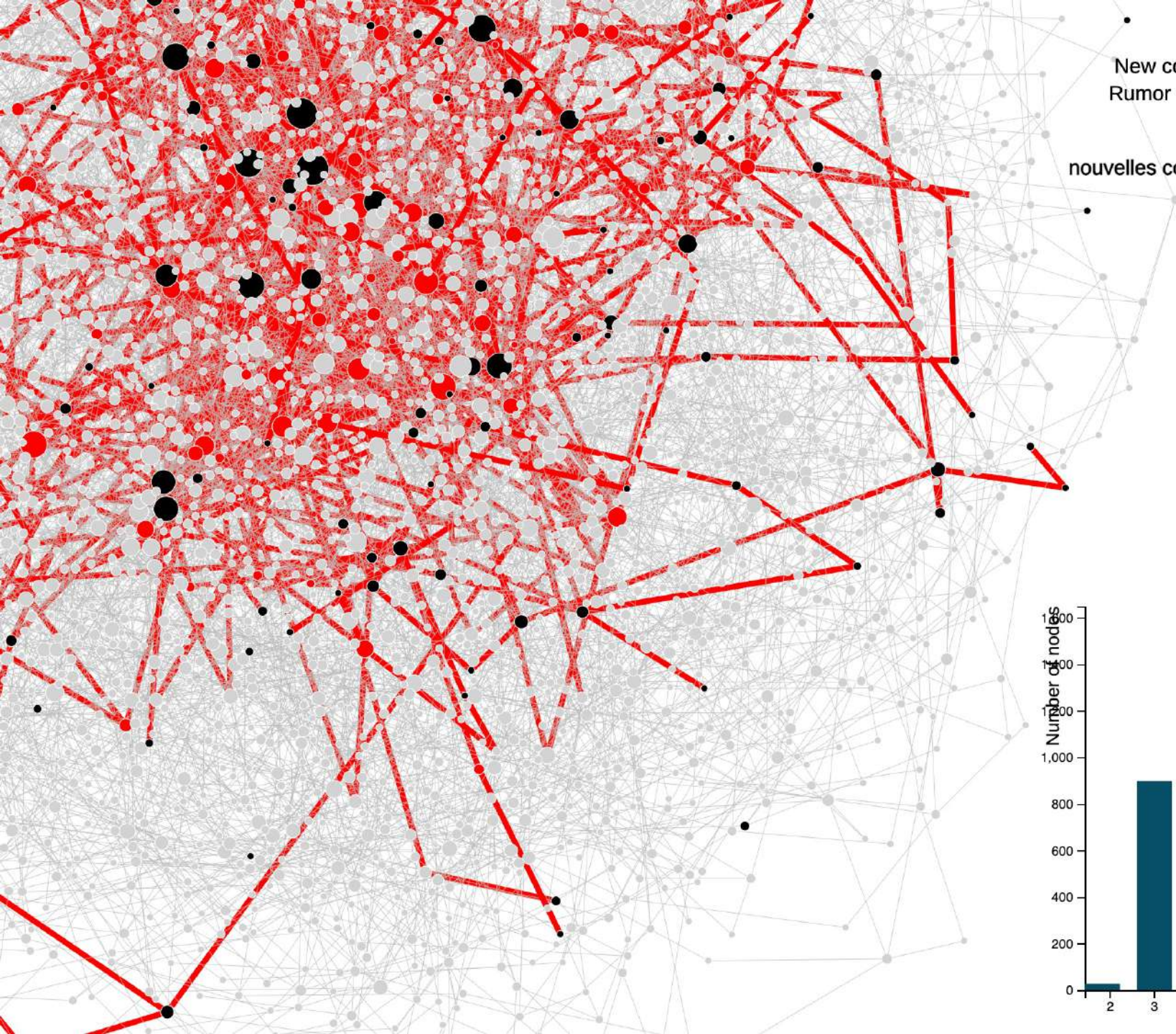
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4106 individus  
3719 sains  
147 incubent  
240 infectés



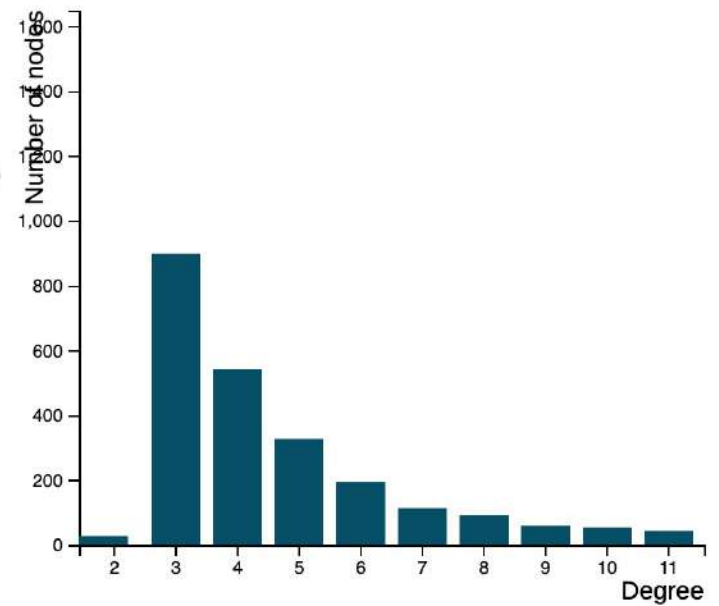




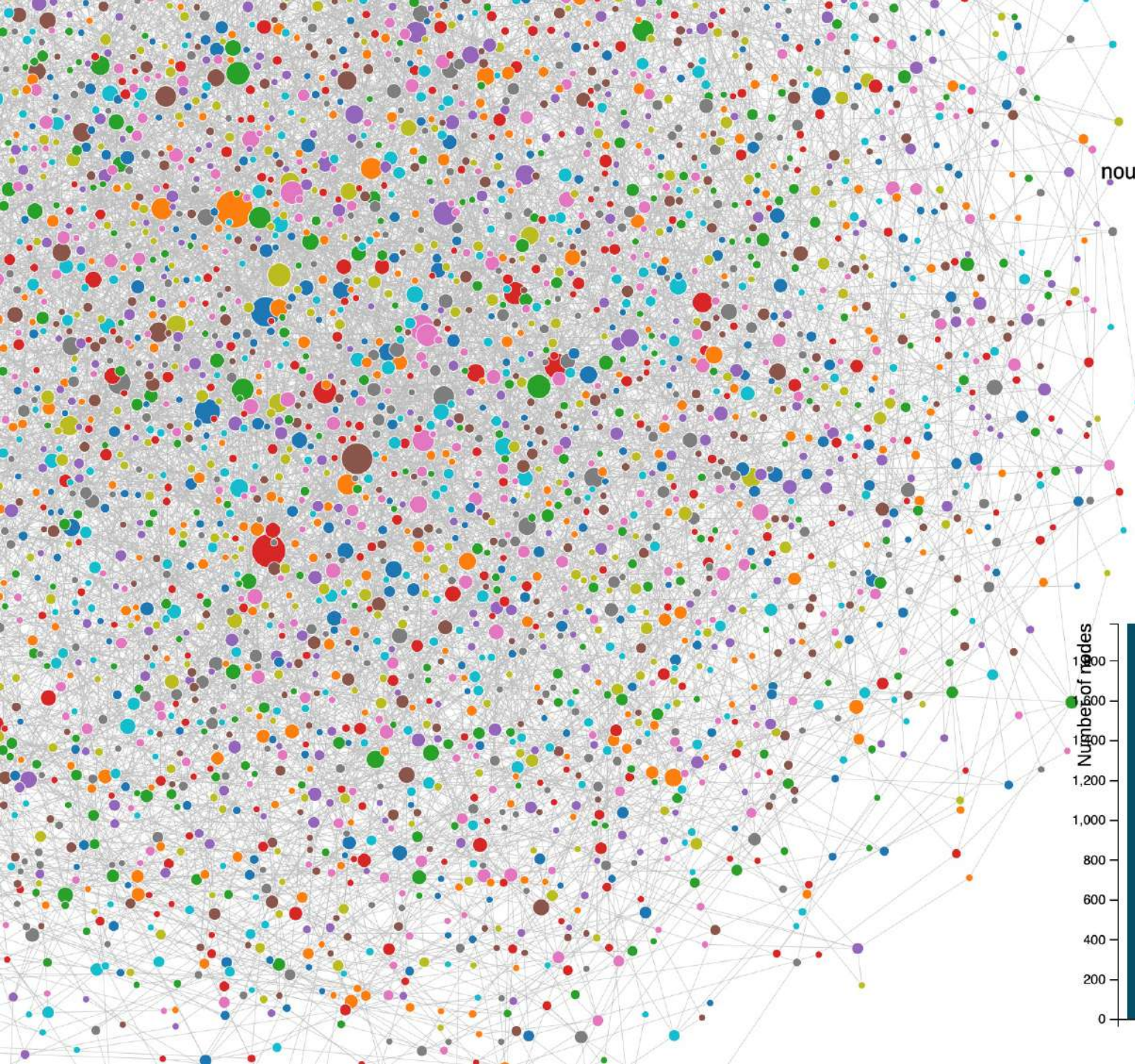
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4106 individus  
3719 sains  
147 incubent  
240 infectés



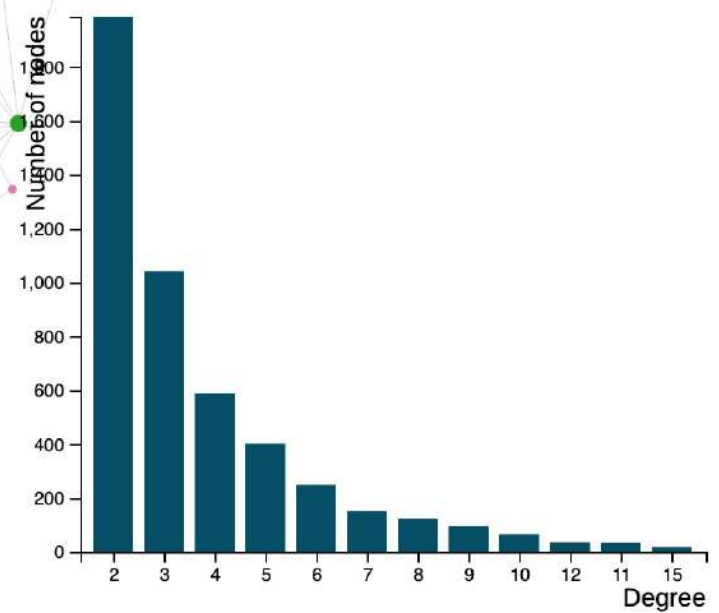




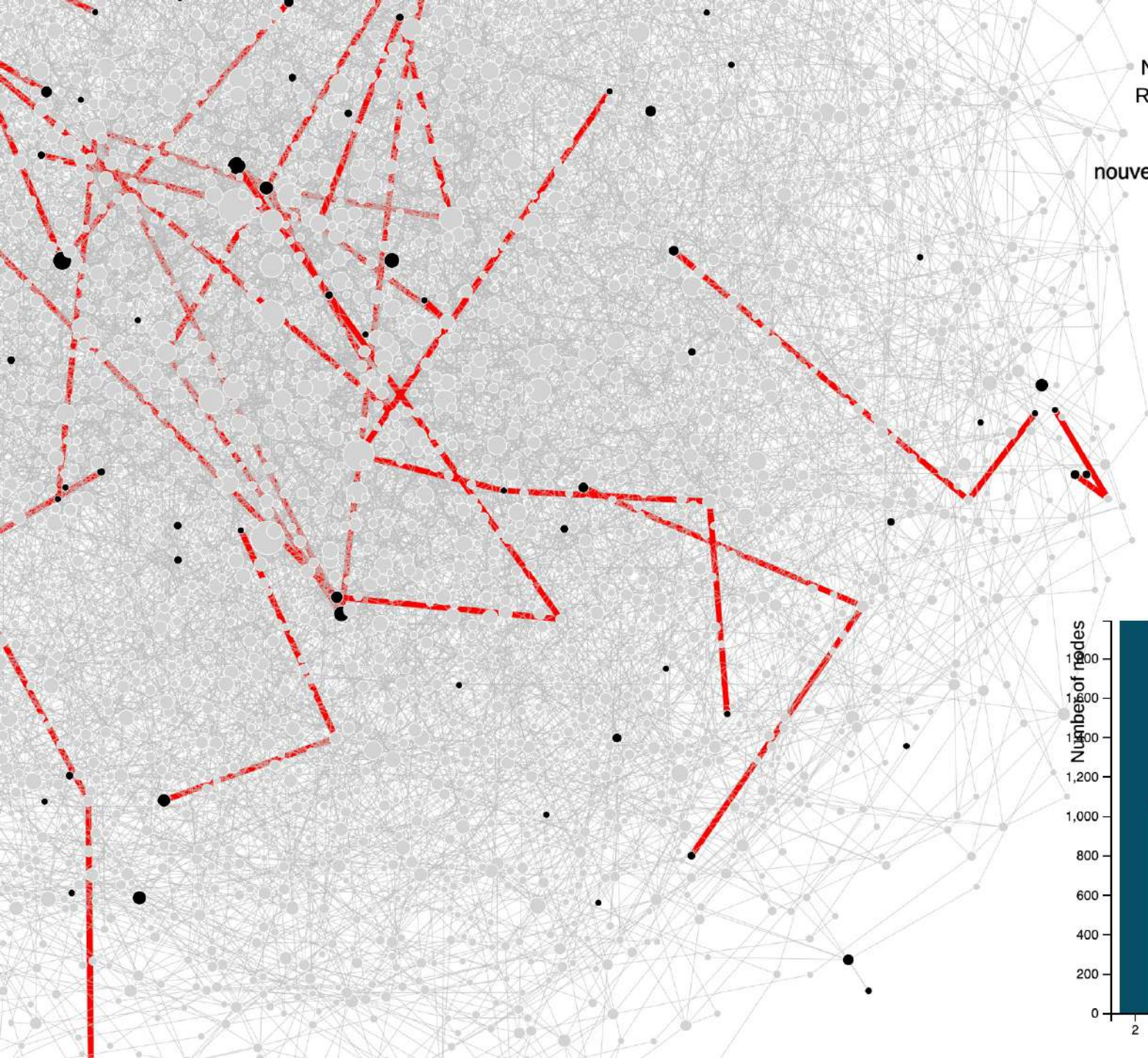
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4892 individus



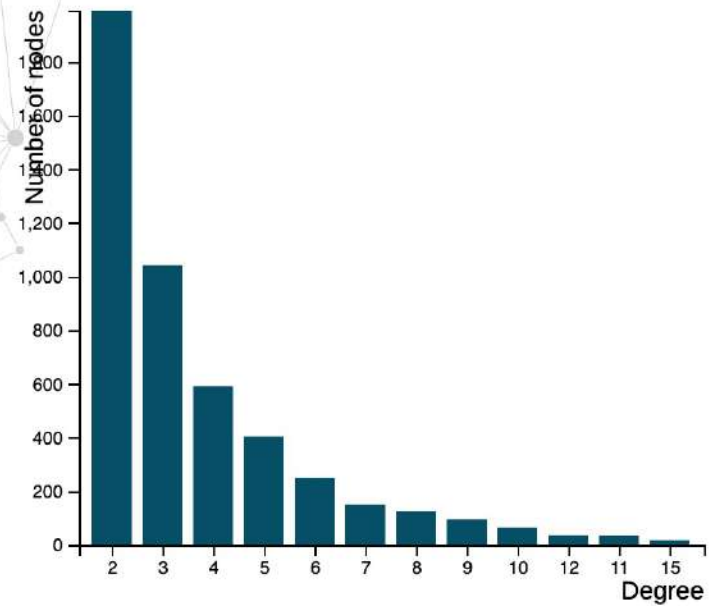




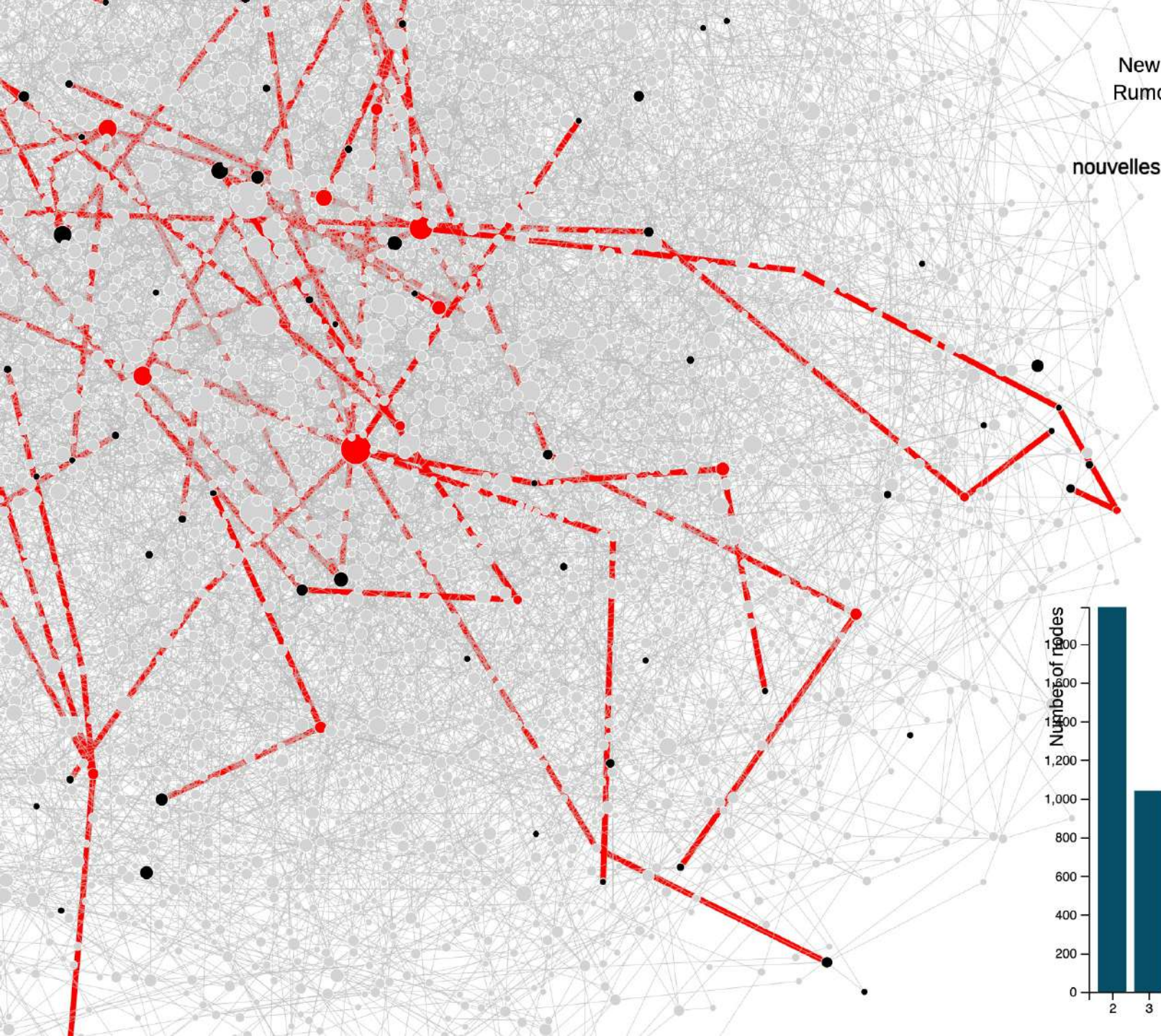
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4779 sains  
21 incubent  
100 infectés



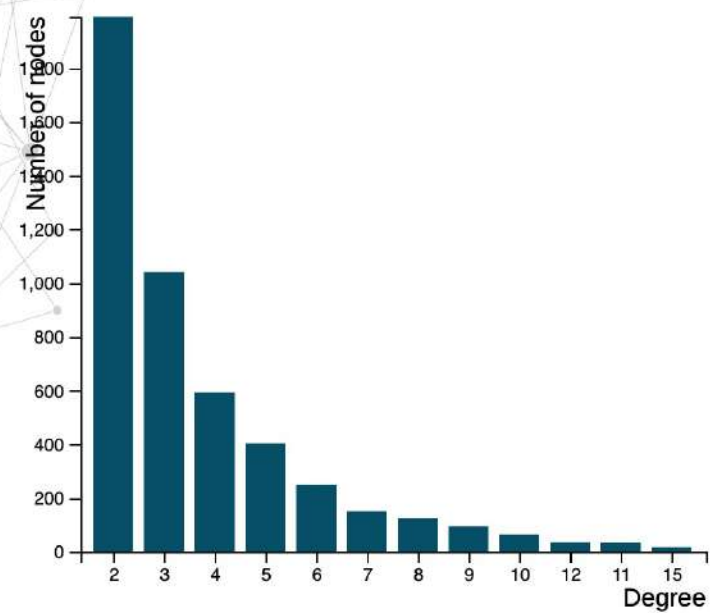




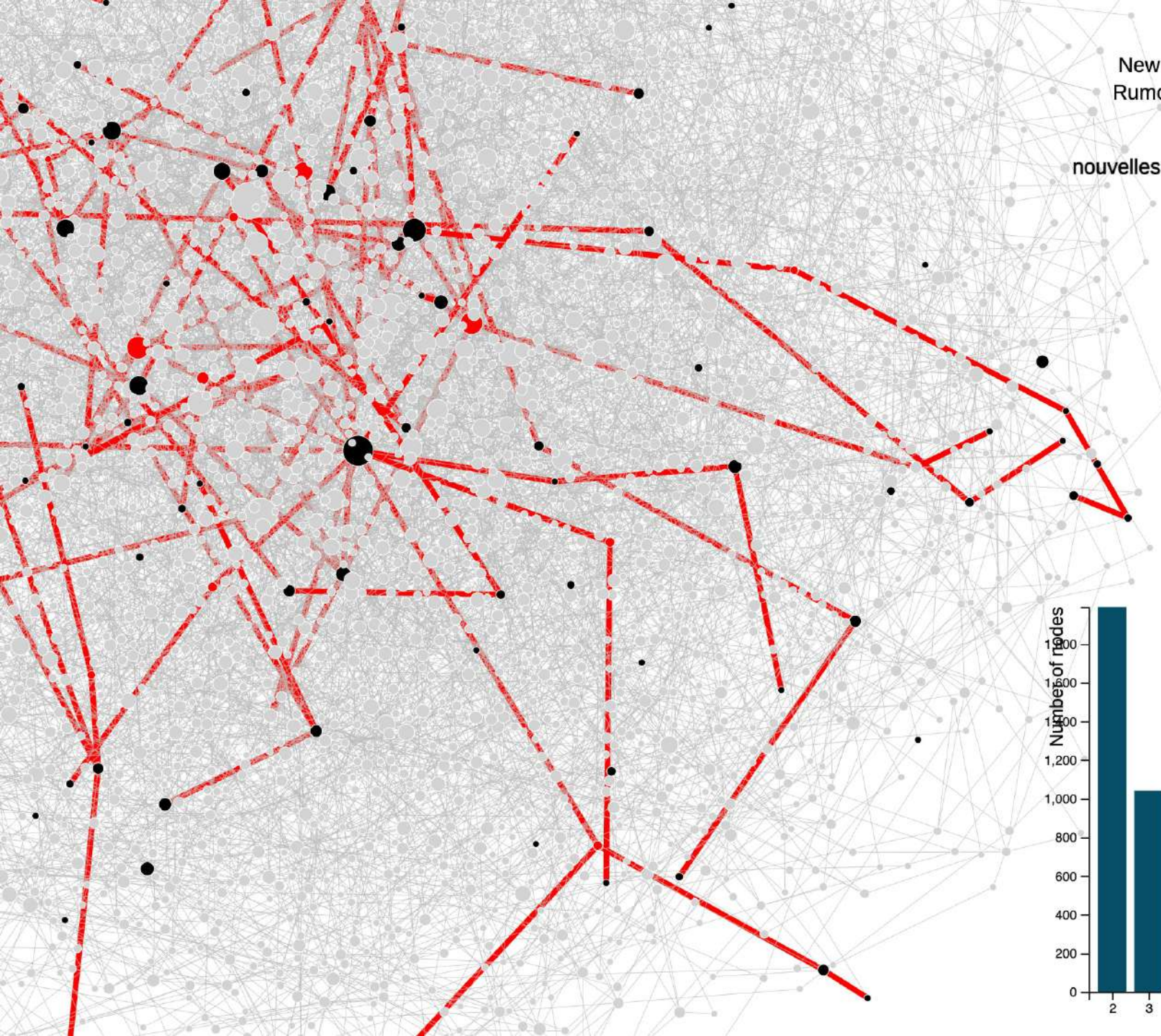
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4765 sains  
15 incubent  
121 infectés



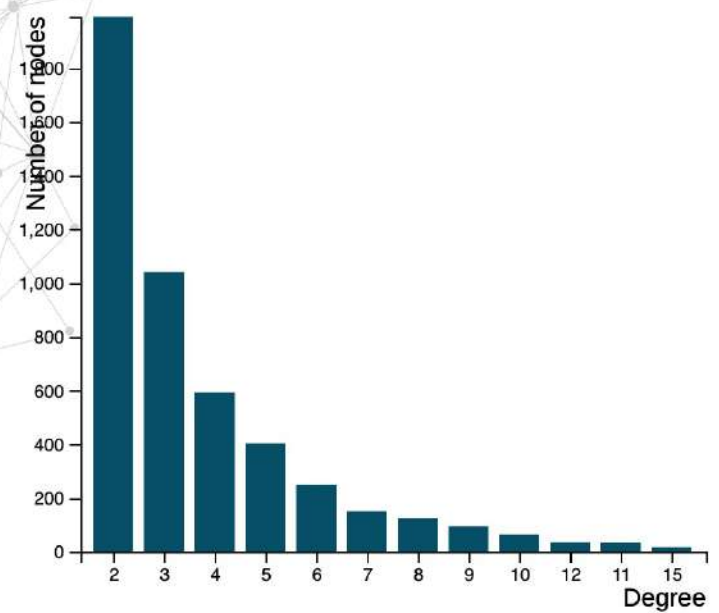




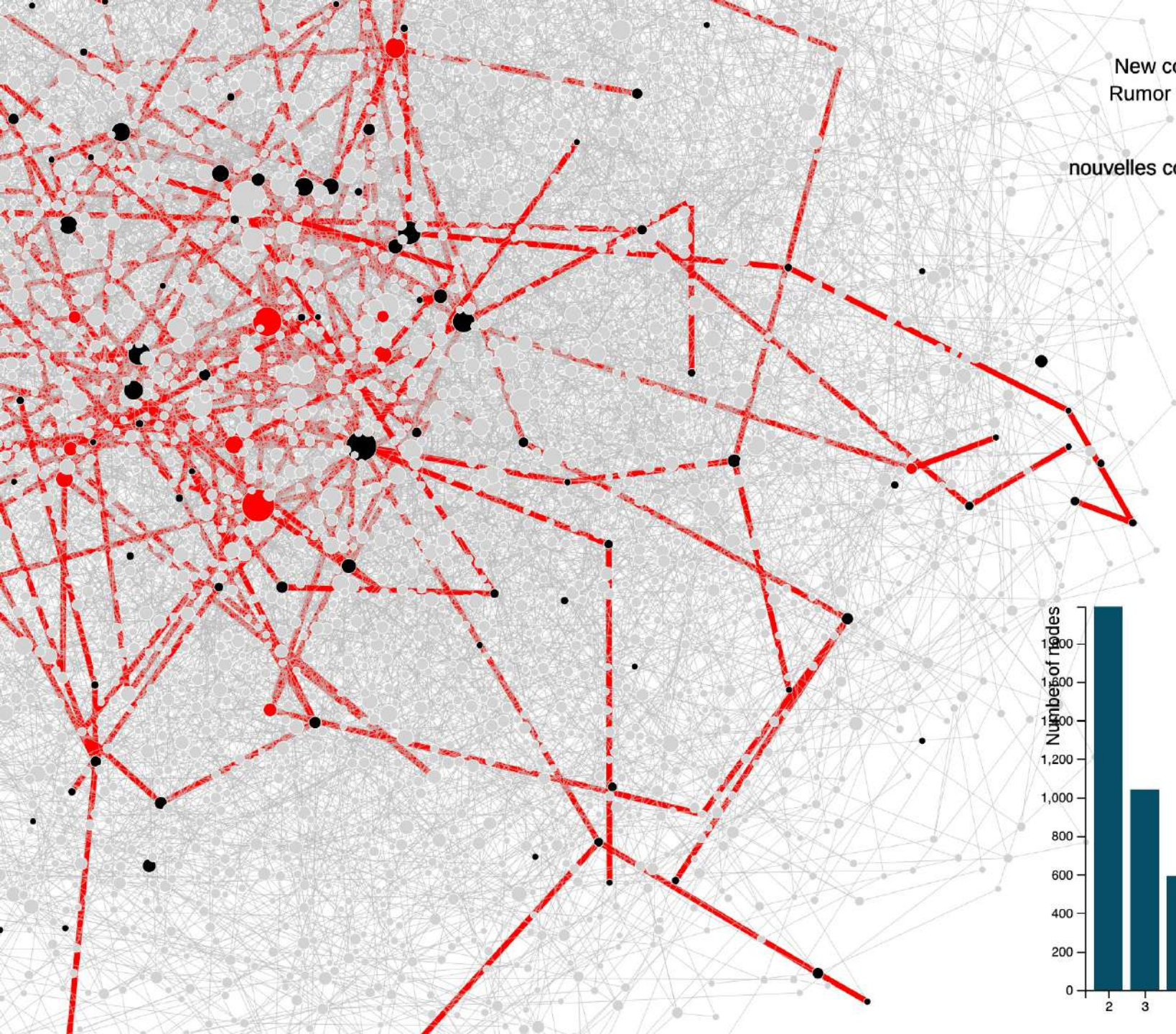
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4750 sains  
15 incubent  
136 infectés



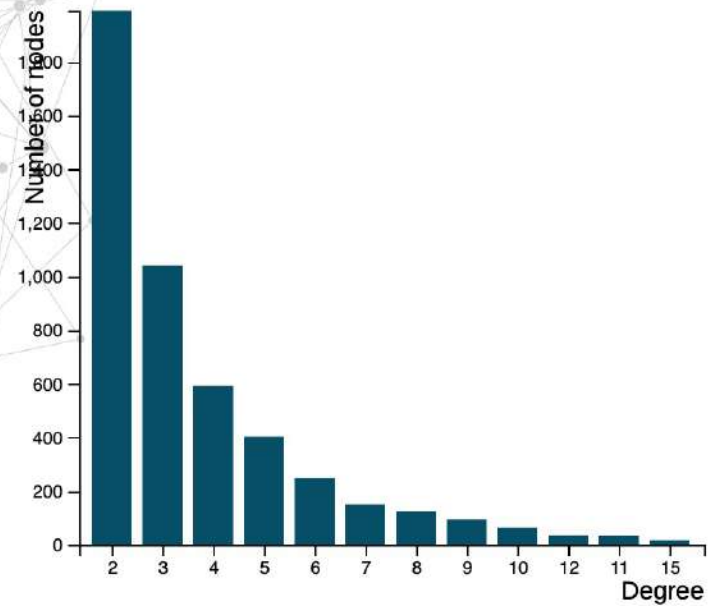




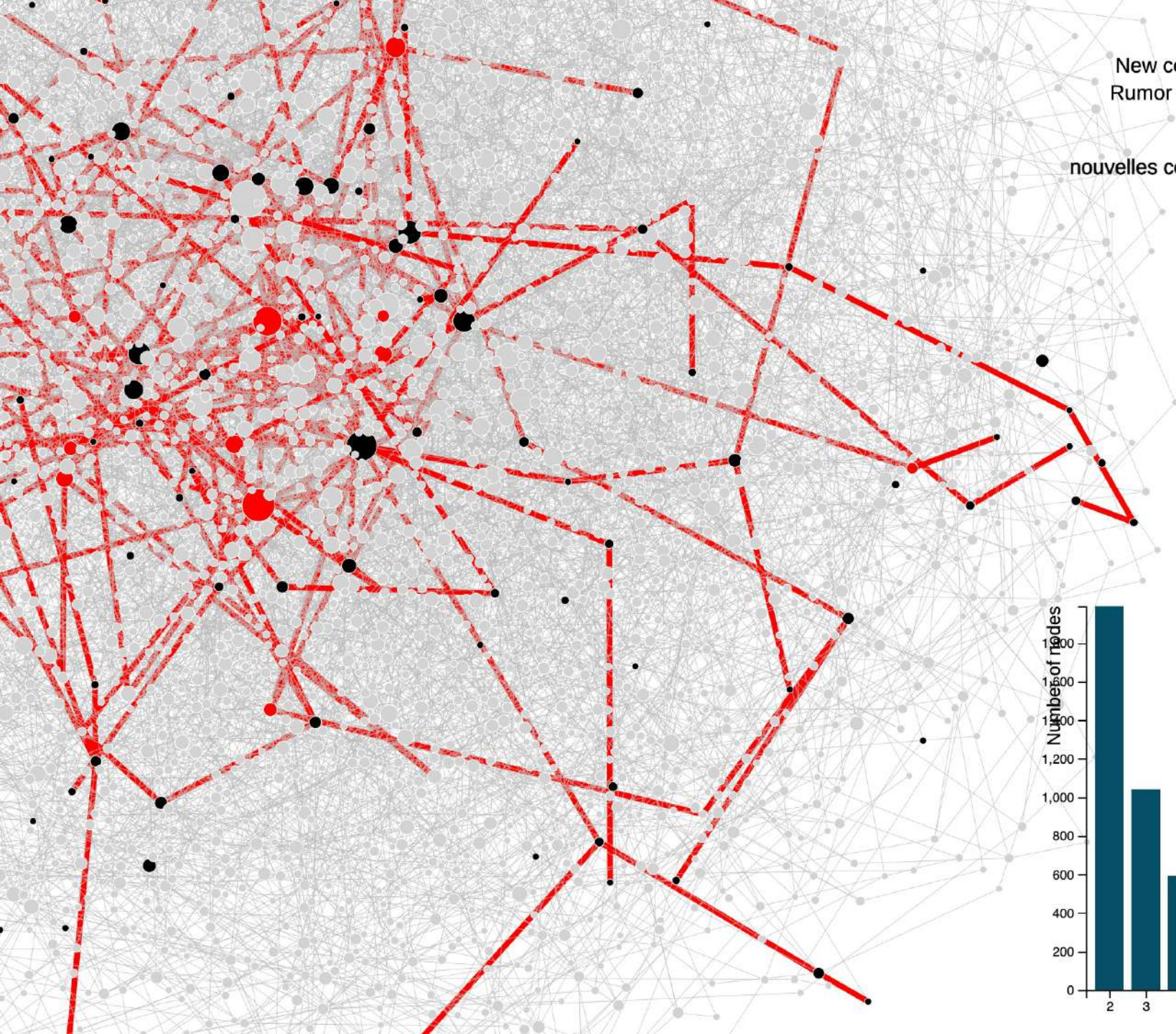
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4714 sains  
36 incubent  
151 infectés



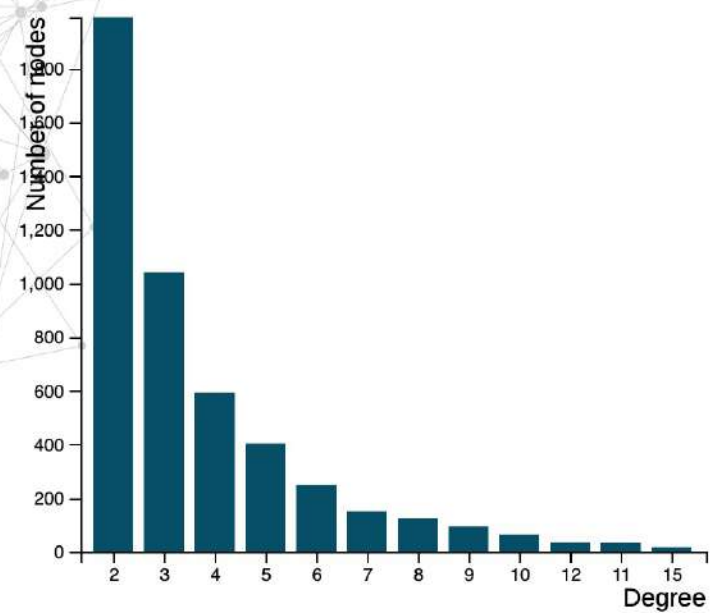




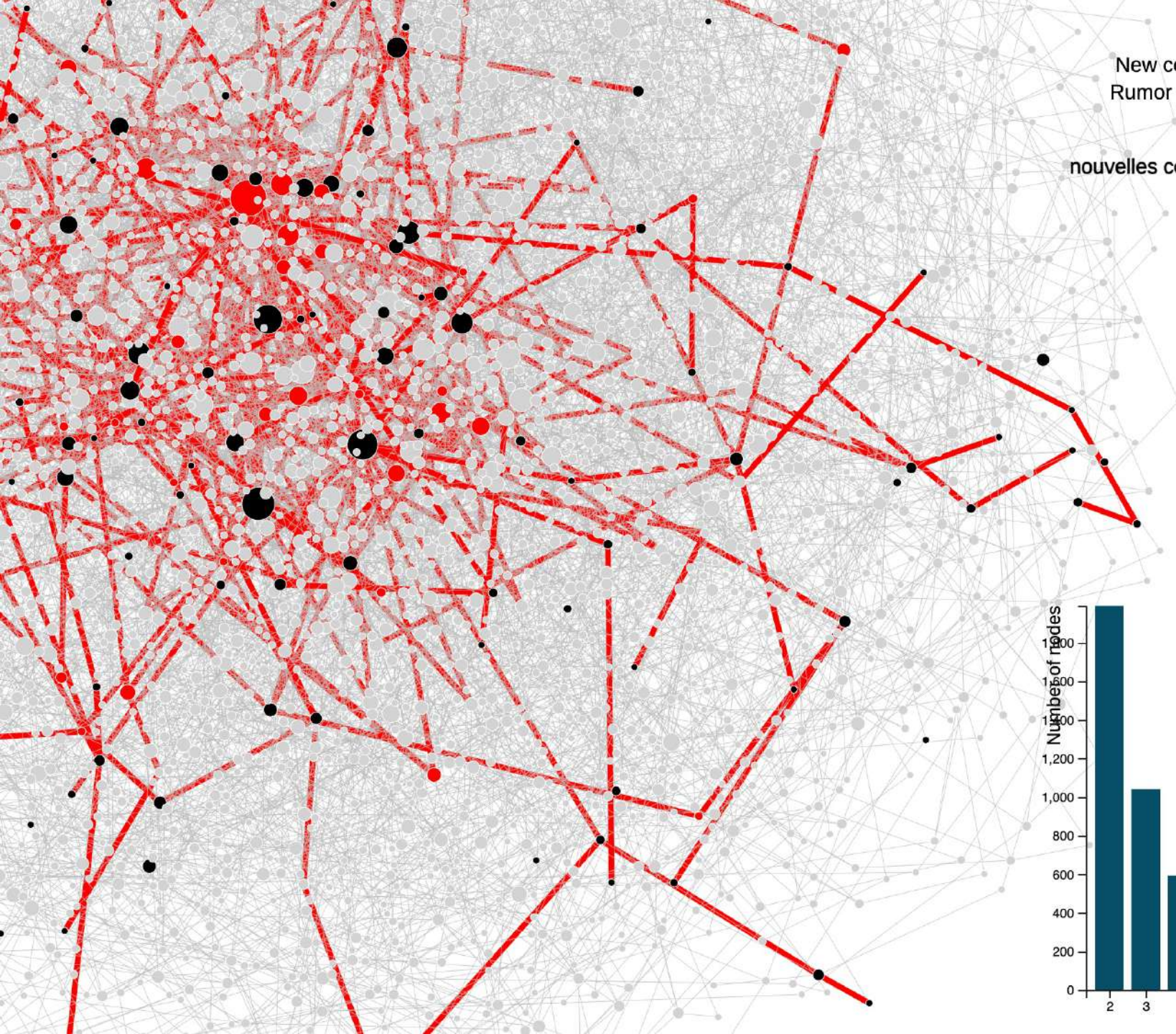
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4714 sains  
36 incubent  
151 infectés



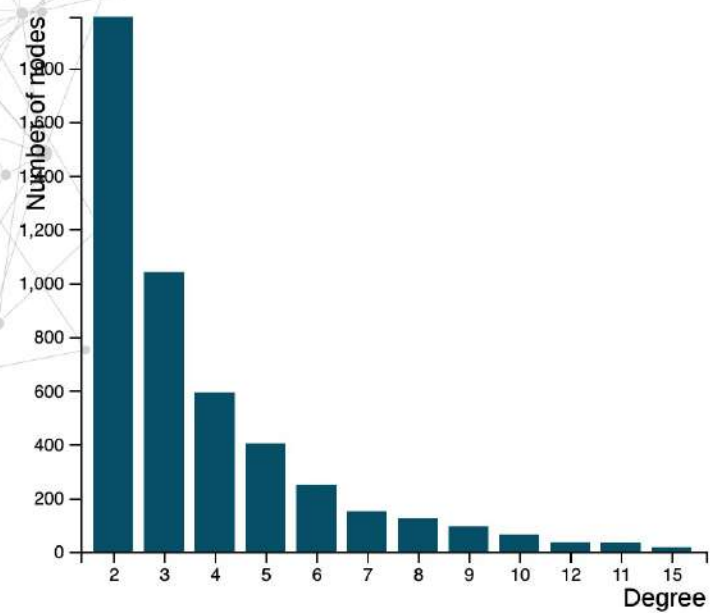




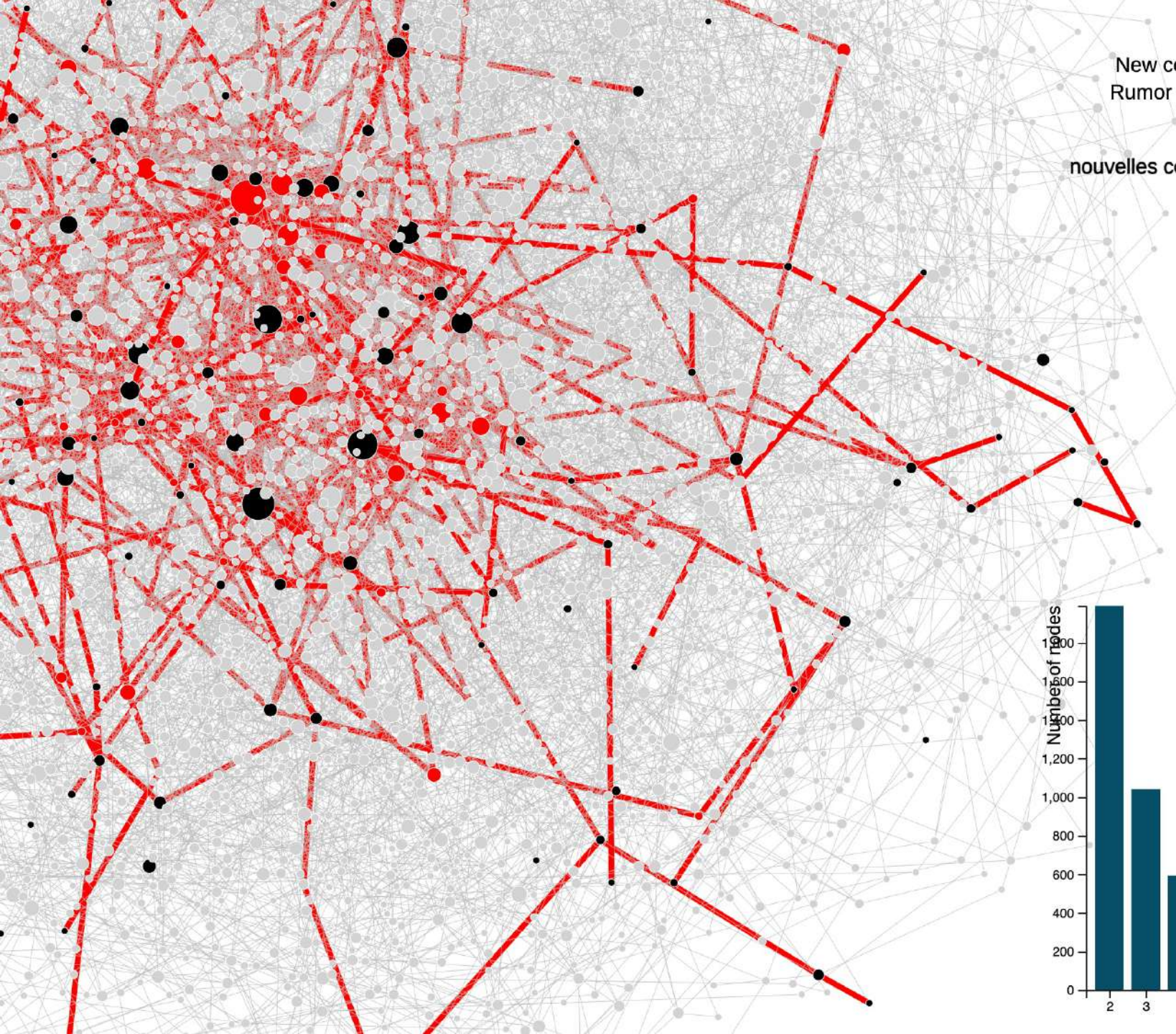
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4644 sains  
70 incubent  
187 infectés



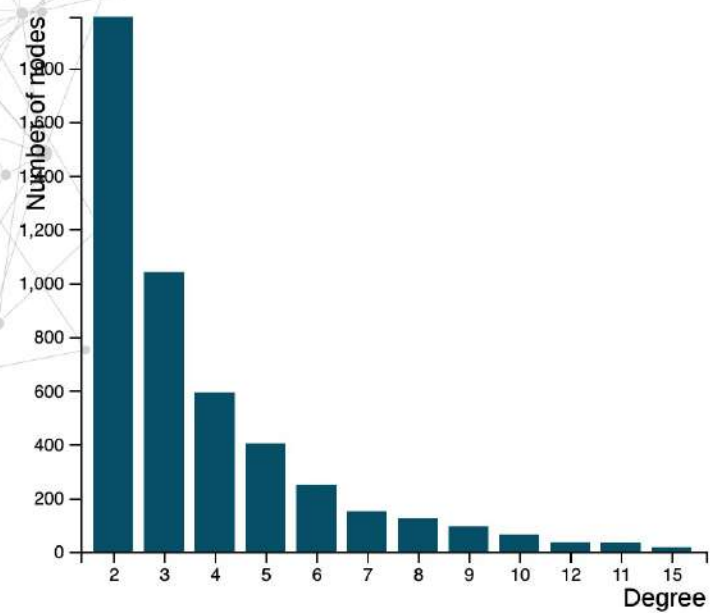




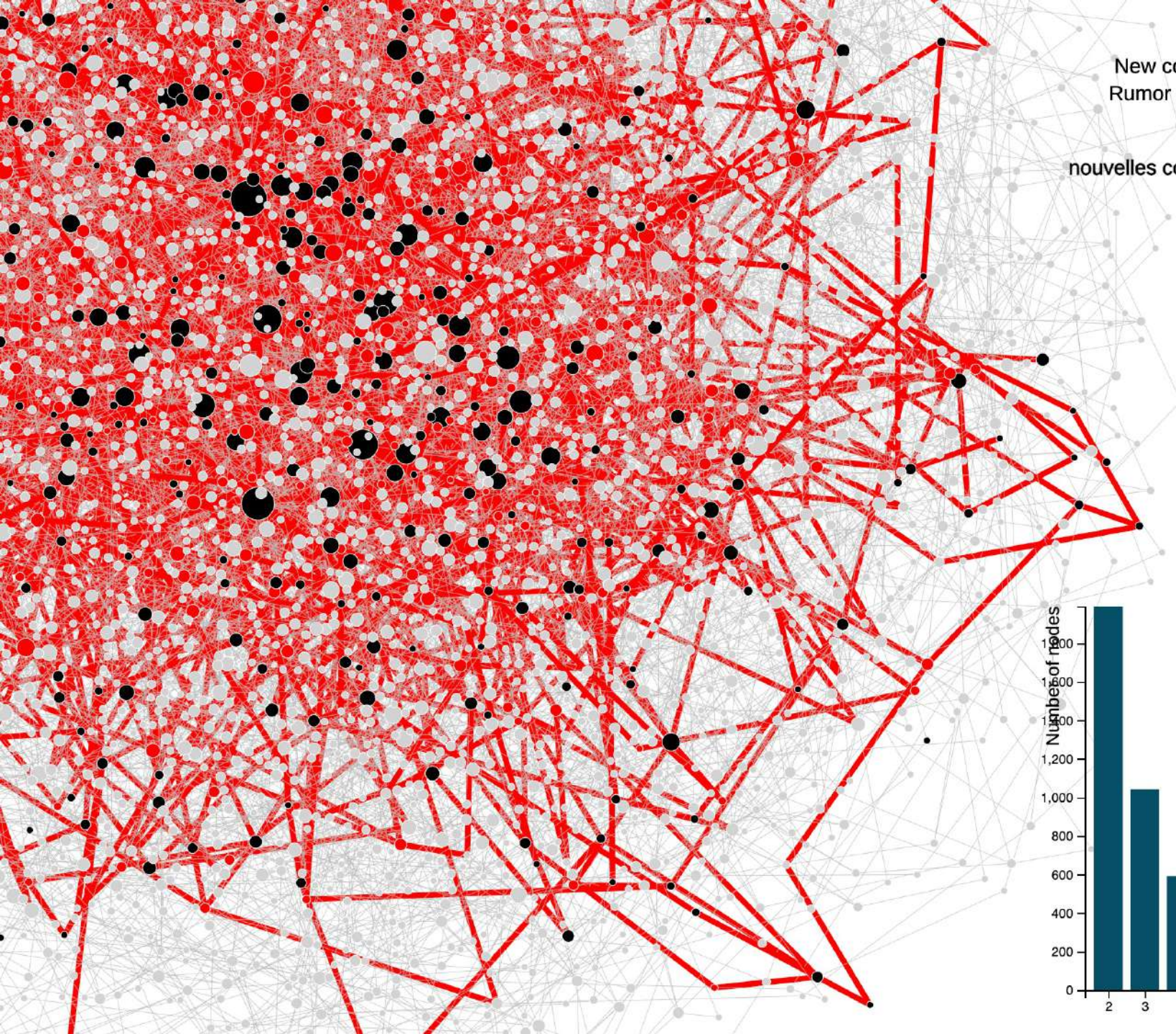
New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4644 sains  
70 incubent  
187 infectés



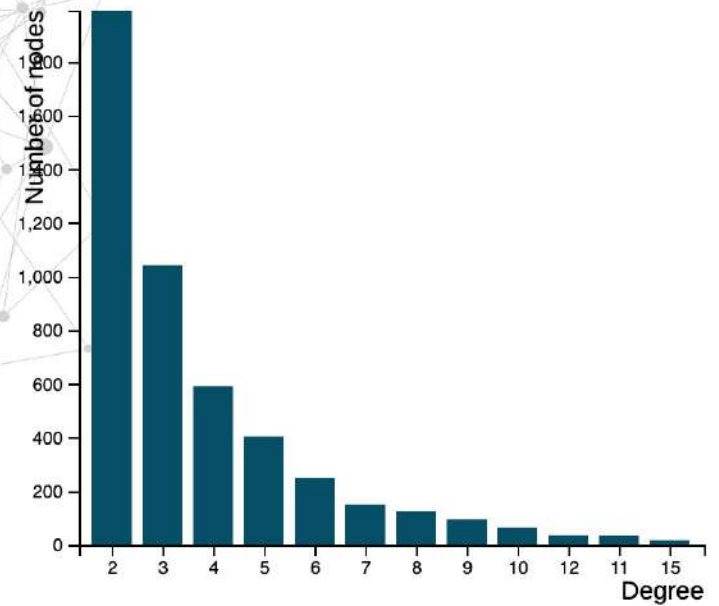




New connections:   
Rumor starters (%)

nouvelles connections: 2, starters proportion: 0.02

4901 individus  
4050 sains  
286 incubent  
565 infectés



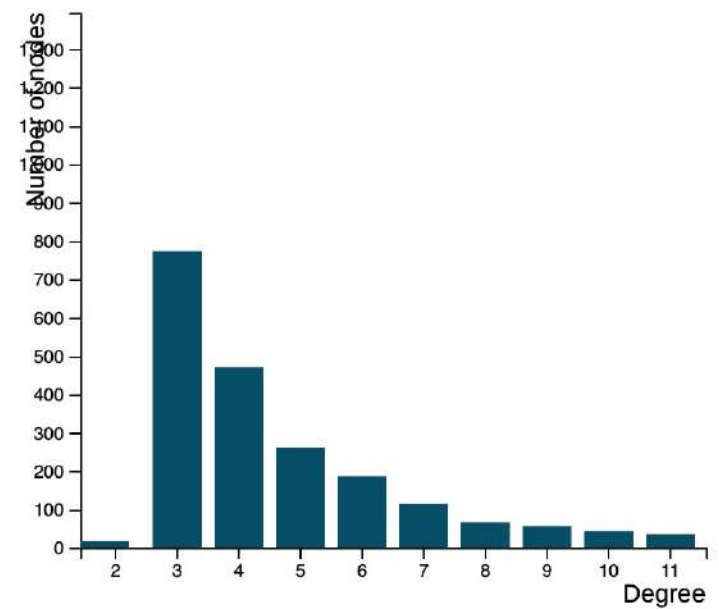




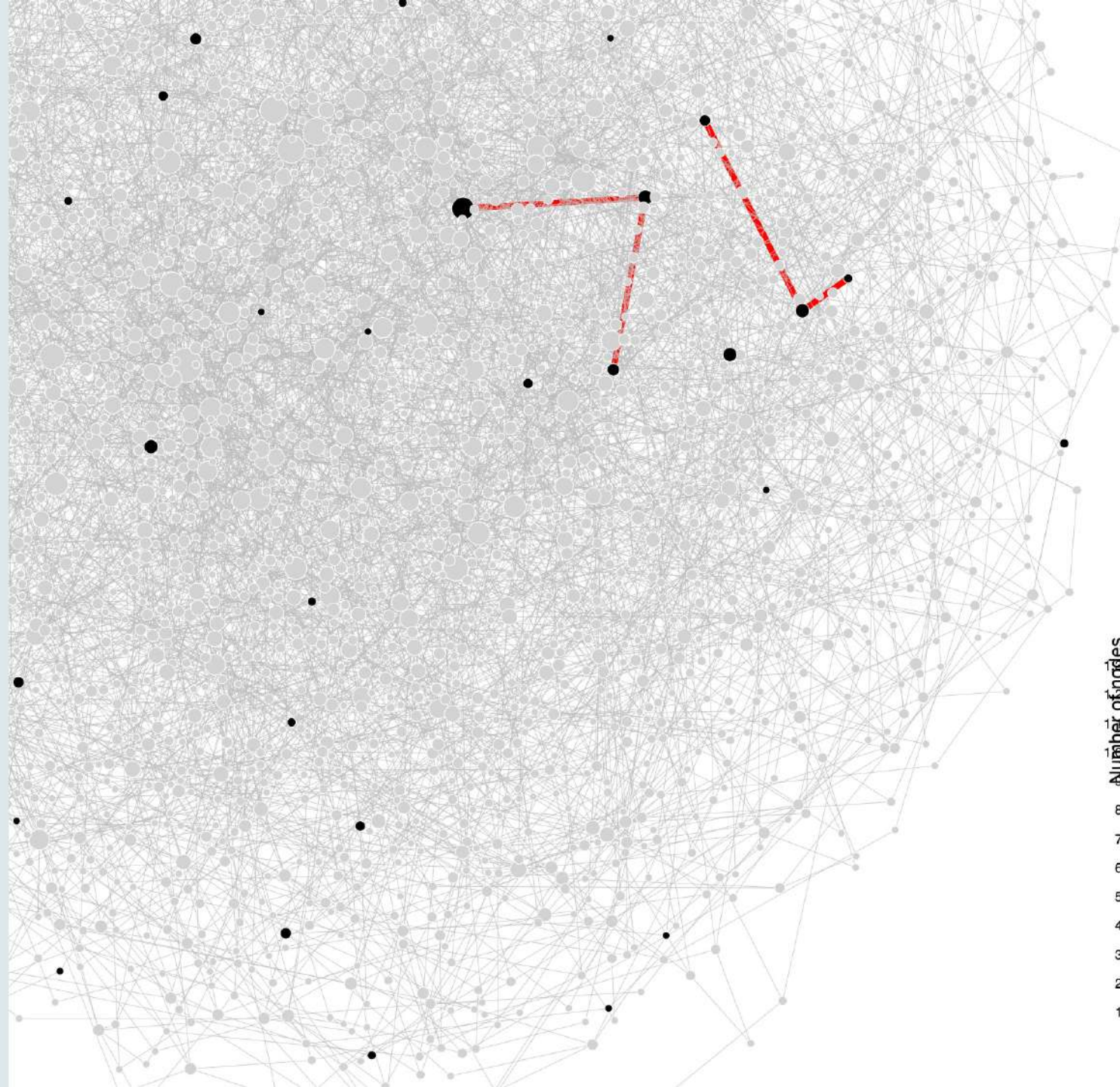
New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

3519 individus



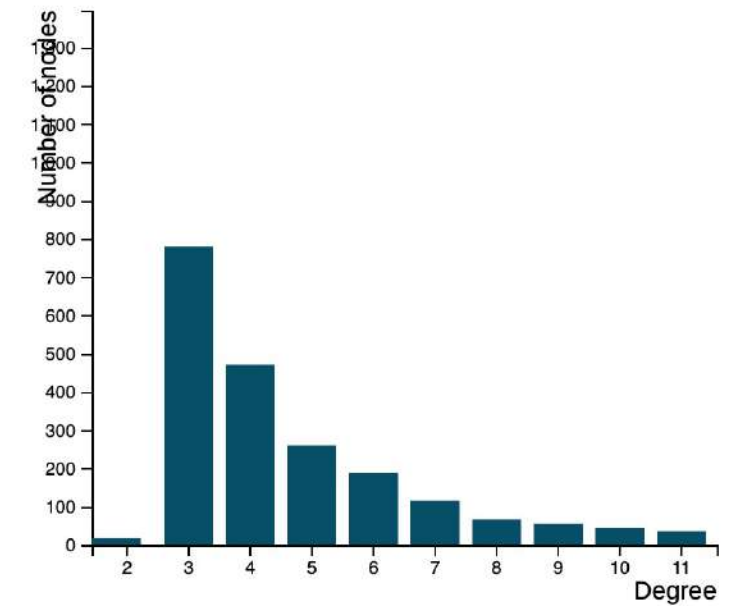




New connections:   
Rumor starters (%):

New connections: 2, starters proportion: 0.01

3528 individuals  
3488 sane  
0 incube  
40 infected



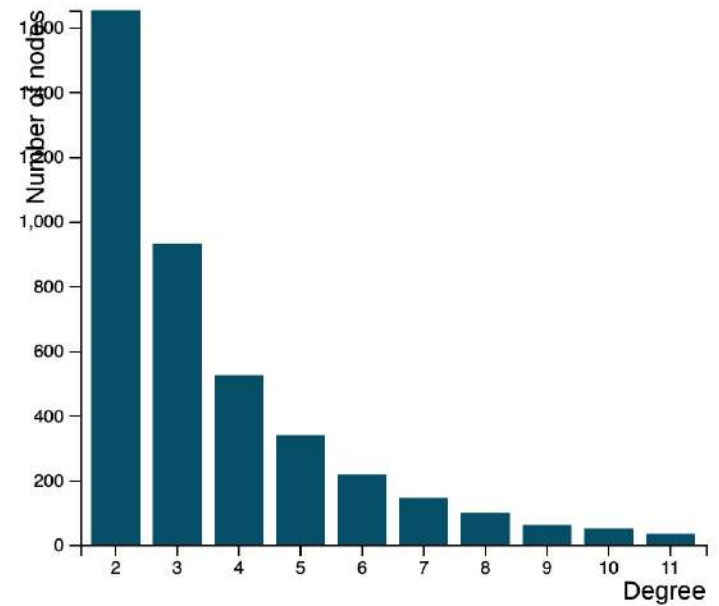




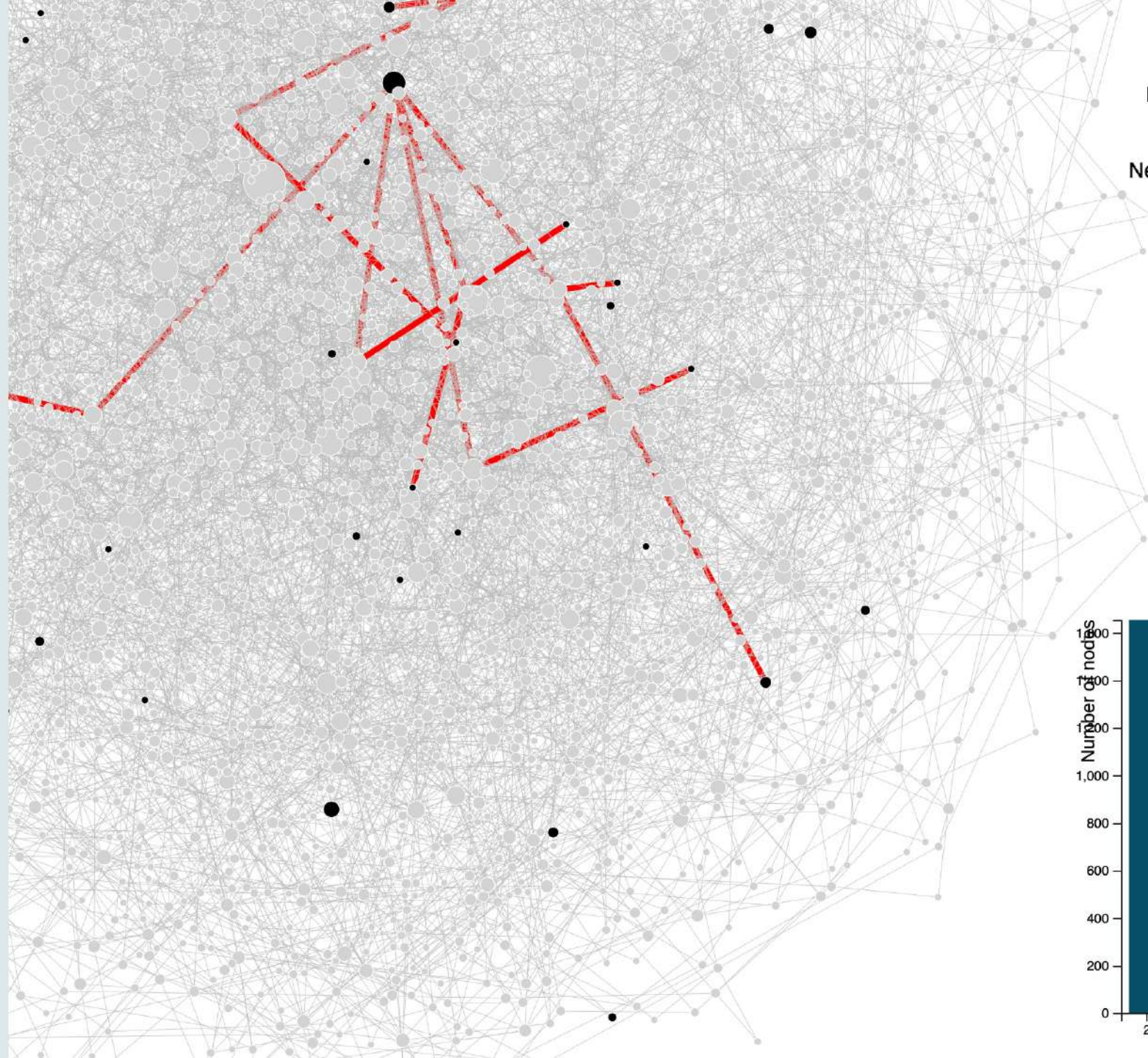
New connections:   
Rumor starters (%):

New connections: 2, starters proportion: 0.01

4192 individus



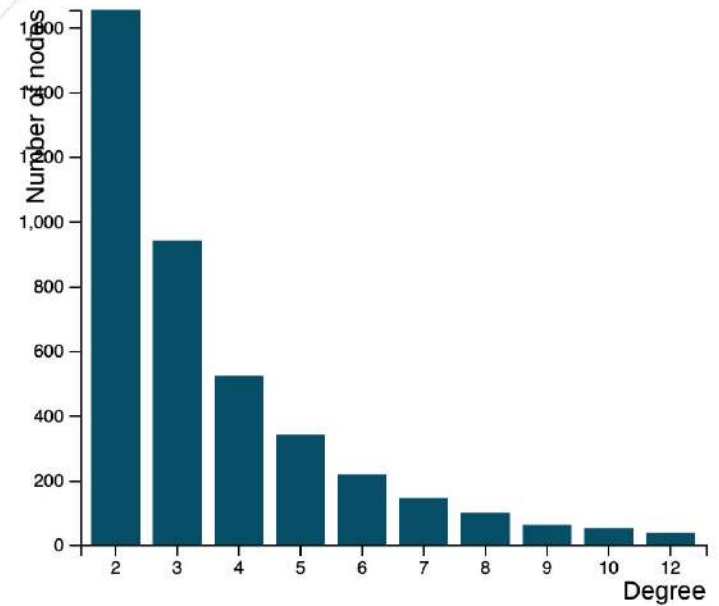




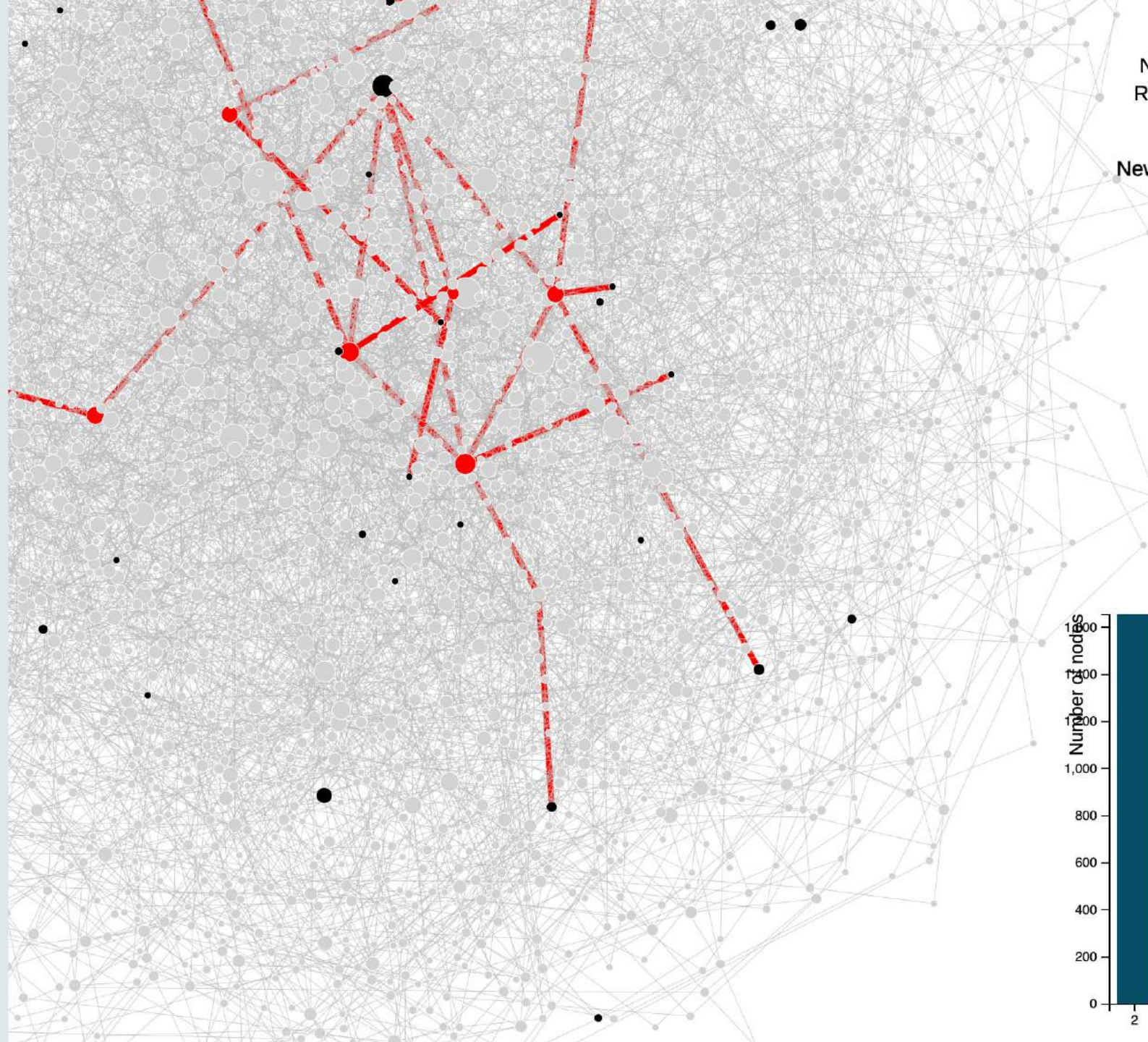
New connections:   
Rumor starters (%):

New connections: 2, starters proportion: 0.01

4201 individus  
4149 sane  
8 incube  
43 infected



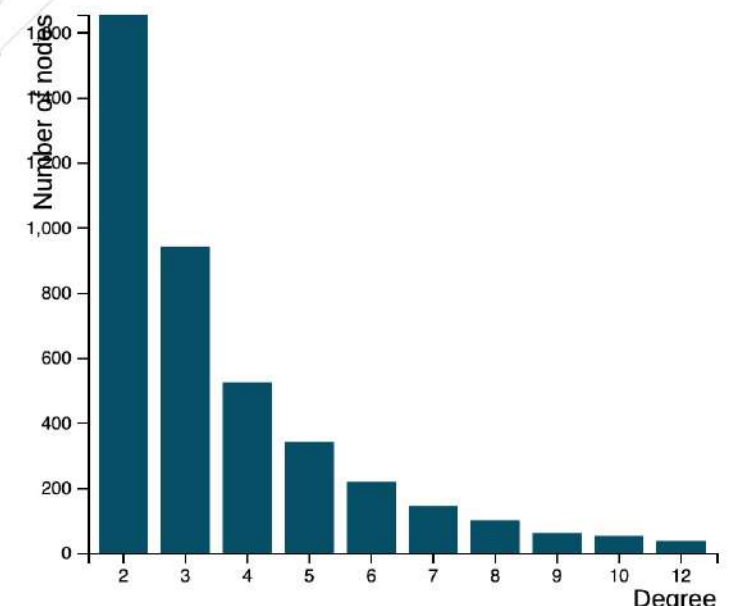




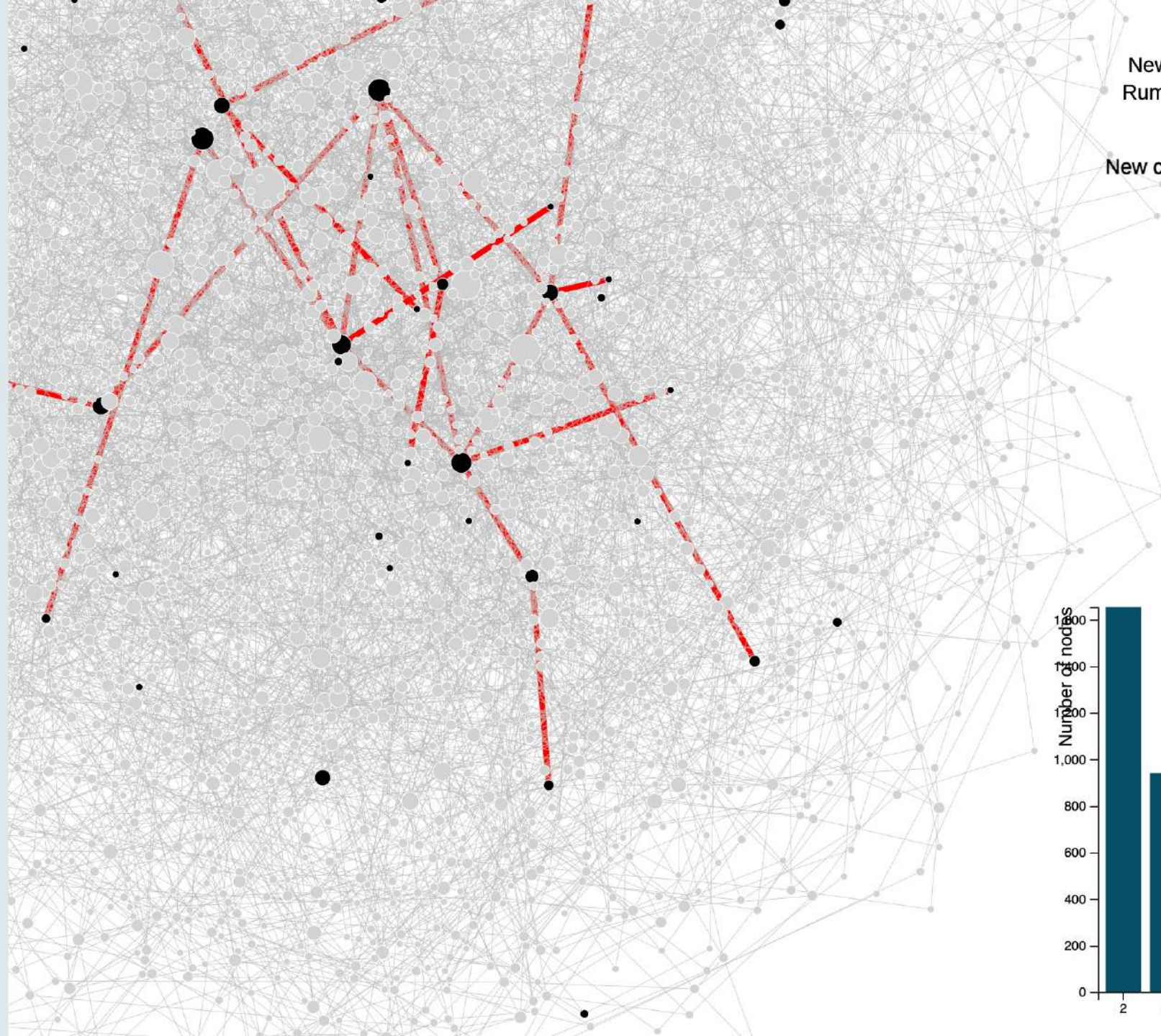
New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

4201 individuals  
4147 sane  
3 incube  
51 infected



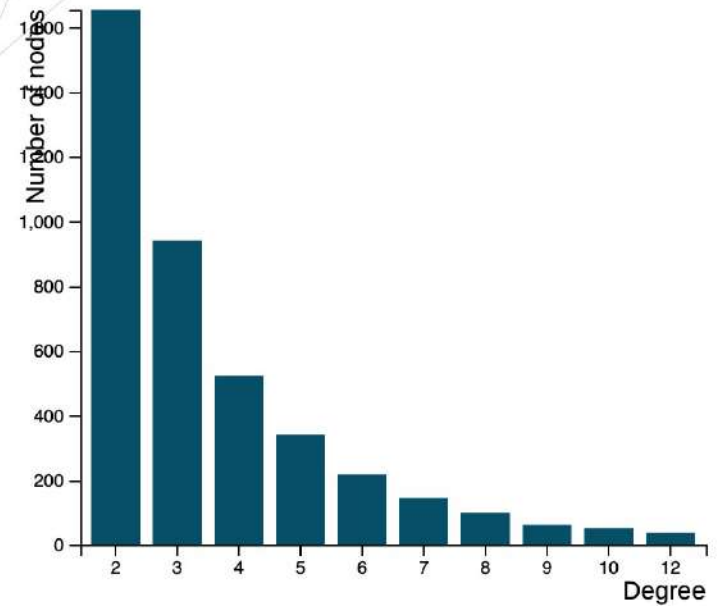




New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

4201 individuals  
4146 sane  
0 incube  
55 infected



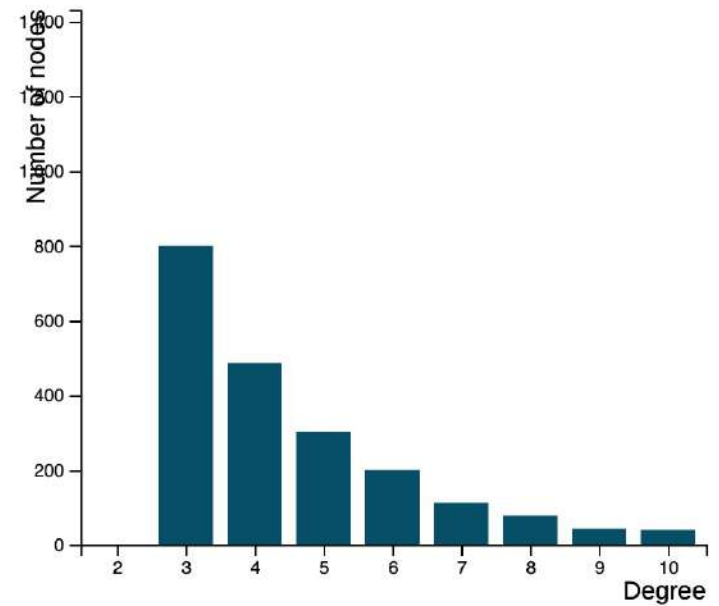




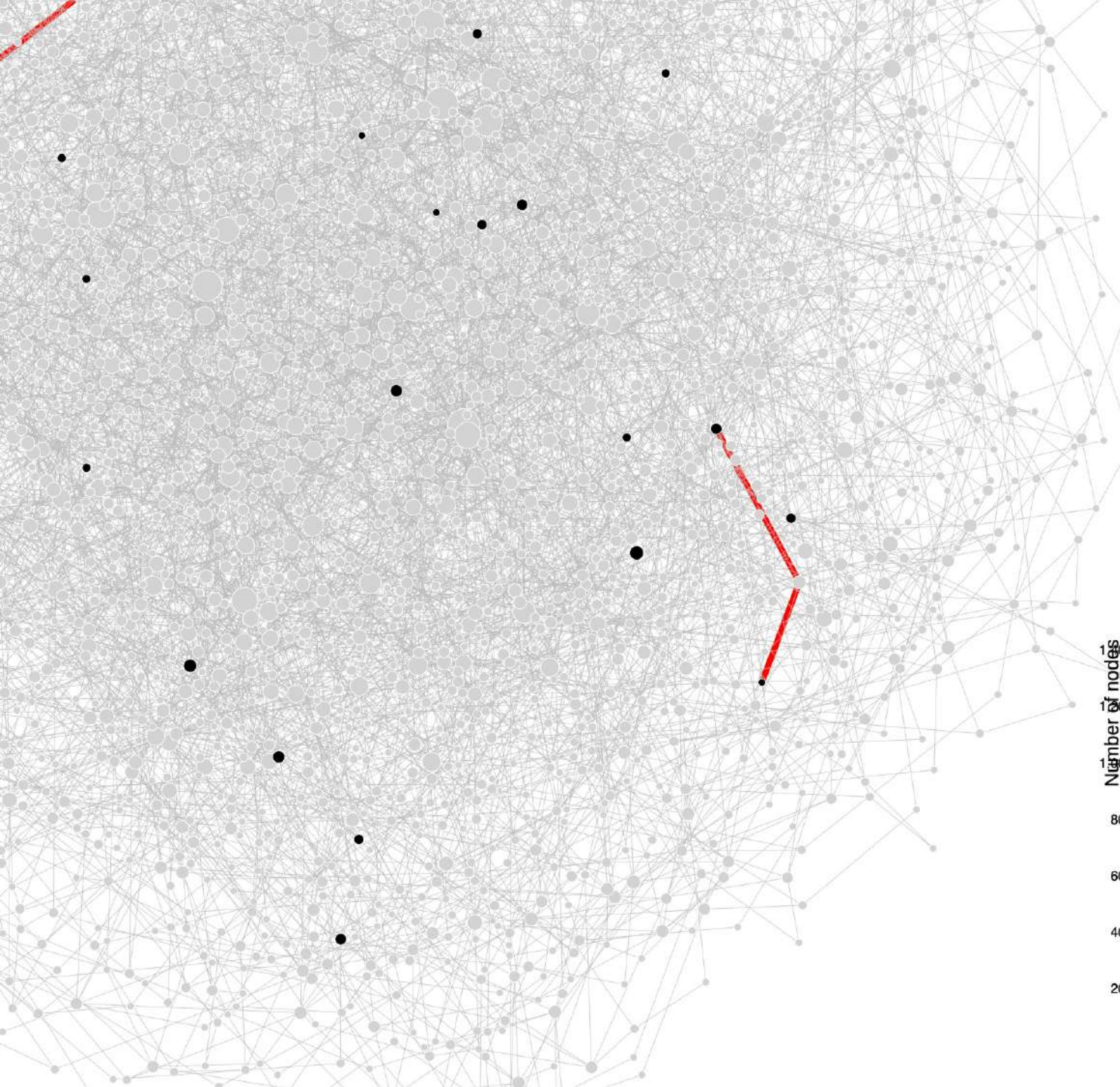
New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

3652 individus



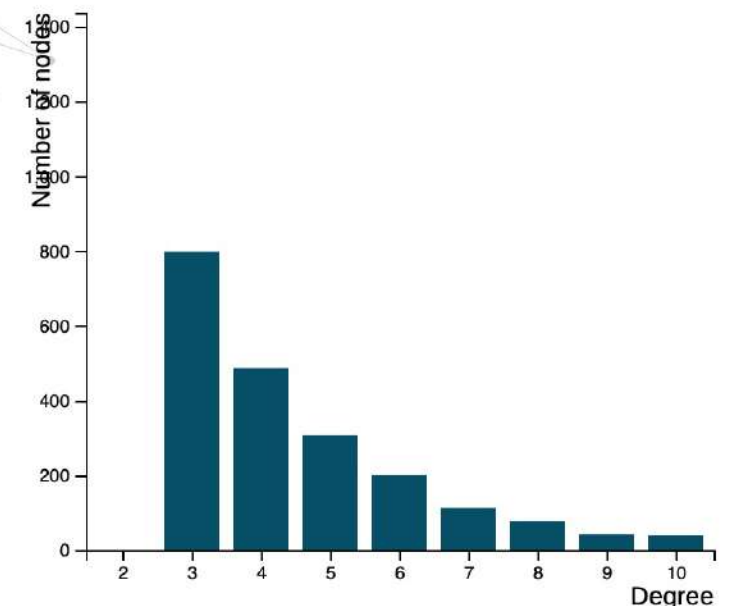




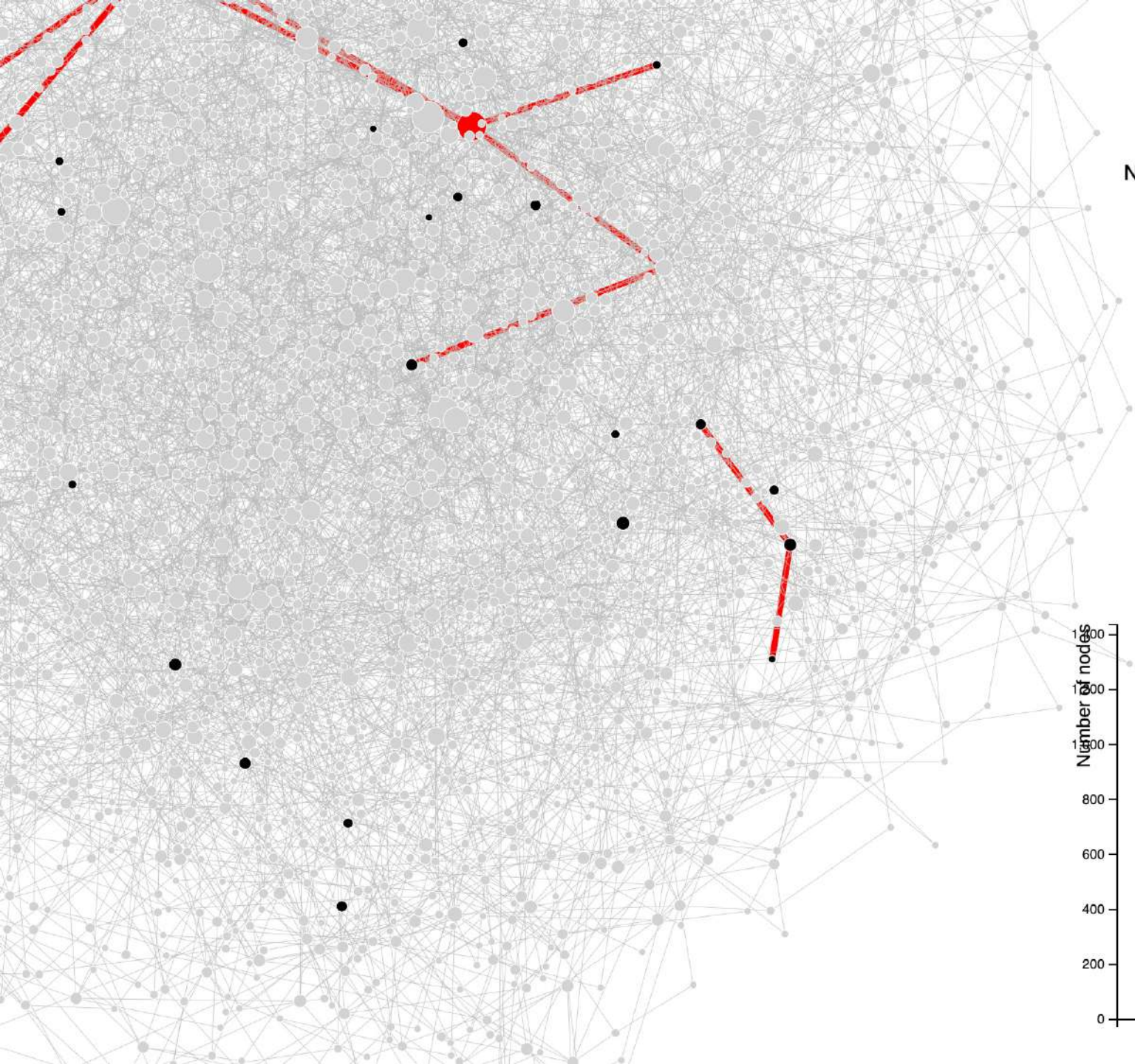
New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

3661 individus  
3622 sane  
2 incube  
36 infected



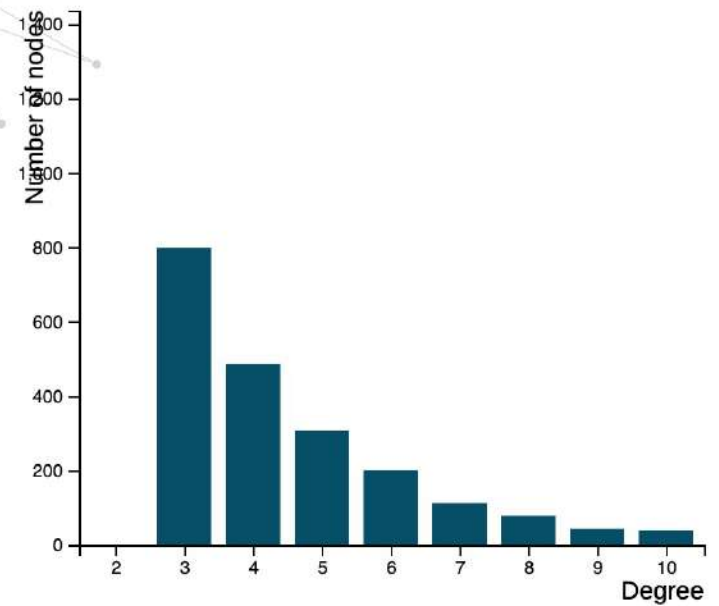




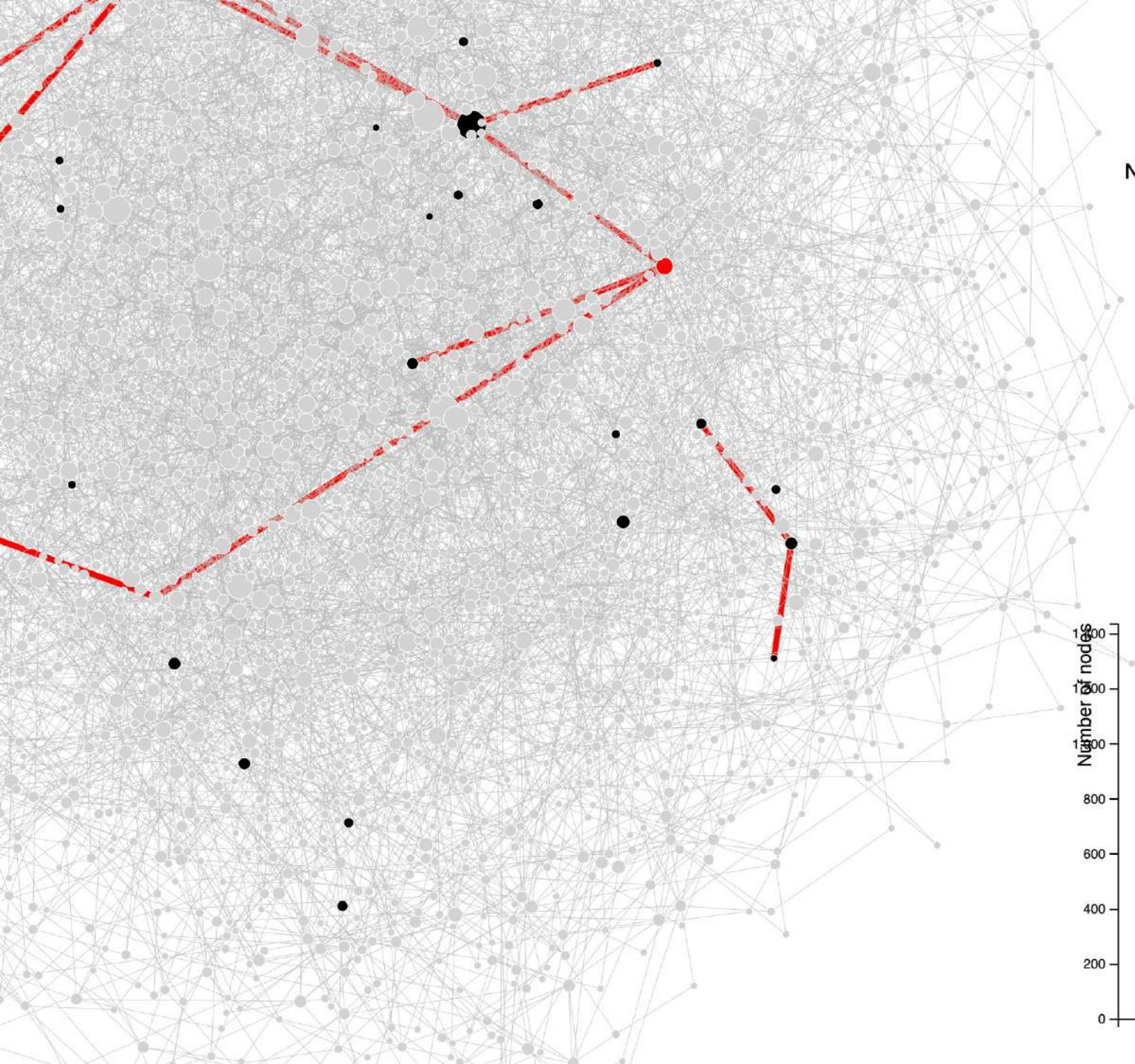
New connections:   
Rumor starters (%):

New connections: 2, starters proportion: 0.01

3661 individuals  
3619 sane  
2 incube  
40 infected



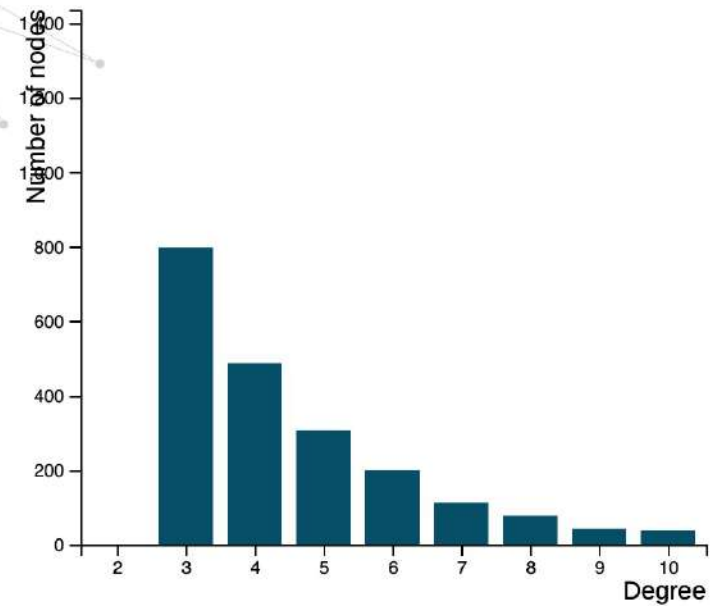




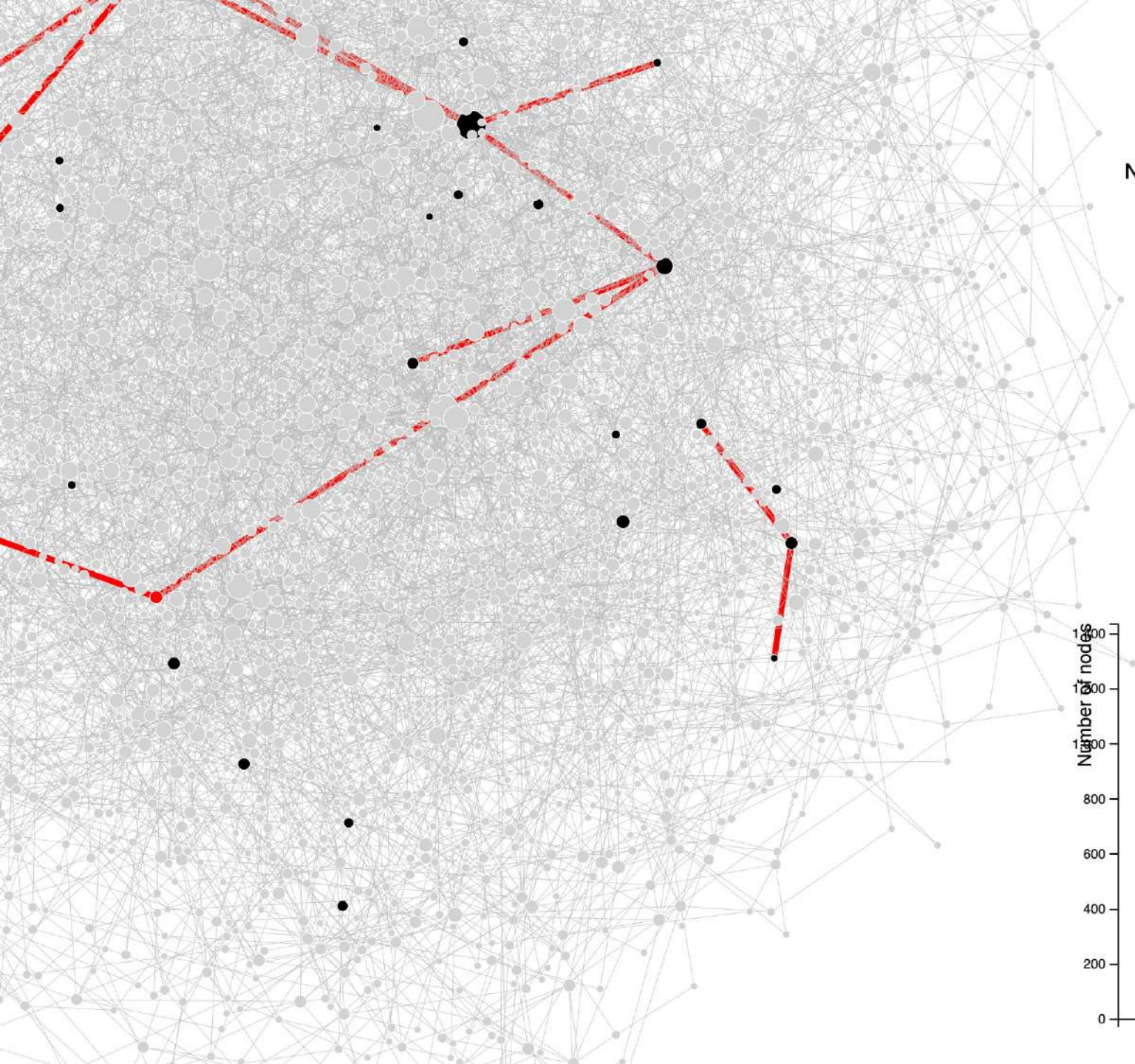
New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

3661 individuals  
3618 sane  
1 incube  
42 infected







New connections:   
Rumor starters (%)

New connections: 2, starters proportion: 0.01

3661 individuals  
3618 sane  
0 incube  
43 infected

