SesIndexCreatoR
Création et visualisation d'indices socioéconomiques

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Statut socio-économique

- Outil fréquent de l'analyse d'inégalités sociales de santé : le **statut socio-économique** (SES)

- Notion complexe, multidimensionnelle : revenu, emploi, éducation, famille, logement, …

- Une solution pour le prendre en compte : utiliser un **indice socioéconomique** synthétisant l'information

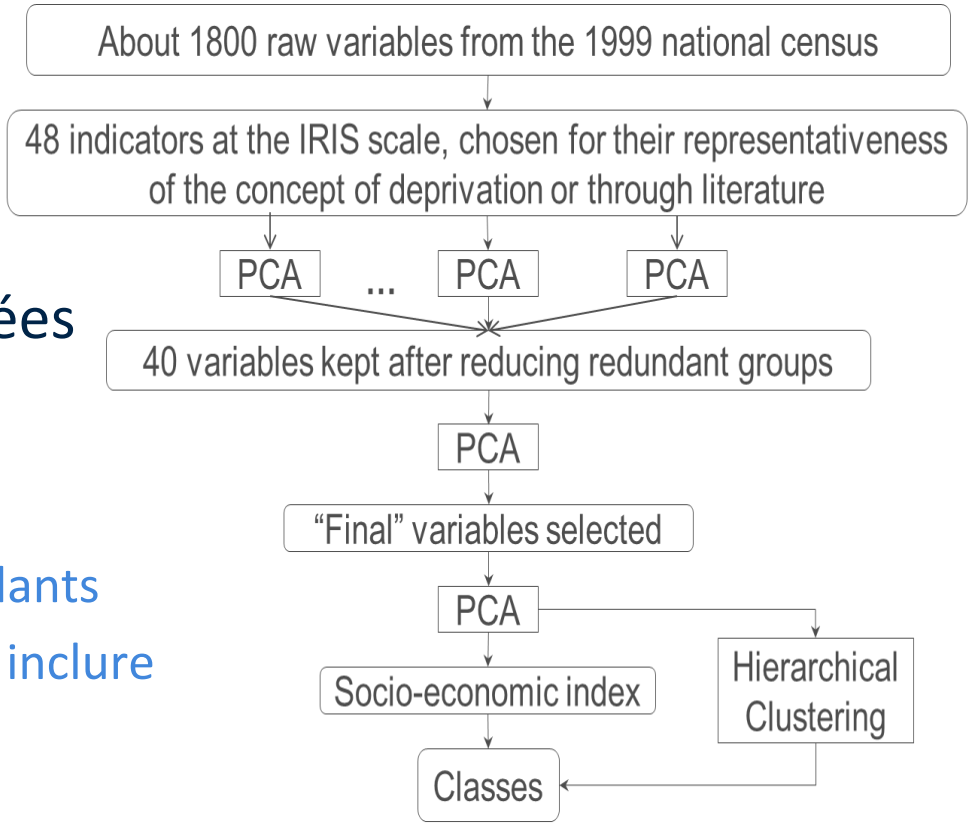
- De nombreux indices socio-économiques existent déjà : Townsend, Carstairs, …

Une nouvelle procédure

- Méthodologie statistique adaptée et flexible

- Basée sur l'analyse de données

- 3 phases :
  - *Réduire* les groupes redondants
  - *Sélectionner* les variables à inclure
  - *Synthétiser :* Créer l'indice



Lalloué et al.: **A statistical procedure to create a neighborhood socioeconomic index for health inequalities analysis.** *International Journal for Equity in Health* 2013 **12**:21.

Pourquoi un package R ?

- Offrir une intégration sans a priori des variables par rapport aux autres indices

- Faciliter la reproductibilité

- Faciliter l'utilisation pour des non-statisticiens

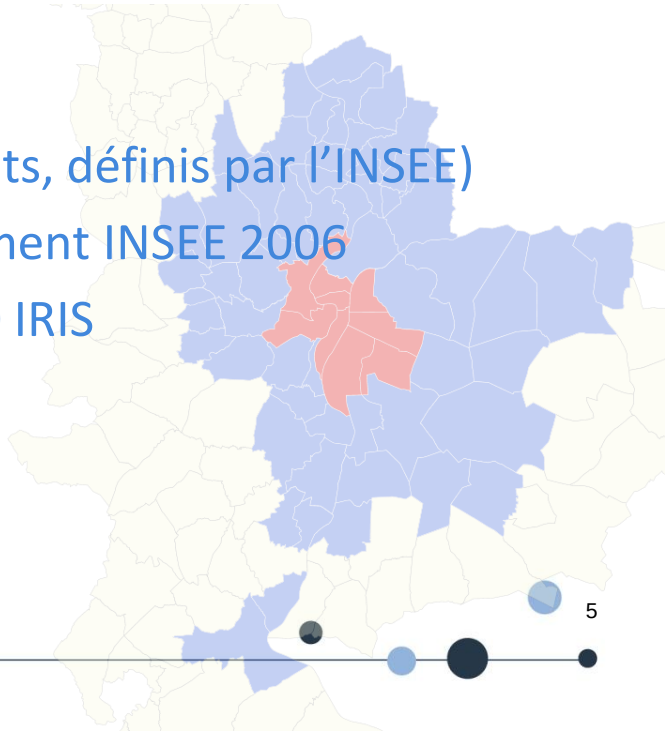
- Étendre les zones et les contextes d'application

SesIndexCreatoR

- Disponible sur CRAN et www.equitarea.org

- Dépendances : FactoMineR, class, R (≥ 3.0.0)

- Données d'exemple :
  - Échelle : IRIS (« quartiers », ~2000 habitants, définis par l'INSEE)
  - 54 variables socio-économiques, recensement INSEE 2006
  - Agglomération de Lyon (Grand Lyon) : 510 IRIS



SesIndexCreatoR: Les fonctions

Function	Description
`ClassifHC`	Internal function: Classification with Hierarchical Clustering (HC)
`ClassifInt`	Internal function: Classification by intervals
`ClassifQuant`	Internal function: Classification by quantiles
`plot.SesClassif`	Plot the results of the classification of a socioeconomic index
`plot.SesIndex`	Plot the results of the construction of a socioeconomic index
`print.SesClassif`	Print the classification of a socioeconomic index results
`print.SesIndex`	Print the creation of a socioeconomic index results
`SelectVar`	Internal function: Selection of variables
`SesClassif`	Create categories from a socioeconomic index
`SesIndex`	Creation of a Socio-Economic Index
`SesReport`	Creation of a report for SesIndex and SesClassif functions
`SesStep1`	Internal function: perform the first step of the creation of the socioeconomic index

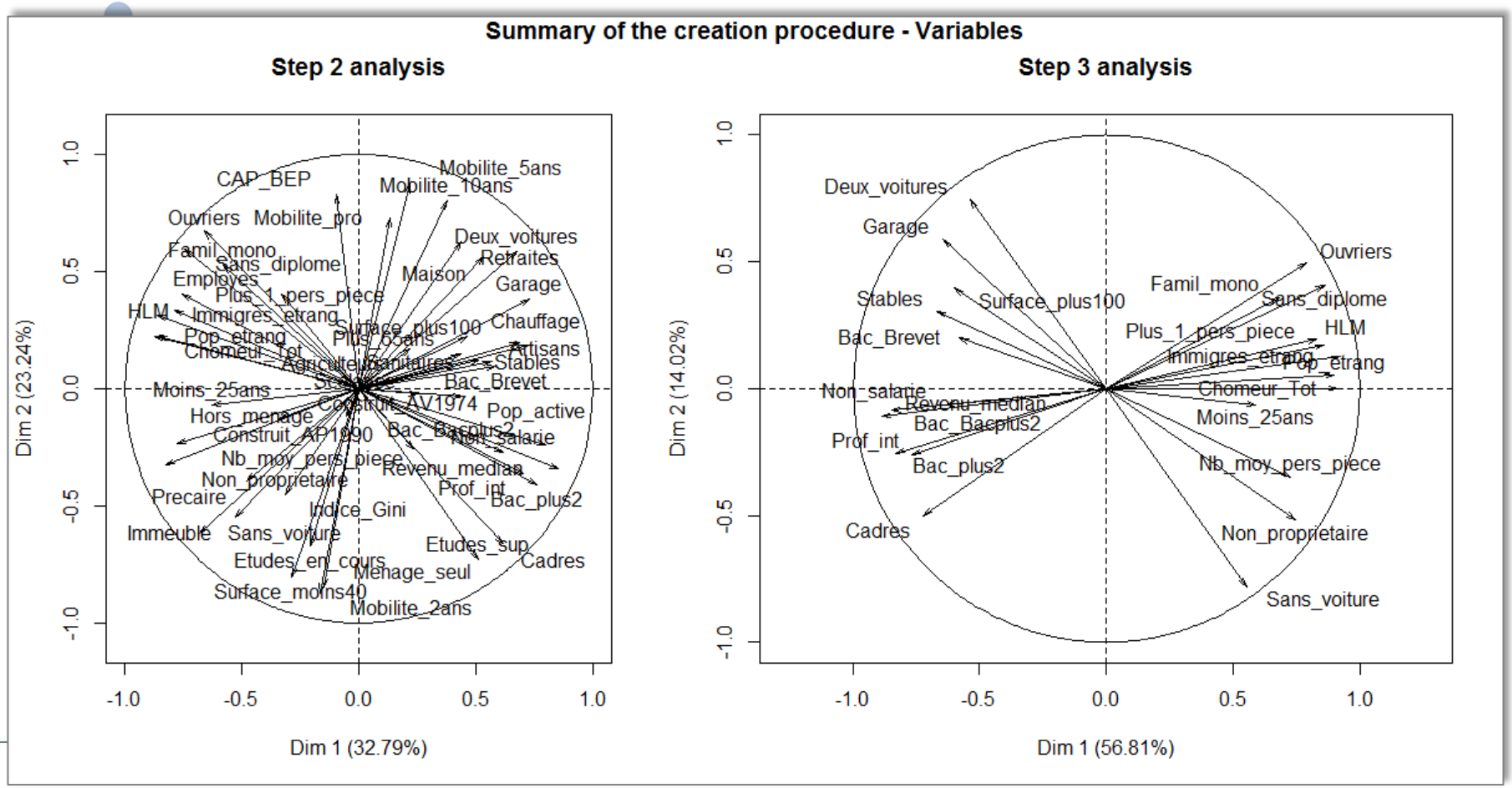
Exemple d'application

```
> library(SesIndexCreatoR)
>
> #Import et préparation des données
> SesData = read.table("Lyon_2006_revenu-comp.txt", header=TRUE,sep="\t", row.names=1)
> varnames <- colnames(SesData)[3:ncol(SesData)]
> group1 <- grep("+Chomeur", colnames(SesData), value=TRUE)
> group2 <- grep("+active", colnames(SesData), value=TRUE)
> groupvarnames <- list(group1, group2)
> illus <- rownames(SesData[SesData[,"TYP_IRIS"] %in% c("A", "D"),])
>
> # Application de la procédure
> index <- SesIndex(SesData, varnames=varnames, groupvarnames=groupvarnames, sup=illus)
> index
**Procedure of creation of a socio-economic index**
*The results are available in the following objects:

   Name                Description
1  "$step1"            "Results of the first step"
2  "$step1$analysis"   "Detailed results of the PCA on each redundant group"
3  "$step1$selection"  "Names of the variable selected in each group"
4  "$step2"            "Results of the second step"
5  "$step2$analysis"   "Detailed results of the selection step (PCA)"
6  "$step2$selection"  "Names of the selected variables"
7  "$step3"            "Results of the third step"
8  "$step3$analysis"   "Detailed results of the final PCA"
9  "$step3$indices"    "Original dataset and the computed socio-economic index"
10 "$call"             "Arguments passed in the call of the function"
>
```

Exemple – SesIndex

```
> plot(index, choice="var")
```



Exemple – SesIndex (2)

Variables sélectionnées lors de la réduction des groupes redondants

Variables sélectionnées à l'étape 2 pour constituer l'indice

Coordonnées sur les 2 premiers axes des variables de l'indice (i.e. corrélations variables/indice)

```
> index$step1$selection
[1] "Chomeur_Tot" "Pop_active"
> index$step2$selection
 [1] "Moins_25ans"       "Pop_etrang"         "Chomeur_Tot"
 [4] "Non_salarie"       "Stables"            "Sans_diplome"
 [7] "Bac_Brevet"        "Bac_plus2"          "Bac_Bacplus2"
[10] "Garage"            "Non_proprietaire"   "Surface_plus100"
[13] "Sans_voiture"      "Deux_voitures"      "HLM"
[16] "Immigres_etrang"   "Revenu_median"      "Plus_1_pers_piece"
[19] "Nb_moy_pers_piece" "Cadres"             "Prof_int"
[22] "Ouvriers"          "Famil_mono"
> round(index$step3$analysis$var$coord[,c(1,2)],2)
                  Dim.1 Dim.2
Moins_25ans        0.59 -0.06
Pop_etrang         0.90  0.05
Chomeur_Tot        0.91  0.00
Non_salarie       -0.64 -0.06
Stables           -0.67  0.31
Sans_diplome       0.86  0.41
Bac_Brevet        -0.58  0.20
Bac_plus2         -0.83 -0.25
Bac_Bacplus2      -0.85 -0.09
Garage            -0.65  0.59
Non_proprietaire   0.74 -0.52
Surface_plus100   -0.60  0.40
Sans_voiture       0.55 -0.78
Deux_voitures     -0.54  0.74
HLM                0.83  0.19
Immigres_etrang    0.92  0.13
Revenu_median     -0.89 -0.11
Plus_1_pers_piece  0.86  0.17
Nb_moy_pers_piece  0.73 -0.35
Cadres            -0.72 -0.50
Prof_int          -0.77 -0.26
Ouvriers           0.79  0.50
Famil_mono         0.68  0.36
```

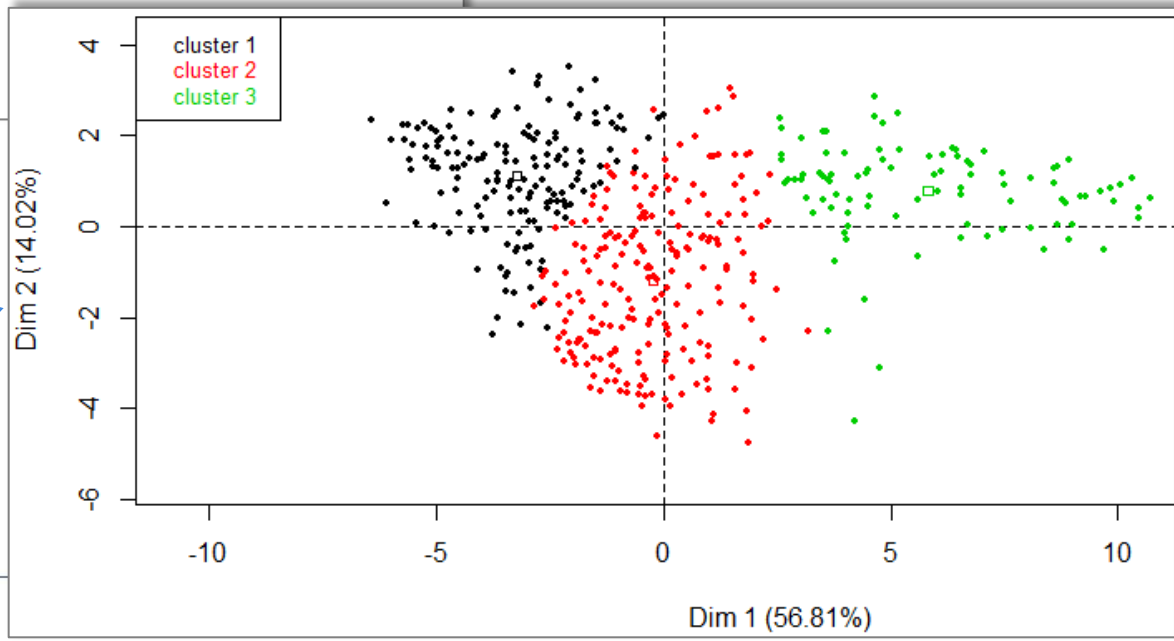
Exemple – SesClassif

```
> categories <- SesClassif(index, nb=3)
> categories
**Classification of a socio-economic index**
  3 classes were created using: HC+knn

*The results are available in the following objects:
  Name         Description
1 "$analysis" "Detailed results of the HC"
2 "$table"    "Results of the classification"
3 "$call"     "Arguments passed in the call of the function"

*Number of units in each class:
  1   2   3
178 225 103
>
```

```
> plot(categories$analysis, choice="map",
label="none", draw.tree=F)
```



Exemple – SesReport

```
> SesReport(categories)
```

Step 3: Creation of the index

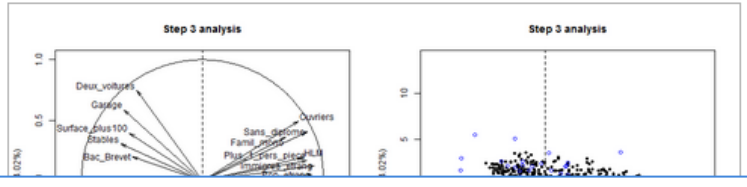
The final step of the creation perform a Principal Component Analysis on the variables selected in Step 2. The socio-economic index is therefore the first component of the final PC. *Interpreted as a socio-economic component.*
The results of the final analysis are :

10 first eigenvalues

	Eigenvalue	Percentage of variance	Cumulative percentage of variance
comp 1	13.07	56.81	56.81
comp 2	3.22	14.02	70.82
comp 3	2.14	9.32	80.14
comp 4	1.07	4.67	84.81
comp 5	0.81	3.53	88.34
comp 6	0.63	2.74	91.08
comp 7	0.39	1.69	92.77
comp 8	0.27	1.17	93.94
comp 9	0.23	1.01	94.94
comp 10	0.19	0.82	95.77

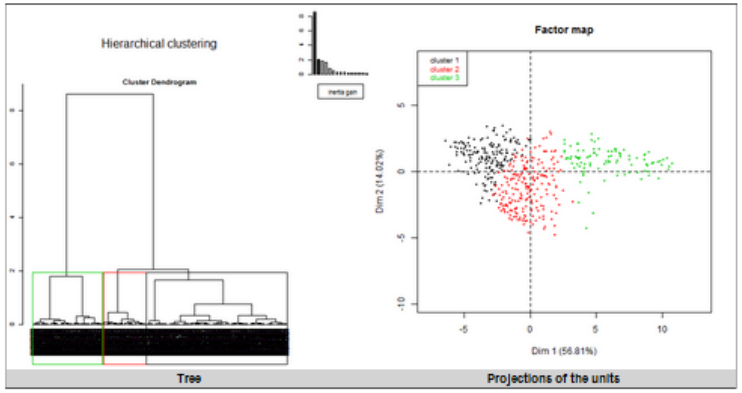
Summary of the two first components

Variable	Coord 1	Cos2 1	Contrib 1	Coord 2	Cos2 2	Contrib 2
Moins_25ans	0.59	0.35	2.67	-0.06	0	0.12
Pop_etrang	0.9	0.81	6.21	0.05	0	0.09
Chomeur_Tot	0.91	0.84	6.4	0	0	0
Non_salarie	-0.64	0.4	3.09	-0.06	0	0.12
Stables	-0.67	0.45	3.42	0.31	0.09	2.91
Sans_diplome	0.86	0.74	5.69	0.41	0.17	5.13
Bac_Brevet	-0.58	0.34	2.57	0.2	0.04	1.22
Bac_plus2	-0.83	0.69	5.28	-0.25	0.06	2.01
Bac_Bacplus2	-0.85	0.72	5.5	-0.09	0.01	0.23
Garage	-0.65	0.42	3.19	0.59	0.35	10.72
Non_proprietaire	0.74	0.55	4.24	-0.52	0.27	8.28
Surface_plus100	-0.6	0.36	2.77	0.4	0.16	4.86
Sans_voiture	0.55	0.31	2.35	-0.78	0.61	18.91
Deux_voitures	-0.54	0.29	2.22	0.74	0.55	17.2
HLM	0.83	0.69	5.3	0.19	0.04	1.17
Immigres_etrang	0.92	0.85	6.52	0.13	0.02	0.49
Revenu_median	-0.89	0.79	6.02	-0.11	0.01	0.38
Plus_1_pers_piece	0.86	0.74	5.68	0.17	0.03	0.91
Nb_moy_pers_piece	0.73	0.53	4.04	-0.35	0.12	3.74
Cadres	-0.72	0.52	4	-0.5	0.25	7.8
Prof_Int	-0.77	0.59	4.5	-0.26	0.07	2.09
Ouvriers	0.79	0.63	4.79	0.5	0.25	7.6
Famil_mono	0.68	0.47	3.56	0.36	0.13	4.02



Classification

After the creation of the socioeconomic index, a classification is performed using HC+knn. 3 classes are created using this technic.



The following tables contain descriptions of each classe by the variables selected in the socioeconomic index (only variables with a significant difference between the class and the whole sample are shown):

Description by the variables of the class 1

Variable	Mean in category	Overall mean	Sd in category	Overall Sd
Deux_voitures	0.43	0.26	0.15	0.17
Surface_plus100	0.37	0.2	0.19	0.18
Garage	0.76	0.55	0.14	0.23
Revenu_median	22632.43	18606.23	4081.71	5163.72
Bac_Bacplus2	0.28	0.24	0.06	0.07
Non_salarie	0.12	0.09	0.06	0.05
Stables	0.73	0.68	0.09	0.09
Bac_plus2	0.13	0.11	0.04	0.04
Cadres	0.18	0.14	0.09	0.09
Bac_Brevet	0.15	0.13	0.05	0.04
Prof_Int	0.21	0.19	0.04	0.06
Famil_mono	0.08	0.09	0.03	0.04
Moins_25ans	0.31	0.34	0.05	0.07
Ouvriers	0.1	0.14	0.05	0.08
Sans_diplome	0.11	0.16	0.05	0.11
HLM	0.07	0.21	0.08	0.25
Plus_1_pers_piece	0.04	0.07	0.02	0.05
Pop_etrang	0.04	0.09	0.02	0.07
Immigres_etrang	0.07	0.13	0.03	0.09
Chomeur_Tot	0.07	0.12	0.03	0.06
Nb_moy_pers_piece	0.61	0.68	0.05	0.1
Sans_voiture	0.11	0.24	0.06	0.15
Non_proprietaire	0.31	0.54	0.15	0.23

Description by the variables of the class 2

Variable	Mean in	Overall mean	Sd in	Overall Sd

Conclusions

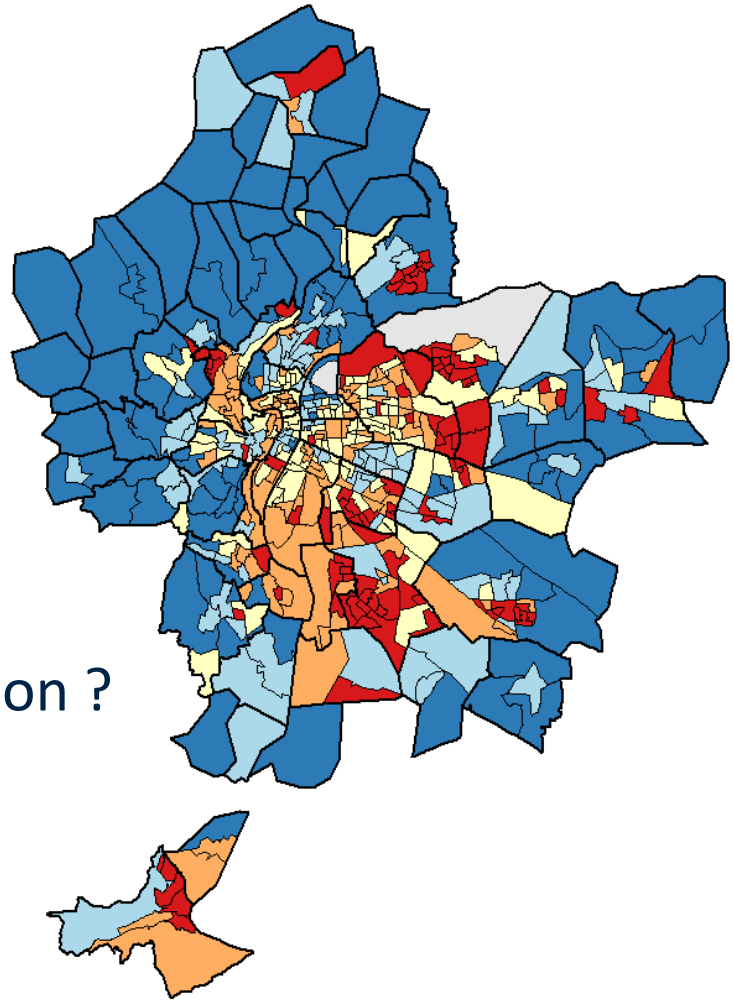
- Facilité d'utilisation : il faut tout de même connaître R

- Facilité d'interprétation : il faut connaître l'ACP

- Procédure de création d'indices statistiquement justifiée, flexible, reproductible à différentes échelles et sur différentes zones

- Package « tout en un » comprenant l'ensemble des outils pour l'appliquer et l'interpréter

Perspectives



-Autres méthodes de classifications ?

- Nouveaux outils d'aide à l'interprétation ?

- Autres moyens de visualisation ?

- Autres possibilités basées sur les retours …