

# FAMD

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```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.4.1
```

```
## Warning: package 'stringr' was built under R version 4.4.1
```

```
## — Attaching core tidyverse packages — tidyverse 2.0.0 —
## ✓ dplyr      1.1.4      ✓ readr      2.1.5
## ✓ forcats    1.0.0      ✓ stringr    1.5.1
## ✓ ggplot2     3.5.1      ✓ tibble     3.2.1
## ✓ lubridate  1.9.3      ✓ tidyr      1.3.1
## ✓ purrr       1.0.2
## — Conflicts — tidyverse_conflicts() —
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(FactoMineR)
```

```
## Warning: package 'FactoMineR' was built under R version 4.4.1
```

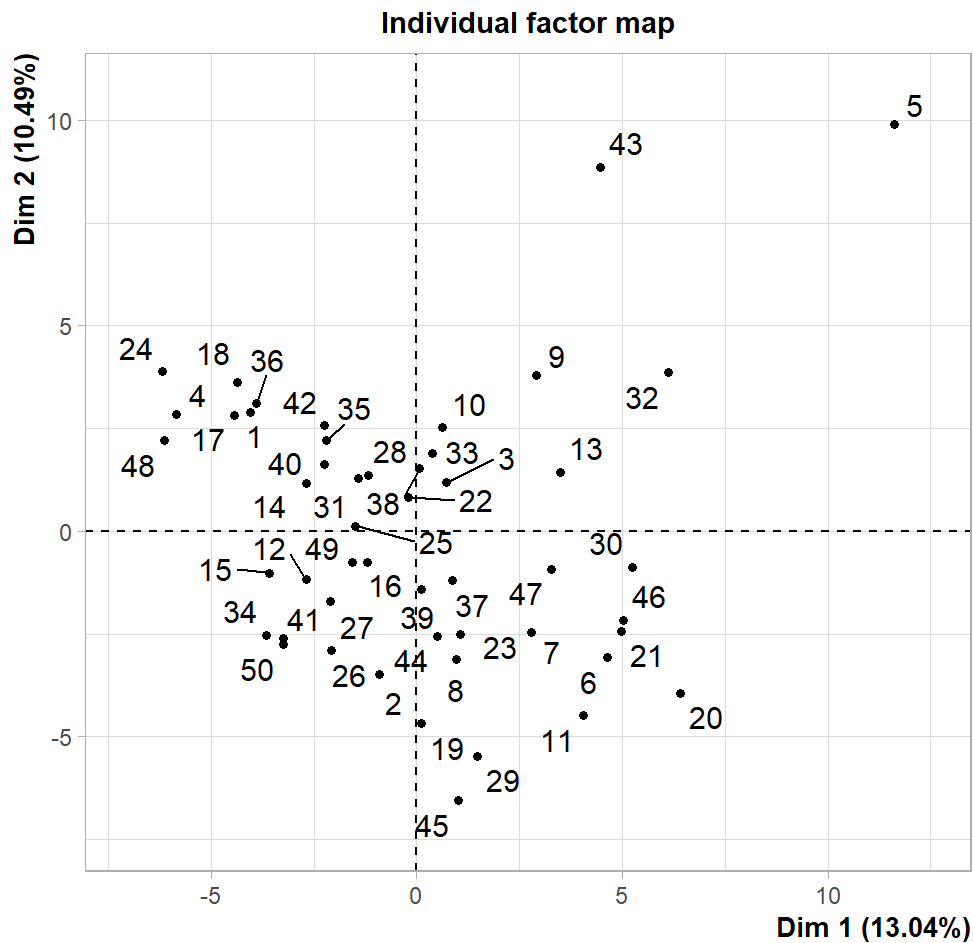
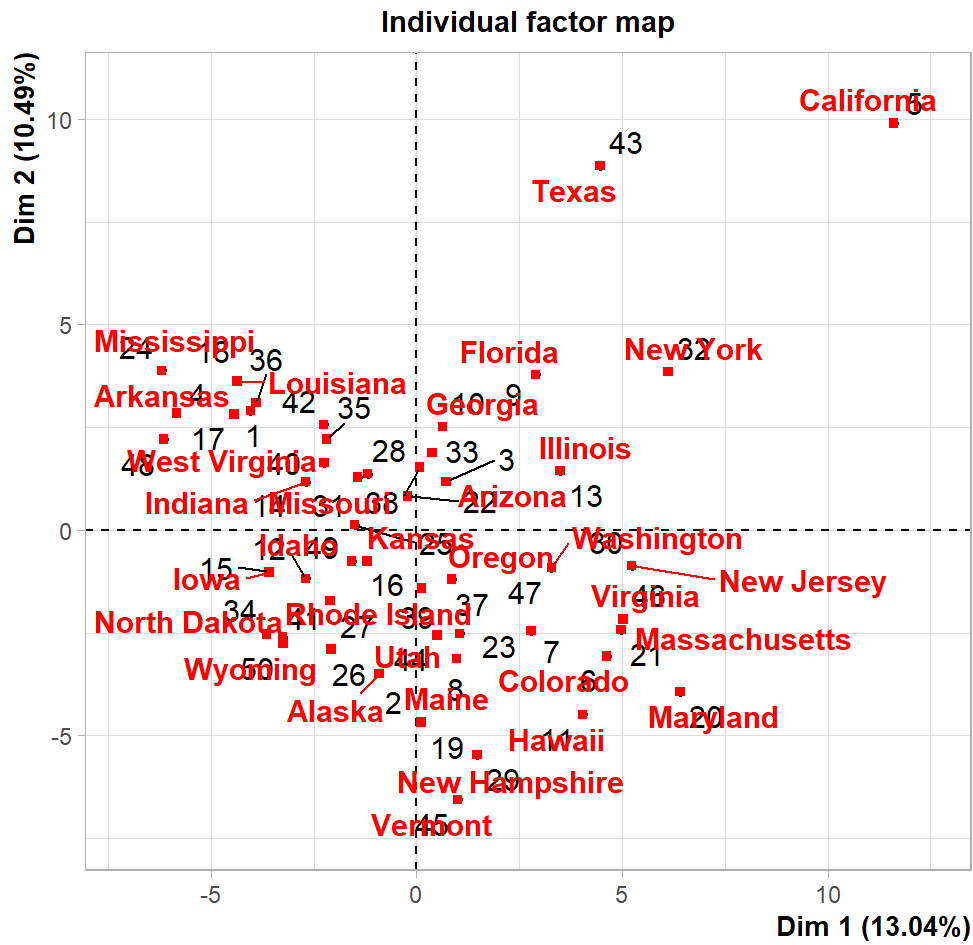
```
controls <- read_csv("ctrl_vars.csv")
```

```
## Rows: 50 Columns: 56
## — Column specification —
## Delimiter: ","
## chr (1): state
## dbl (52): fips, median_age, median_income, population_2022, poverty_perc, wh...
## num (3): foreign_born, bills_introduced, bills_enacted
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
control_vars <- controls %>%
  select(-fips)

analysis <- FAMD(control_vars)
```

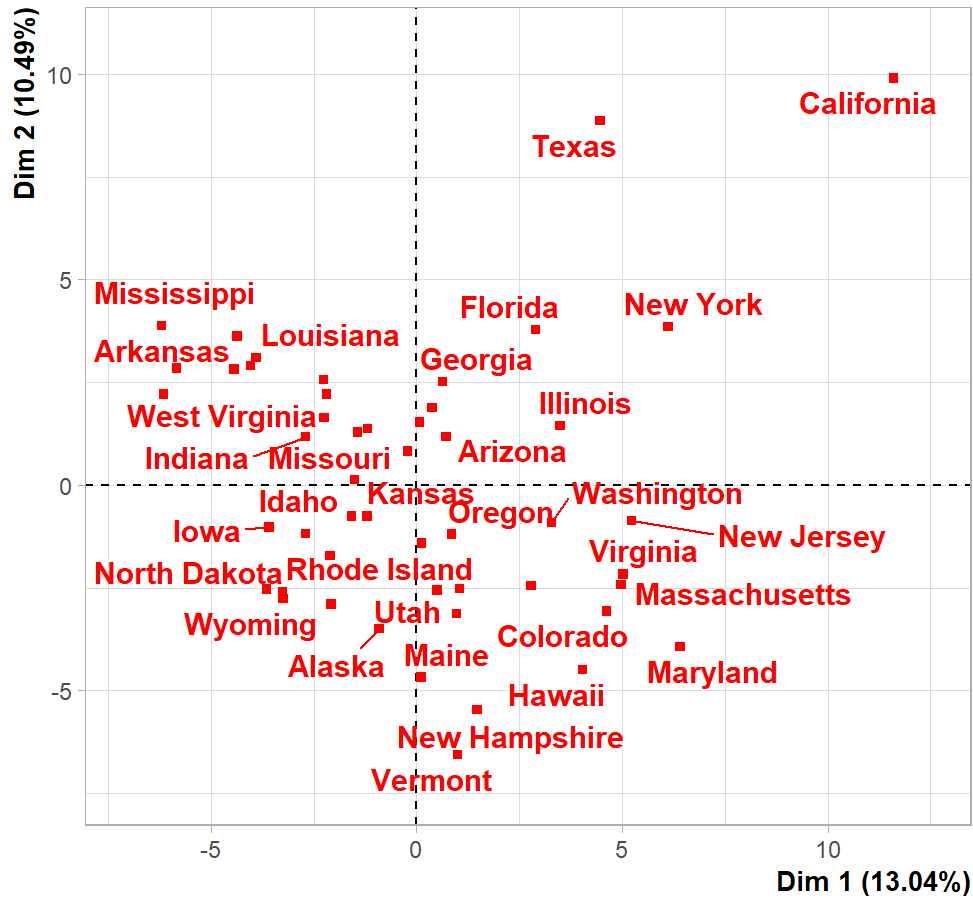
```
## Warning: ggrepel: 18 unlabeled data points (too many overlaps). Consider  
## increasing max.overlaps
```



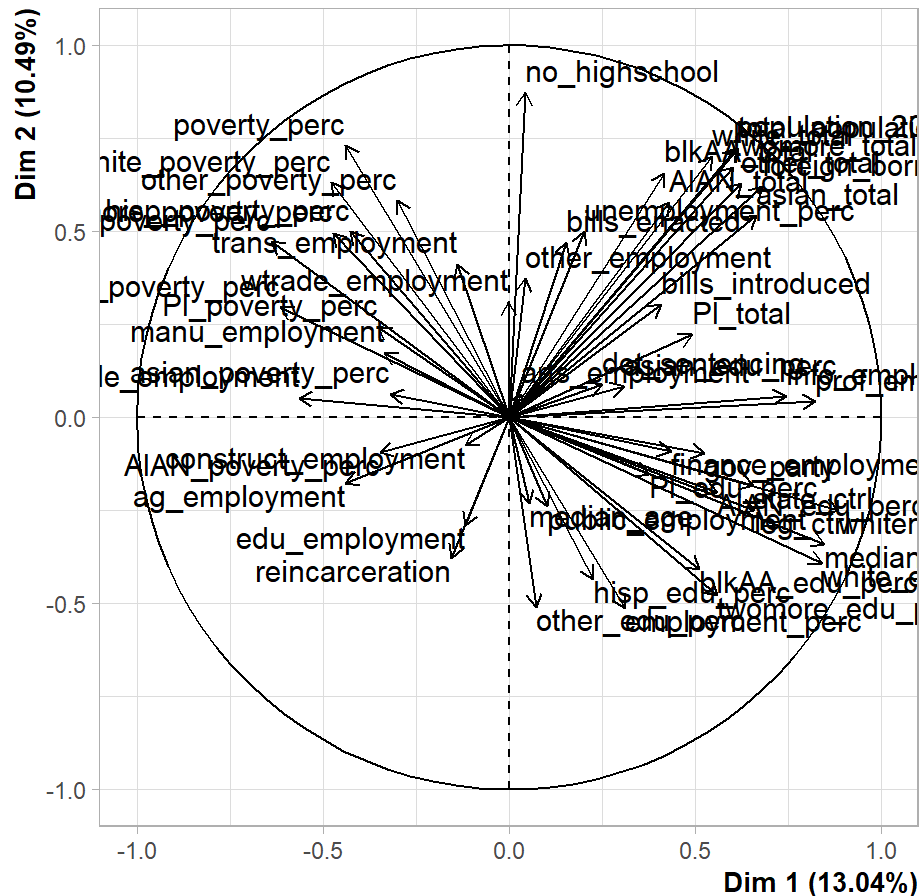
A PCA plot with Dim 1 (13.04%) on the x-axis and Dim 2 (10.49%) on the y-axis. The plot shows numerous variables as points. A vertical dashed line is at Dim 1 = 0.00 and a horizontal dashed line is at Dim 2 = 0.00. Variables like 'no\_highschool' are in the upper left quadrant. A cluster of demographic and economic variables is in the center. Variables related to education and income are on the right side. One variable, 'state\_unemployment', is an outlier in the top right corner.

```
## Warning: ggrepel. 18 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```

Graph of the categories



Graph of the quantitative variables



```
summary(analysis)
```

```
##
## Call:
## FAMD(base = control_vars)
##
##
## Eigenvalues
##           Dim.1 Dim.2 Dim.3 Dim.4 Dim.5
## Variance    13.429 10.803  5.927  5.366  4.035
## % of var.    13.037 10.488  5.754  5.210  3.917
## Cumulative % of var. 13.037 23.526 29.280 34.489 38.407
##
## Individuals (the 10 first)
##           Dist   Dim.1   ctr   cos2   Dim.2   ctr   cos2
## 1 |  8.971 | -4.037  2.427  0.203 |  2.899  1.556  0.104 |
## 2 | 12.274 | -0.910  0.123  0.006 | -3.490  2.256  0.081 |
## 3 |  8.686 |  0.725  0.078  0.007 |  1.183  0.259  0.019 |
## 4 |  9.924 | -5.838  5.077  0.346 |  2.846  1.500  0.082 |
## 5 | 17.859 | 11.611 20.078  0.423 |  9.902 18.152  0.307 |
## 6 |  9.616 |  4.625  3.185  0.231 | -3.063  1.737  0.101 |
## 7 |  9.277 |  2.784  1.154  0.090 | -2.451  1.113  0.070 |
## 8 |  9.570 |  0.975  0.141  0.010 | -3.125  1.808  0.107 |
## 9 | 10.575 |  2.900  1.253  0.075 |  3.783  2.650  0.128 |
## 10 |  8.590 |  0.635  0.060  0.005 |  2.521  1.176  0.086 |
##           Dim.3   ctr   cos2
## 1 |  1.035  0.361  0.013 |
## 2 | -7.009 16.577  0.326 |
## 3 | -0.968  0.317  0.012 |
## 4 | -0.494  0.082  0.002 |
## 5 | -3.922  5.192  0.048 |
## 6 | -1.035  0.361  0.012 |
## 7 |  3.642  4.477  0.154 |
## 8 |  1.784  1.074  0.035 |
## 9 | -1.366  0.630  0.017 |
## 10 | -0.241  0.020  0.001 |
##
## Continuous variables (the 10 first)
##           Dim.1   ctr   cos2   Dim.2   ctr   cos2   Dim.3
## median_age |  0.055  0.022  0.003 | -0.231  0.494  0.053 |  0.424
## median_income |  0.848  5.361  0.720 | -0.341  1.079  0.117 | -0.154
## foreign_born |  0.682  3.459  0.464 |  0.620  3.559  0.385 | -0.130
## population_2022 |  0.611  2.785  0.374 |  0.724  4.848  0.524 |  0.018
## poverty_perc | -0.439  1.436  0.193 |  0.731  4.946  0.534 | -0.007
## white_poverty_perc | -0.479  1.706  0.229 |  0.631  3.691  0.399 | -0.095
## blkAA_poverty_perc | -0.616  2.825  0.379 |  0.295  0.804  0.087 |  0.295
## AIAN_poverty_perc | -0.347  0.898  0.121 | -0.095  0.084  0.009 | -0.081
## asian_poverty_perc | -0.319  0.757  0.102 |  0.062  0.036  0.004 | -0.014
## PI_poverty_perc | -0.352  0.920  0.124 |  0.243  0.547  0.059 |  0.055
##           ctr   cos2
## median_age |  3.038  0.180 |
## median_income |  0.398  0.024 |
## foreign_born |  0.284  0.017 |
## population_2022 |  0.005  0.000 |
```

```

## poverty_perc      0.001  0.000 |
## white_poverty_perc 0.153  0.009 |
## blkAA_poverty_perc 1.469  0.087 |
## AIAN_poverty_perc  0.111  0.007 |
## asian_poverty_perc 0.003  0.000 |
## PI_poverty_perc    0.051  0.003 |
##
## Categories (the 10 first)
##          Dim.1   ctr   cos2 v.test   Dim.2   ctr   cos2 v.test
## Alabama      | -4.037  0.181  0.203 -1.102 |  2.899  0.144  0.104  0.882
## Alaska        | -0.910  0.009  0.006 -0.248 | -3.490  0.209  0.081 -1.062
## Arizona       |  0.725  0.006  0.007  0.198 |  1.183  0.024  0.019  0.360
## Arkansas      | -5.838  0.378  0.346 -1.593 |  2.846  0.139  0.082  0.866
## California    | 11.611  1.495  0.423  3.168 |  9.902  1.680  0.307  3.013
## Colorado      |  4.625  0.237  0.231  1.262 | -3.063  0.161  0.101 -0.932
## Connecticut   |  2.784  0.086  0.090  0.760 | -2.451  0.103  0.070 -0.746
## Delaware      |  0.975  0.011  0.010  0.266 | -3.125  0.167  0.107 -0.951
## Florida       |  2.900  0.093  0.075  0.791 |  3.783  0.245  0.128  1.151
## Georgia       |  0.635  0.004  0.005  0.173 |  2.521  0.109  0.086  0.767
##          Dim.3   ctr   cos2 v.test
## Alabama      |  1.035  0.061  0.013  0.425 |
## Alaska        | -7.009  2.797  0.326 -2.879 |
## Arizona       | -0.968  0.053  0.012 -0.398 |
## Arkansas      | -0.494  0.014  0.002 -0.203 |
## California    | -3.922  0.876  0.048 -1.611 |
## Colorado      | -1.035  0.061  0.012 -0.425 |
## Connecticut   |  3.642  0.755  0.154  1.496 |
## Delaware      |  1.784  0.181  0.035  0.733 |
## Florida       | -1.366  0.106  0.017 -0.561 |
## Georgia       | -0.241  0.003  0.001 -0.099 |

```