



Training workshop May 2012

Class 2 instructions: Latent class models for single groups; fit statistics

The data for these exercises are taken from the latest (2008-9) wave of the European Values Survey:

*EVS (2011): European Values Study 2008: Integrated Dataset (EVS 2008). GESIS Data Archive, Cologne. ZA4800 Data file Version 3.0.0, [doi:10.4232/1.11004](https://doi.org/10.4232/1.11004)
<http://info1.gesis.org/dbksearch/sdesc2.asp?no=4800&db=e&doi=10.4232/1.11004>*

We will focus on a set of items asking respondents how much confidence they have in a range of institutions. We focus on a subset of the items for the analyses here, but include the full list of items in the data set, so that you may explore models using other items if you wish. The institutions are:

Variable name	Description
church	church
army	armed forces
educ	education system
press	the press
tu	trade unions
police	the police
parlt	parliament
civil	civil service
welfare	social security system
eu	European Union
nato	NATO
un	United Nations
health	health care system
justice	justice system
company	major companies
environ	environmental organisations
party	political parties
govt	government

In the data set they are provided in two forms. Variable names followed by a '4' (e.g. church4) are items with 4-point scales (with coding reversed from the original) so that:

1	=	none at all
2	=	not very much
3	=	quite a lot
4	=	a great deal

Variable names followed by a '2' (e.g. church2) are binary items recoded from the originals so that:

0	=	none or not very much
1	=	quite a lot or a great deal.

In this class we will start by fitting some latent class models, adding them to the objects created in the first session, and viewing the results. Then we will inspect some fit statistics (including marginal residual fit statistics) for the latent class models. Finally we will do the same for the latent trait models fitted in the first session.

1. Latent class model with 2 classes; 1 group; 6 binary items

- Mplus input file: 2class_binary_gb.inp
- Model: 2 latent classes, 6 binary items (police2 parlt2 justice2 eu2 nato2 un2), 1 group = British respondents ('gb')
- R command to read in the data and apply the LCAT function, and read the results:

```
bin6gb<-lcat("2class_binary_gb.out",sessionpath,addto=bin6gb)
print(bin6gb,6)
```
- Changing the order in which the classes are presented (left to right), so that the (original) second class is first and the (original) first class is now second, and check the results:

```
reorder(bin6gb,elements=6,classes=c(2,1))
print(bin6gb,6)
```
- Plotting conditional item response probabilities for the higher level of response (trust quite a lot or a great deal) for items 1 to 6:

```
plot(bin6gb,6,items=1:6,levels=2)
```

2. Latent class model with 3 classes; 1 group; 6 binary items

- Mplus input file: 3class_binary_gb.inp
- Model: 3 latent classes, 6 binary items (police2 parlt2 justice2 eu2 nato2 un2), 1 group = British respondents ('gb')
- R command to read in the data and apply the LCAT function, and read the results:

```
bin6gb<-lcat("3class_binary_gb.out",sessionpath,addto=bin6gb)
print(bin6gb,7)
```
- Changing the order in which the classes are presented, so that the (original) third class is first, the (original) first class is now second, and the (original) second class is now third:

```
reorder(bin6gb,elements=7,classes=c(3,1,2))
```
- Plotting conditional item response probabilities for the higher level of response (trust quite a lot or a great deal) for items 1 to 6:

```
plot(bin6gb,7,items=1:6,levels=2)
```

3. Latent class model with 4 classes; 1 group; 6 binary items

- Mplus input file: 4class_binary_gb.inp
- Model: 4 latent classes, 6 binary items (police2 parlt2 justice2 eu2 nato2 un2), 1 group = British respondents ('gb')
- R command to read in the data and apply the LCAT function, and read the results:

```
bin6gb<-lcat("4class_binary_gb.out",sessionpath,addto=bin6gb)
print(bin6gb,8)
```
- Changing the order in which the classes are presented, so that the (original) first and second classes remain as they are but the last two are switched around:

```
reorder(bin6gb,elements=8,classes=c(1,2,4,3))
```
- Plotting some conditional item response probabilities for the higher level of response (trust quite a lot or a great deal), in two different plots:

```
plot(bin6gb,8,items=4:6,levels=2)
plot(bin6gb,8,items=c(2,4,6),levels=2)
```

4. Latent class model; 1 group; polytomous nominal items

- Mplus input file: 2class_nominal_gb.inp
- Model: 2 latent classes, 6 4-category items (police4 parlt4 justice4 eu4 nato4 un4) treated as nominal, 1 group = British respondents ('gb')
- R command to read in the data and apply the LCAT function, and read the results:

```
poly6gb<-lcat("2class_nominal_gb.out",sessionpath,addto=poly6gb)
print(poly6gb,3)
```
- Changing the order in which the classes are presented, so that the (original) second class is first, the (original) first class is now second, and checking the results:

```
reorder(poly6gb,elements=3,classes=c(2,1))
print(poly6gb,3)
```
- Plotting response probabilities for the second response option ("not very much") for items 1 through 6:

```
plot(poly6gb,3,items=1:6,levels=2)
```
- Plotting cumulative response probabilities for the 2nd response (i.e. "not very much") for items 1 through 6, then for the 1st and 2nd together ("none at all" or "not very much"):

```
plot(poly6gb,3,items=1:6,levels=2)
plot(poly6gb,3,items=1:6,levels=2,cumprob="low")
```

5. Marginal residual fit statistics

- To obtain the full list of residuals for the first latent class model you fitted in this session:
`resid(bin6gb, 6, full=T)`
- To print just those residuals for the first item and sort them from largest to smallest, use these commands:
`resid(bin6gb, 6, item=1, sort=T)`
- To request a summary of large two-way marginal residuals for this model
`resid(bin6gb, 6, item2way=T, over4=T)`
- To sort these from largest to smallest, add one more argument:
`resid(bin6gb, 6, item2way=T, over4=T, sort=T)`
- To sort these from largest to smallest, add one more argument:
`resid(bin6gb, 6, item2way=T, over4=T, sort=T)`
- To print the sums of the two-way margins across pairs of items for this model:
`resid(bin6gb, 6, sumitem2way=T)`
- For a summary of these for all the models fitted to the set of six binary items for the British sample of data:
`bin6gb`
- Now ask for a summary of all models fitted for four-category versions of the items:
`poly6gb`
- And finally, look more closely at any that interest you. For example, compare the fits of the one-trait models that treat items as nominal and as ordinal:
`resid(poly6gb, 1, item2way=T, over4=T, sort=T)`
`resid(poly6gb, 2, item2way=T, over4=T, sort=T)`