Scripts & Outputs
“Insomnia symptoms in children and adolescents: Screening for sleep problems with the Two-item Sleep Condition Indicator (SCI-02)”

Latent Profile Analysis (LPA) in Mplus

Step 1: Model Parameterization Structure

The parametrization structure for the LPA models was defined based on comparison of different parametrization structures given three class model.

Parametrization Model 1 (Default) - Equal variances and zero covariances

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/11/2023  11:26 AM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M1 free means, constrained
variance, zero covariance
  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a “.” which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see “Four-Profile Final
Model with Covariate Analysis
  !Syntax” for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus’
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M1.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.
```

Scripts & Outputs

“Insomnia symptoms in children and adolescents: Screening for sleep problems with the Two-item Sleep Condition Indicator (SCI-02)”

```
LPA 3 profile syntax: M1 free means, constrained variance, zero covariance

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable           ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm for
Continuous Outcomes
  Maximum number of iterations                   100
  Convergence criterion                          0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                   500
  Convergence criteria
    Loglikelihood change                         0.100D-06
    Relative loglikelihood change                0.100D-06
    Derivative                                   0.100D-05
Optimization Specifications for the M step of the EM Algorithm for
Categorical Latent variables
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
Optimization Specifications for the M step of the EM Algorithm for
Censored, Binary or Ordered Categorical (Ordinal), Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
  Maximum value for logit thresholds             15
  Minimum value for logit thresholds             -15
  Minimum expected cell size for chi-square      0.100D-01
Maximum number of iterations for H1              2000
Convergence criterion for H1                     0.100D-03
Optimization algorithm                           EMA
Random Starts Specifications
  Number of initial stage random starts          1000
  Number of final stage optimizations            250
  Number of initial stage iterations             500
  Initial stage convergence criterion            0.100D+01
  Random starts scale                            0.500D+01
  Random seed for generating random starts       0

Input data file(s)
    mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y


           Covariance Coverage
              SLPNSSNC      WORRYNC       SOLC          SLPDURC
              ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT DESCRIPTIVE STATISTICS

          Variable/         Mean/     Skewness/   Minimum/ % with Percentiles
                Sample Size     Variance    Kurtosis    Maximum      Min/Max     20%/60%    40%/80%    Median

     SLPNSSNC              0.933       0.086       0.000   27.10%       0.000      1.000      1.000
            27802.000       0.471      -0.878       2.000   20.40%       1.000      2.000
     WORRYNC               0.000      -1.036      -2.825    1.71%      -0.928      0.020      0.495
            27802.000       1.000       0.165       0.969   28.55%       0.495      0.969
     SOLC                  0.000       0.967      -1.054   31.63%      -1.054     -0.072     -0.072
            27123.000       1.000       0.467       2.875    2.77%      -0.072      0.910
     SLPDURC               0.000       0.568      -1.205   25.70%      -1.205     -0.292     -0.292
            26763.000       1.000      -0.470       2.445    3.44%      -0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST TO THE WORST LOGLIKELIHOOD VALUES

Final stage loglikelihood values at local maxima, seeds, and initial stage start numbers:

      -128973.336  780698         337
      -128973.336  569338         755
      -128973.336  699810         571
      -128973.336  298553         773
      -128973.336  232559         136
      -128973.336  628143         854
      -128973.336  635245         121
      -128973.336  27071           15
      -128973.336  810705         626
      -128973.336  545108         667
      -128973.336  926283         269
```

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-128973.336	268896	124	-128973.336	383902	673
-128973.336	850112	922	-128973.336	887676	22
-128973.336	297518	166	-128973.336	351622	551
-128973.336	738393	619	-128973.336	402699	604
-128973.336	214681	824	-128973.336	130011	587
-128973.336	797594	234	-128973.336	72344	897
-128973.336	425929	508	-128973.336	474357	789
-128973.336	200041	810	-128973.336	318177	748
-128973.336	609089	241	-128973.336	458181	189
-128973.336	853781	716	-128973.336	483369	270
-128973.336	914505	838	-128973.336	92564	583
-128973.336	399848	220	-128973.336	288738	940
-128973.336	444228	860	-128973.336	535063	329
-128973.336	209031	632	-128973.336	475419	987
-128973.336	351807	617	-128973.336	966499	963
-128973.336	937885	426	-128973.336	424223	900
-128973.336	646573	741	-128973.336	848890	95
-128973.336	327140	678	-128973.336	195353	225
-128973.336	996231	310	-128973.336	117391	710
-128973.336	264901	634	-128973.336	326091	759
-128973.336	710445	792	-128973.336	965994	396
-128973.336	568859	49	-128973.336	966603	919
-128973.336	435506	988	-128973.336	89970	223
-128973.336	573096	20	-128973.336	865906	641
-128973.336	85734	411	-128973.336	891347	504
-128973.336	21132	351	-128973.336	484406	421
-128973.336	563002	360	-128973.336	849670	347
-128973.336	538872	949	-128973.336	507218	613
-128973.336	248742	556	-128973.336	900921	984
-128973.336	686482	215	-128973.336	970689	266
-128973.336	705224	953	-128973.336	810594	845
-128973.336	43523	297	-128973.336	192191	629
-128973.336	950604	172	-128973.336	314034	513
-128973.336	499150	216	-128973.336	939021	8
-128973.336	668003	647	-128973.336	438144	271
-128973.336	357866	968	-128973.336	341960	685
-128973.336	284716	713	-128973.336	137888	901
-128973.336	285380	1	-128973.336	281558	184
-128973.336	224950	455	-128973.336	392751	480
-128973.336	67009	564	-128973.336	850545	357
-128973.336	490123	995	-128973.336	928287	197
-128973.336	462228	298	-128973.336	264081	186
-128973.336	344422	296	-128973.336	629720	926
-128973.336	72662	729	-128973.336	572637	989
-128973.336	291112	645	-128973.336	644297	340
-128973.336	805768	879	-128973.336	323588	826
-128973.336	68850	462	-128973.336	210139	991
-128973.336	921023	782	-128973.336	215353	164
-128973.336	710154	831	-128973.336	809240	543
-128973.336	376411	473	-128973.336	432513	803
-128973.336	574942	558	-128973.336	298275	418
-128973.336	804660	260	-128973.336	23012	352
-128973.336	393232	152	-128973.336	979450	913
-128973.336	595759	997	-128973.336	118421	139
-128973.336	364676	27	-128973.336	857122	889
-128973.336	629320	222	-128973.336	669639	699
-128973.336	350608	334	-128973.336	107446	12
-128973.336	700349	401	-128973.336	252949	487
-128973.336	167409	772	-128973.336	417035	149
-128973.336	195763	358	-128973.336	343926	624
-128973.336	147440	514	-128973.336	39136	226
-128973.336	603842	61	-128973.336	696830	668
-128973.336	608849	224	-128973.336	597614	284
-128973.336	415931	10	-128973.336	213532	503
-128973.336	652266	490	-128973.336	551340	766
-128973.336	900631	774	-128973.336	22075	659
-128973.336	231281	542	-128973.336	519357	559
-128973.336	922596	456	-128973.336	404426	344
-128973.336	154575	539	-128973.336	79945	395

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```
      -128973.336  164305        128
      -128973.336  760599        832
      -128973.336  387701        275
      -128973.336  792993        859
      -128973.336  869564        869
      -128973.336  638577        769
      -128973.336  407168         44
      -128973.336  863094        147
      -128973.336  217744        326
      -128973.336  782821        272
      -128973.336  805935        615
      -128973.336  173191        422
      -128973.336   81233        825
      -128973.336  749453         33
      -128973.336  724087        925
      -128973.336  752769        253
      -128973.336  702492        718
      -128973.336  547702        767
      -128973.336  988761        475
      -128973.336  224151        973
      -128973.336  679448        937
      -128973.336  724519        333
      -128973.336  246261         38
      -128973.336  977800        853
      -128973.336  220454        288
      -128973.336  648555        113
      -128973.336  413564        535
      -128973.336  476295        969
      -128973.336  138695        783
      -128973.336  860102        495
      -128973.336  781190        219
      -128973.336  341041         34
      -128973.336  127362        757
      -128973.336  418686        338
      -128973.336  152496        123
      -128973.336   46437        153
      -128973.336  830292        527
      -128973.336  211281        292
      -128973.336  995913        787
      -128973.336  590834        785
      -128973.336  192071        142
      -128973.336  188640        451
      -128973.336  928624        981
      -128973.336  671390        814
      -128973.336  140849        515
      -128973.336  606576        151
      -128973.336  887580        493
      -128973.336  497522        502
      -128973.336  302046        863
      -128973.336  626208        698
      -128973.336  505244        582
      -128973.336  602032        648
      -128973.336  802256        477
      -128973.336  971853        402
      -128973.336  589483        950
      -128973.336  373702        669
      -128973.336  534864        307
      -128973.336  650371         14
      -128973.336  824126        287
      -128973.336  781489        627
      -128973.336  669634        335
      -128973.336  526324        178
      -128973.336  377584        630
      -128973.336  271809        846
      -128973.336  848331        137
      -128973.336  712702        684
      -128973.336  451258        848
      -128973.336  856612        700
      -128973.336  278661        674
      -128973.336  871851        257
      -128973.336   76974         16
      -128973.336  561664        392
      -128973.336  202790        198
      -128973.336  150531        154
      -128973.336  237332        661
      -128973.336  252346        528
      -128973.336   62835        642
      -128973.336  312754        562
      -128973.336  475420         71
      -128973.336  704798        530
      -128973.336  636396        168
      -128973.336  299977        956
      -128973.336  456213        160
      -128973.336   79212        517
      -128973.336  437181        135
      -128973.336  640833        434
      -128973.336   76451        211
      -128973.336  529496        343
      -128973.336  441191        361
      -128973.336  267983        228
      -128973.336  246794        801
      -128973.336  225995        847
      -128973.336  568405        233
      -128973.336  575700        100
      -128973.336  345974        622
      -128973.336  726744        939
      -128973.336  920593        611
      -128973.336  379823        905
      -128973.336  824956        607
      -128973.336  645052        910
      -128973.336  742688        594

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       18

Loglikelihood

          H0 Value                    -128973.336
          H0 Scaling Correction Factor      1.3080
            for MLR

Information Criteria

          Akaike (AIC)                 257982.672
          Bayesian (BIC)               258130.863
          Sample-Size Adjusted BIC     258073.660
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

     Latent
    Classes

       1      3094.62154          0.11131
       2      6716.69965          0.24159
       3     17990.67881          0.64710
```

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FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

Latent Classes		
1	3094.62154	0.11131
2	6716.69965	0.24159
3	17990.67881	0.64710

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS MEMBERSHIP

Class Counts and Proportions

Latent Classes		
1	3065	0.11024
2	6569	0.23628
3	18168	0.65348

CLASSIFICATION QUALITY

Entropy 0.863

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2	3
1	0.921	0.079	0.000
2	0.041	0.880	0.078
3	0.000	0.038	0.962

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	0.912	0.088	0.000
2	0.036	0.861	0.103
3	0.000	0.029	0.971

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	13.724	11.383	0.000
2	-1.051	2.123	0.000
3	-13.786	-3.525	0.000

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Latent Class 1				
Means				
SLPNSSNC	1.108	0.014	79.573	0.000
WORRYNC	-2.040	0.017	-118.142	0.000
SOLC	1.488	0.034	43.966	0.000
SLPDURC	1.192	0.024	49.384	0.000
Variances				
SLPNSSNC	0.465	0.003	155.639	0.000
WORRYNC	0.184	0.003	68.676	0.000
SOLC	0.597	0.008	76.749	0.000
SLPDURC	0.677	0.007	95.747	0.000
Latent Class 2				
Means				
SLPNSSNC	0.982	0.010	98.325	0.000
WORRYNC	-0.687	0.022	-31.840	0.000
SOLC	0.444	0.015	30.251	0.000
SLPDURC	0.517	0.015	34.921	0.000
Variances				
SLPNSSNC	0.465	0.003	155.639	0.000
WORRYNC	0.184	0.003	68.676	0.000
SOLC	0.597	0.008	76.749	0.000
SLPDURC	0.677	0.007	95.747	0.000
Latent Class 3				
Means				
SLPNSSNC	0.885	0.005	167.165	0.000
WORRYNC	0.607	0.005	127.737	0.000
SOLC	-0.416	0.007	-61.368	0.000
SLPDURC	-0.395	0.008	-51.870	0.000
Variances				
SLPNSSNC	0.465	0.003	155.639	0.000
WORRYNC	0.184	0.003	68.676	0.000
SOLC	0.597	0.008	76.749	0.000
SLPDURC	0.677	0.007	95.747	0.000
Categorical Latent Variables				
Means				
C#1	-1.760	0.034	-51.148	0.000
C#2	-0.985	0.019	-50.760	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.514E-02
(ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

Random Starts Specifications for the k-1 Class Analysis Model
Number of initial stage random starts 1000
Number of final stage optimizations 250

VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO TEST FOR 2 (H0) VERSUS 3 CLASSES

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```
        H0 Loglikelihood Value                -131941.399
        2 Times the Loglikelihood Difference     5936.126
        Difference in the Number of Parameters          5
        Mean                                       14.458
        Standard Deviation                         30.006
        P-Value                                    0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                                  5822.329
        P-Value                                    0.0000


TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts         1000
      Number of final stage optimizations            250

    Random Starts Specification for the k-1 Class Model for
Generated Data
      Number of initial stage random starts            2
      Number of final stage optimizations              1
    Random Starts Specification for the k Class Model for
Generated Data
      Number of initial stage random starts           50
      Number of final stage optimizations             10
    Number of bootstrap draws requested              250


    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value                -131941.399
        2 Times the Loglikelihood Difference     5936.126
        Difference in the Number of Parameters          5
        Approximate P-Value                        0.0000
        Successful Bootstrap Draws                    250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 152
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.


PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step1_LPA3M1.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    C              F10.3
    ID             I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol        *


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  11:26:26
        Ending Time:  12:34:43
       Elapsed Time:  01:08:17

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```

Parametrization Model 2 - Varying variances and zero covariance

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/11/2023   1:23 PM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M2 Unconstrained variance, 0
covariance
  DATA:
    FILE IS mplus2.csv;
    ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
    ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;
```

```
  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

  %c#2%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

  %c#3%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M2.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.


LPA 3 profile syntax: m2 Unconstrained variance, 0
covariance

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                   100
```

```
  Convergence criterion                                    0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                                500
  Convergence criteria
    Loglikelihood change                                   0.100D-06
    Relative loglikelihood change                          0.100D-06
    Derivative                                             0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                                   1
  M step convergence criterion                             0.100D-05
  Basis for M step termination                             ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                                   1
  M step convergence criterion                             0.100D-05
  Basis for M step termination                             ITERATION
  Maximum value for logit thresholds                           15
  Minimum value for logit thresholds                           -15
  Minimum expected cell size for chi-square                0.100D-
01
Maximum number of iterations for H1                         2000
Convergence criterion for H1                             0.100D-03
Optimization algorithm                                   EMA
Random Starts Specifications
  Number of initial stage random starts                      1000
  Number of final stage optimizations                         250
  Number of initial stage iterations                          500
  Initial stage convergence criterion                      0.100D+01
  Random starts scale                                      0.500D+01
  Random seed for generating random starts                        0

Input data file(s)
  mplus2.csv
Input data format  FREE


SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0


COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


     PROPORTION OF DATA PRESENT FOR Y


           Covariance Coverage
              SLPNSSNC       WORRYNC        SOLC
SLPDURC
              ________       ________       ________       ________
 SLPNSSNC       1.000
 WORRYNC        1.000          1.000
 SOLC           0.976          0.976          0.976
 SLPDURC        0.963          0.963          0.940          0.963


UNIVARIATE SAMPLE STATISTICS


     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

          Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
          Sample Size      Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median

     SLPNSSNC              0.933       0.086       0.000   27.10%
0.000      1.000      1.000
            27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC               0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
            27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC                  0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
            27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
     SLPDURC               0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
            26763.000       1.000      -0.470       2.445    3.44%
-0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

999 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:


250 perturbed starting value run(s) did not converge or were
rejected in the third stage.


     THE ESTIMATED COVARIANCE MATRIX FOR THE Y
VARIABLES IN CLASS 1 COULD NOT
     BE INVERTED.  PROBLEM INVOLVING VARIABLE
SLPDURC.  COMPUTATION COULD
     NOT BE COMPLETED IN ITERATION 17.  CHANGE
YOUR MODEL AND/OR STARTING
     VALUES.  THIS MAY BE DUE TO A ZERO ESTIMATED
VARIANCE, THAT IS, NO WITHIN-CLASS
     VARIATION FOR THE VARIABLE.
     THE MODEL ESTIMATION DID NOT TERMINATE
NORMALLY.  ESTIMATES CANNOT
     BE TRUSTED.


     THE MODEL ESTIMATION DID NOT TERMINATE
NORMALLY DUE TO AN ERROR IN THE
     COMPUTATION.  CHANGE YOUR MODEL AND/OR
STARTING VALUES.

MODEL RESULTS

                    Estimate

Latent Class 1
```

```
 Means
    SLPNSSNC         -0.197
    WORRYNC          55.382
    SOLC          -1907.460
    SLPDURC          -266.045

 Variances
    SLPNSSNC          6.868
    WORRYNC          37.105
    SOLC           3564.902
    SLPDURC           0.000

Latent Class 2

 Means
    SLPNSSNC          0.508
    WORRYNC          -0.016
    SOLC             -0.134
    SLPDURC           1.084

 Variances
    SLPNSSNC          0.302
    WORRYNC           0.399
    SOLC              0.078
    SLPDURC           0.598

Latent Class 3

 Means
    SLPNSSNC          0.941
    WORRYNC           0.000
    SOLC              0.003
    SLPDURC          -0.020

 Variances
    SLPNSSNC          0.470
    WORRYNC           1.011
    SOLC              1.015
    SLPDURC           0.986

Categorical Latent Variables

 Means
    C#1            -233.972
    C#2              -3.905


MODEL COMMAND WITH FINAL ESTIMATES USED AS STARTING VALUES

    %OVERALL%

    [ c#1*-233.97177 ];
    [ c#2*-3.90489 ];

    %C#1%

    [ slpnssnc*-0.19736 ];
    [ worrync*55.38240 ];
    [ solc*-1907.45996 ];
    [ slpdurc*-266.04523 ];

    slpnssnc*6.86776;
    worrync*37.10458;
    solc*3564.90186;
    slpdurc*0.00000;

    %C#2%

    [ slpnssnc*0.50800 ];
    [ worrync*-0.01614 ];
    [ solc*-0.13390 ];
    [ slpdurc*1.08362 ];

    slpnssnc*0.30176;
    worrync*0.39880;
    solc*0.07827;
    slpdurc*0.59777;

    %C#3%

    [ slpnssnc*0.94078 ];
    [ worrync*0.00030 ];
    [ solc*0.00289 ];
    [ slpdurc*-0.01953 ];

    slpnssnc*0.47027;
    worrync*1.01098;
    solc*1.01502;
    slpdurc*0.98561;



TECHNICAL 11 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250



TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250

    Random Starts Specification for the k-1 Class Model for Generated Data
      Number of initial stage random starts             2
      Number of final stage optimizations               1
    Random Starts Specification for the k Class Model for Generated Data
      Number of initial stage random starts            50
      Number of final stage optimizations              10
    Number of bootstrap draws requested               250


SAVEDATA INFORMATION

    Class probabilities were not computed.
    No data were saved.


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture analysis.
  No diagram output was produced.


    Beginning Time:  13:23:15
       Ending Time:  13:26:44
      Elapsed Time:  00:03:29

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```

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Parametrization Model 3 - Equal variances and equal covariances

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/11/2023   1:29 PM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M3 constrained variance and
equal covariance
  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M3.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

LPA 3 profile syntax: M3 constrained variance and equal
covariance

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                       27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables
```

```
  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                       MLR
Information matrix                              OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                  100
  Convergence criterion                      0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                  500
  Convergence criteria
    Loglikelihood change                     0.100D-06
    Relative loglikelihood change            0.100D-06
    Derivative                               0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                     1
  M step convergence criterion               0.100D-05
  Basis for M step termination               ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                     1
  M step convergence criterion               0.100D-05
  Basis for M step termination               ITERATION
  Maximum value for logit thresholds             15
  Minimum value for logit thresholds             -15
  Minimum expected cell size for chi-square  0.100D-
01
Maximum number of iterations for H1            2000
Convergence criterion for H1               0.100D-03
Optimization algorithm                         EMA
Random Starts Specifications
  Number of initial stage random starts        1000
  Number of final stage optimizations           250
  Number of initial stage iterations            500
  Initial stage convergence criterion        0.100D+01
  Random starts scale                        0.500D+01
  Random seed for generating random starts           0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
                 SLPNSSNC      WORRYNC       SOLC
SLPDURC
                 ________      ________      ________
________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940
0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

         Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
           Sample Size     Variance    Kurtosis    Maximum
Min/Max     20%/60%    40%/80%    Median

     SLPNSSNC             0.933       0.086       0.000   27.10%
0.000     1.000     1.000
           27802.000       0.471      -0.878       2.000   20.40%
1.000     2.000
     WORRYNC              0.000      -1.036      -2.825    1.71%
-0.928     0.020     0.495
           27802.000       1.000       0.165       0.969   28.55%
0.495     0.969
     SOLC                 0.000       0.967      -1.054   31.63%    -
1.054    -0.072    -0.072
           27123.000       1.000       0.467       2.875    2.77%
-0.072     0.910
     SLPDURC              0.000       0.568      -1.205   25.70%
-1.205    -0.292    -0.292
           26763.000       1.000      -0.470       2.445    3.44%
-0.292     0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

8 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -126772.383  349562         359
      -126772.383  869564         869
      -126772.383  347515         24
      -126772.383  848331         137
      -126772.383  588923         606
      -126772.383  781489         627
      -126772.383  440841         118
      -126772.383  77571          980
      -126772.383  407168         44
      -126772.383  351807         617
      -126772.383  63231          935
      -126772.383  631413         439
      -126772.383  415931         10
      -126772.383  294811         637
      -126772.383  354208         196
      -126772.383  319144         176
      -126772.383  535804         111
      -126772.383  57226          208
      -126772.383  782821         272
      -126772.383  967902         52
      -126772.383  173191         422
      -126772.383  444228         860
      -126772.383  251641         784
      -126772.383  669639         699
      -126772.383  370957         554
```

-126772.383	965994	396	-126772.383	424223	900
-126772.383	995648	936	-126772.383	66276	217
-126772.383	592219	119	-126772.383	939021	8
-126772.383	617658	660	-126772.383	939709	112
-126772.383	634782	979	-126772.383	244349	736
-126772.383	140442	500	-126772.383	804561	59
-126772.383	213189	605	-126772.383	501995	791
-126772.383	505244	582	-126772.383	569131	26
-126772.383	471398	74	-126772.383	391179	78
-126772.383	860102	495	-126772.383	529455	268
-126772.383	567165	319	-126772.383	366533	484
-126772.383	226322	478	-126772.383	404426	344
-126772.383	260601	36	-126772.383	520865	763
-126772.383	147440	514	-126772.383	266340	683
-126772.383	85114	385	-126772.383	836515	341
-126772.383	965639	463	-126772.383	622860	259
-126772.383	887676	22	-126772.383	748692	204
-126772.383	164305	128	-126772.383	462821	745
-126772.383	50887	389	-126772.383	202790	198
-126772.383	422103	62	-126772.383	638577	769
-126772.383	425149	878	-126772.383	344422	296
-126772.383	777492	972	-126772.383	118438	601
-126772.383	98068	998	-126772.383	79212	517
-126772.383	636396	168	-126772.383	539389	544
-126772.383	414828	322	-126772.383	328661	813
-126772.383	417035	149	-126772.383	488125	368
-126772.383	609089	241	-126772.383	714997	399
-126772.383	859432	770	-126772.383	227563	63
-126772.383	406935	958	-126772.383	686482	215
-126772.383	94610	884	-126772.383	213532	503
-126772.383	387701	275	-126772.383	441191	361
-126772.383	473343	844	-126772.383	973369	202
-126772.383	579995	183	-126772.383	105435	265
-126772.383	726744	939	-126772.383	434915	552
-126772.383	251680	794	-126772.383	712702	684
-126772.383	68850	462	-126772.383	431271	943
-126772.383	760850	739	-126772.383	284716	713
-126772.383	677062	680	-126772.383	136842	58
-126772.383	642386	662	-126772.383	65651	214
-126772.383	425982	485	-126772.383	850112	922
-126772.383	370466	41	-126772.383	130011	587
-126772.383	484687	306	-126772.383	40327	971
-126772.383	508482	446	-126772.383	12477	155
-126772.383	648555	113	-126772.383	926797	406
-126772.383	502157	799	-126772.383	783165	170
-126772.383	423661	875	-126772.383	455617	242
-126772.383	195353	225	-126772.383	610181	711
-126772.383	93468	3	-126772.383	271809	846
-126772.383	650371	14	-126772.383	193569	440
-126772.383	972873	157	-126772.383	858804	534
-126772.383	742688	594	-126772.383	402699	604
-126772.383	89970	223	-126772.383	203508	806
-126772.383	194143	510	-126772.383	4091	548
-126772.383	884242	957	-126772.383	942358	644
-126772.383	343926	624	-127270.473	638977	643
-126772.383	903633	553	-127270.473	210870	383
-126772.383	891347	504	-127270.473	476498	179
-126772.383	131856	90	-127270.473	584397	428
-126772.383	40340	188	-127270.473	789528	837
-126772.383	22089	143	-127270.473	945065	255
-126772.383	326091	759	-127270.473	224950	455
-126772.383	210139	991	-127270.473	476295	969
-126772.383	917702	693	-127270.473	608496	4
-126772.383	322790	636	-127270.473	739214	807
-126772.383	549244	756	-127270.473	534483	290
-126772.383	838615	677	-127270.473	354624	448
-126772.383	966499	963	-127270.473	902278	21
-126772.383	617243	237	-127270.473	137377	397
-126772.383	628143	854	-127270.473	691041	590
-126772.383	36714	201	-127270.473	625191	350

```
    -127270.473  303834         798
    -127270.473  963967         941
    -127270.473  152496         123
    -127270.473  392751         480
    -127270.473  666720         671
    -127270.473  967237          48
    -127270.473  341519         653
    -127270.473  188498         258
    -127270.473  848590         694
    -127270.473  985387         381
    -127270.473  599729         658
    -127270.473  582296         452
    -127270.473  396614         918
    -127270.473  618000         190
    -127270.473  741888         138
    -127270.473  59674          240
    -127270.473  67009          564
    -127270.473  879211         453
    -127270.473  995249         525
    -127270.473  70118          104
    -127270.473  690596         858
    -127270.473  539751         459
    -127270.473  286735         175
    -127270.473  49910          829
    -127270.473  977800         853
    -127270.473  216565         474
    -127270.473  561664         392
    -127270.473  214681         824
    -127270.473  851945          18
    -127270.473  872743         374
    -127270.473  563584         657
    -127270.473  807534         850
    -127270.473  392418          28
    -127270.473  238906         430
    -127270.473  939870         655
    -127270.473  126371         526
    -127270.473  302046         863
    -127270.473  999211         628
    -127270.473  364676          27
    -127270.473  137888         901
    -127270.473  158612         581
    -127270.473  345726         461
    -127270.473  736574         414
    -127270.473  544048          87
    -127270.473  978061         488
    -127270.473  849670         347
    -127270.473  648035         836
    -127270.473  783102         433
    -127270.473  58507          793
    -127270.473  73576          213
    -127270.473  377504         294
    -127270.473  436892         565
    -127270.473  758647         951
    -127270.473  347222         533
    -127270.473  489927         520
    -127270.473  unperturbed      0
    -127270.473  529496         343
    -127270.473  154575         539
    -127270.473  732596         320
    -127270.473  871438         561
    -127270.473  685657          69
    -127270.473  11984          934
    -127270.473  3607           873
    -127270.473  77210          712
    -127270.473  863094         147
    -127270.473  791678         974
    -127270.473  283492         435
    -127270.473  496710         386
    -127270.473  265218         924
    -127270.473  402224          91
    -127270.473  845580         805
    -127270.473  484406         421
    -127270.473  643311         888
    -127270.473  259507          53
    -127270.473  688839         273
    -127270.473  915642          40
    -127270.473  207896          25
    -127270.473  207917         976
    -127270.473  964570         701
    -127270.473  153053         378
    -127270.473  311214          64
    -127270.473  531546         702
    -127270.473  220454         288
    -127270.473  161421         519
    -127270.473  248742         556

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       24

Loglikelihood

          H0 Value                    -126772.383
          H0 Scaling Correction Factor      1.2282
            for MLR

Information Criteria

          Akaike (AIC)                 253592.765
          Bayesian (BIC)               253790.354
          Sample-Size Adjusted BIC     253714.083
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

    Latent
   Classes

       1      3218.02371          0.11575
       2     18879.70470          0.67908
       3      5704.27159          0.20517

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

    Latent
   Classes

       1      3218.02371          0.11575
       2     18879.70470          0.67908
       3      5704.27159          0.20517

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions
```

```
  Latent
 Classes

    1          3167        0.11391
    2         18928        0.68081
    3          5707        0.20527

CLASSIFICATION QUALITY

    Entropy                         0.870

Average Latent Class Probabilities for Most Likely Latent
Class Membership (Row)
by Latent Class (Column)

        1      2      3

   1  0.908    0.000    0.092
   2  0.000    0.975    0.025
   3  0.060    0.074    0.866


Classification Probabilities for the Most Likely Latent Class
Membership (Column)
by Latent Class (Row)

        1      2      3

   1  0.894    0.000    0.106
   2  0.000    0.978    0.022
   3  0.051    0.082    0.867


Logits for the Classification Probabilities for the Most Likely
Latent Class Membership (Column)
by Latent Class (Row)

          1      2      3

   1     2.131  -11.006    0.000
   2   -10.015    3.778    0.000
   3    -2.834   -2.352    0.000


MODEL RESULTS

                                                    Two-Tailed
               Estimate       S.E.  Est./S.E.    P-Value

Latent Class 1

 SLPNSSNC WITH
   WORRYNC         -0.018      0.003     -7.135      0.000
   SOLC             0.118      0.004     30.181      0.000
   SLPDURC          0.030      0.004      7.611      0.000

 WORRYNC  WITH
   SOLC            -0.155      0.005    -30.483      0.000
   SLPDURC          -0.129      0.004    -29.670      0.000

 SOLC     WITH
   SLPDURC          0.225      0.006     35.821      0.000

 Means
   SLPNSSNC         1.037      0.014     72.590      0.000
   WORRYNC          -2.034      0.019   -106.696      0.000
   SOLC             1.096      0.033     33.163      0.000
   SLPDURC          0.922      0.026     35.171      0.000

 Variances
   SLPNSSNC         0.469      0.003    156.716      0.000
   WORRYNC          0.168      0.002     89.473      0.000
   SOLC             0.754      0.009     88.524      0.000
   SLPDURC          0.790      0.007    107.265      0.000

Latent Class 2

 SLPNSSNC WITH
   WORRYNC         -0.018      0.003     -7.135      0.000
   SOLC             0.118      0.004     30.181      0.000
   SLPDURC          0.030      0.004      7.611      0.000

 WORRYNC  WITH
   SOLC            -0.155      0.005    -30.483      0.000
   SLPDURC          -0.129      0.004    -29.670      0.000

 SOLC     WITH
   SLPDURC          0.225      0.006     35.821      0.000

 Means
   SLPNSSNC         0.907      0.005    175.707      0.000
   WORRYNC          0.581      0.004    138.481      0.000
   SOLC            -0.314      0.006    -48.571      0.000
   SLPDURC          -0.301      0.007    -43.319      0.000

 Variances
   SLPNSSNC         0.469      0.003    156.716      0.000
   WORRYNC          0.168      0.002     89.473      0.000
   SOLC             0.754      0.009     88.524      0.000
   SLPDURC          0.790      0.007    107.265      0.000

Latent Class 3

 SLPNSSNC WITH
   WORRYNC         -0.018      0.003     -7.135      0.000
   SOLC             0.118      0.004     30.181      0.000
   SLPDURC          0.030      0.004      7.611      0.000

 WORRYNC  WITH
   SOLC            -0.155      0.005    -30.483      0.000
   SLPDURC          -0.129      0.004    -29.670      0.000

 SOLC     WITH
   SLPDURC          0.225      0.006     35.821      0.000

 Means
   SLPNSSNC         0.959      0.011     88.715      0.000
   WORRYNC          -0.777      0.017    -45.568      0.000
   SOLC             0.444      0.017     26.141      0.000
   SLPDURC          0.491      0.017     29.459      0.000

 Variances
   SLPNSSNC         0.469      0.003    156.716      0.000
   WORRYNC          0.168      0.002     89.473      0.000
   SOLC             0.754      0.009     88.524      0.000
   SLPDURC          0.790      0.007    107.265      0.000

Categorical Latent Variables

 Means
   C#1             -0.572      0.038    -15.206      0.000
   C#2              1.197      0.019     62.898      0.000

QUALITY OF NUMERICAL RESULTS

     Condition Number for the Information Matrix
0.123E-02
       (ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT
```

```
    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250

    VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

      H0 Loglikelihood Value                -128233.817
      2 Times the Loglikelihood Difference     2922.868
      Difference in the Number of Parameters          5
      Mean                                       12.618
      Standard Deviation                         15.491
      P-Value                                    0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

      Value                                    2866.836
      P-Value                                    0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250

    Random Starts Specification for the k-1 Class Model for
Generated Data
      Number of initial stage random starts             2
      Number of final stage optimizations               1
    Random Starts Specification for the k Class Model for
Generated Data
      Number of initial stage random starts            50
      Number of final stage optimizations              10
    Number of bootstrap draws requested               250

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

      H0 Loglikelihood Value                -128233.817
      2 Times the Loglikelihood Difference     2922.868
      Difference in the Number of Parameters          5
      Approximate P-Value                        0.0000
      Successful Bootstrap Draws                    250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 174
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION


  Save file
    Step1_LPA3M3.dat

  Order and format of variables

    SLPNSSNC      F10.3
    WORRYNC       F10.3
    SOLC          F10.3
    SLPDURC       F10.3
    CPROB1        F10.3
    CPROB2        F10.3
    CPROB3        F10.3
    C             F10.3
    ID            I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol       *


DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  13:29:05
        Ending Time:  14:43:06
       Elapsed Time:  01:14:01

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Web: www.StatModel.com
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```

Parametrization Model 4 - Varying variances and equal covariances

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/11/2023   3:04 PM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M4: Varying means, varying
variances, and equal covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
```

```
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  %c#1%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

   %c#2%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

   %c#3%

    [slpnssNC worryNC solC slpDurC];

    slpnssNC worryNC solC slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M4.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

LPA 3 profile syntax: M4: Varying means, varying variances,
and equal covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                       27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                      MLR
```

```
Information matrix                                OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                       100
  Convergence criterion                        0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                       500
  Convergence criteria
    Loglikelihood change                       0.100D-06
    Relative loglikelihood change              0.100D-06
    Derivative                                 0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                          1
  M step convergence criterion                 0.100D-05
  Basis for M step termination                 ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                          1
  M step convergence criterion                 0.100D-05
  Basis for M step termination                 ITERATION
  Maximum value for logit thresholds                  15
  Minimum value for logit thresholds                 -15
  Minimum expected cell size for chi-square    0.100D-
01
Maximum number of iterations for H1                2000
Convergence criterion for H1                 0.100D-03
Optimization algorithm                             EMA
Random Starts Specifications
  Number of initial stage random starts              1000
  Number of final stage optimizations                 250
  Number of initial stage iterations                  500
  Initial stage convergence criterion          0.100D+01
  Random starts scale                          0.500D+01
  Random seed for generating random starts             0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC       WORRYNC        SOLC
SLPDURC
              ________       ________       ________       ________
 SLPNSSNC       1.000
 WORRYNC        1.000          1.000
 SOLC           0.976          0.976          0.976
 SLPDURC        0.963          0.963          0.940          0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
        Sample Size     Variance    Kurtosis    Maximum
Min/Max     20%/60%    40%/80%    Median

     SLPNSSNC           0.933       0.086       0.000   27.10%
0.000      1.000      1.000
           27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC            0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
           27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC               0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
           27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
     SLPDURC            0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
           26763.000       1.000      -0.470       2.445    3.44%
-0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

657 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -122273.536  464179          106
      -122273.536  791396          243
      -122273.536  208797          931
      -122273.536  985387          381
      -122273.536  507218          613
      -122273.536  408713          450
      -122273.536  961454          665
      -122273.536  856536          144
      -122273.536  520865          763
      -122273.536  640833          434
      -122273.536  210139          991
      -122273.536  996231          310
      -122273.536  622173          992
      -122273.536  970689          266
      -122273.536  838615          677
      -122273.536  783165          170
      -122273.536  49293           707
      -122273.536  86698           893
      -122273.536  436892          565
      -122273.536  724519          333
      -122273.536  512836          289
      -122273.536  152496          123
      -122273.536  987560          985
      -122273.536  669639          699
      -122273.536  538872          949
      -122273.536  46437           153
      -122273.536  995913          787
      -122273.536  662718          460
      -122273.536  903369          134
      -122273.536  153053          378
      -122273.536  535303          923
```

-122273.536	972873	157	-122273.536	499347	881
-122273.536	307843	664	-122273.536	81951	907
-122273.536	609185	181	-122273.536	168762	200
-122273.536	85114	385	-122273.536	741484	441
-122273.536	85734	411	-122273.536	130541	896
-122273.536	876943	650	-122273.536	432513	803
-122273.536	610181	711	-122273.536	954914	911
-122273.536	395754	388	-122273.536	212934	568
-122273.536	634782	979	-122273.536	421731	886
-122273.536	416463	467	-122273.536	605161	409
-122273.536	59963	670	-122273.536	505244	582
-122273.536	751153	110	-122273.536	579138	706
-122273.536	534193	689	-122273.536	966603	919
-122273.536	865906	641	-122273.536	751054	117
-122273.536	726744	939	-122273.536	364676	27
-122273.536	920593	611	-122273.536	597614	284
-122273.536	263268	165	-122273.536	484501	163
-122273.536	443917	60	-122273.536	121425	511
-122273.536	529455	268	-122273.536	323588	826
-122273.536	645664	39	-122273.536	637345	19
-122273.536	749453	33	-122273.536	978781	497
-122273.536	344422	296	-122273.536	942358	644
-122273.536	871722	355	-122273.536	327475	518
-122273.536	278692	342	-122273.536	643311	888
-122273.536	939870	655	-122273.536	425929	508
-122273.536	813779	92	-122273.536	762461	425
-122273.536	840031	276	-122273.536	366706	29
-122273.536	514326	325	-122273.536	177175	851
-122273.536	383979	603	-122273.536	3607	873
-122273.536	206099	363	-122273.536	475419	987
-122273.536	347515	24	-122273.536	782821	272
-122273.536	485635	876	-122273.536	210870	383
-122273.536	215353	164	-122273.536	561664	392
-122273.536	791285	416	-122273.536	384199	882
-122273.536	81233	825	-122273.536	319575	499
-122273.536	964570	701	-122273.536	805768	879
-122273.536	301717	823	-122273.536	50887	389
-122273.536	549244	756	-122273.536	327140	678
-122273.536	777492	972	-122273.536	137377	397
-122273.536	376411	473	-122273.536	580181	691
-122273.536	863691	481	-122273.536	569833	85
-122273.536	436806	883	-122273.536	349263	263
-122273.536	22362	365	-122273.536	636396	168
-122273.536	268217	83	-122273.536	292884	103
-122273.536	930872	277	-122273.536	789985	67
-122273.536	211281	292	-122273.536	227563	63
-122273.536	772131	407	-122273.536	489927	520
-122273.536	765586	709	-122273.536	965994	396
-122273.536	134830	780	-122273.536	241197	747
-122273.536	241299	912	-122273.536	629320	222
-122273.536	313306	612	-122273.536	473942	574
-122273.536	178181	753	-122273.536	710154	831
-122273.536	917702	693	-122273.536	214681	824
-122273.536	752769	253	-122273.536	326091	759
-122273.536	436460	89	-122273.536	741888	138
-122273.536	243346	930	-122273.536	580539	786
-122273.536	670281	721	-122273.536	387701	275
-122273.536	507154	387	-122273.536	648555	113
-122273.536	148918	682	-122273.536	569131	26
-122273.536	118421	139	-122273.536	508482	446
-122273.536	999211	628	-122273.536	833196	715
-122273.536	462953	7	-122273.536	699810	571
-122273.536	700270	855	-122273.536	804104	566
-122273.536	857799	315	-122273.536	765392	382
-122273.536	784664	75	-122273.536	140442	500
-122273.536	679832	302	-122273.536	465160	862
-122273.536	891531	206	-122273.536	238317	812
-122273.536	471398	74	-122273.536	937588	293
-122273.536	167409	772	-122273.536	22874	588
-122273.536	787985	482	-122273.536	458181	189

```
-122273.536  953843        651
-122273.536  650371         14
-122273.536  930323        267
-122273.536  495490        990
-122273.536  665121        417
-122273.536  638977        643
-122273.536  314034        513
-122273.536  793035        187
-122273.536  544077        809
-122273.536  618000        190
-122273.536  939021          8
-122273.536  529496        343
-122273.536  836515        341
-122273.536  829540        324
-122273.536   77571        980
-122273.536  804561         59
-122273.536  178475        231
-122273.536  118438        601
-122273.536  193042        316
-122273.536  682718        733
-122273.536  715255        523
-122273.536  604861        800
-122273.536  588923        606
-122273.536  673496        218
-122273.536  231400        738
-122273.536  197223        332
-122273.536  264521        929
-122273.536  798839        312
-122273.536  440395        917
-122273.536   66276        217
-122273.536  459221        652
-122273.536  312754        562
-122273.536  995249        525
-122273.536  855760        593
-122273.536   29591        633
-122273.536   92564        583
-122273.536  194143        510
-122273.536  791678        974
-122273.536   92091        649
-122273.536  303834        798
-122273.536   67009        564
-122273.536  268896        124
-122273.536  291149        536
-122273.536  872743        374
-122273.536  843555        952
-122273.536  875667        367
-122273.536  783110         72
-122273.536  359578        458
-122273.536  391179         78
-122273.536  888905        444
-122273.536  695155        150
-122273.536  794236        127
-122273.536  679615        942
-122273.536   17896        592
-122273.536  573367        986
-122273.536  694303        282
-122273.536  281462        285
-122273.536  474357        789
-122273.536  551639         55
-122273.536  645052        910
-122273.536  352277         42
-122273.536  685268        596
-122273.536  677720        681
-122273.536  153394        429
-122273.536  761302        744
-122273.536  848331        137
-122273.536  471040        403
-122273.536  746978        410
-122273.536  267983        228
-122273.536  486622        522
-122273.536  318177        748
-122273.536  213189        605
-122273.536   42523        730
-122273.536  848969        173
-122273.536  991329        182
-122273.536  123985        248
-122273.536  738393        619

2 perturbed starting value run(s) did not converge or were
rejected in the third stage.

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       32

Loglikelihood

          H0 Value                    -122273.536
          H0 Scaling Correction Factor      1.0161
            for MLR

Information Criteria

          Akaike (AIC)                244611.072
          Bayesian (BIC)              244874.523
          Sample-Size Adjusted BIC    244772.828
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

    Latent
   Classes

       1      9597.87522          0.34522
       2     10278.69205          0.36971
       3      7925.43273          0.28507

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

    Latent
   Classes

       1      9597.87522          0.34522
       2     10278.69205          0.36971
       3      7925.43273          0.28507

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions

    Latent
   Classes

       1          11537          0.41497
       2           8897          0.32001
```

```
      3          7368         0.26502


CLASSIFICATION QUALITY

     Entropy                         0.664

Average Latent Class Probabilities for Most Likely Latent
Class Membership (Row)
by Latent Class (Column)

        1      2      3

   1  0.799  0.198  0.003
   2  0.042  0.832  0.126
   3  0.000  0.081  0.919

Classification Probabilities for the Most Likely Latent Class
Membership (Column)
by Latent Class (Row)

        1      2      3

   1  0.961  0.039  0.000
   2  0.222  0.720  0.058
   3  0.005  0.141  0.854

Logits for the Classification Probabilities for the Most Likely
Latent Class Membership (Column)
by Latent Class (Row)

          1      2      3

   1    11.610  8.413  0.000
   2     1.341  2.519  0.000
   3    -5.235 -1.801  0.000

MODEL RESULTS

                                                    Two-Tailed
               Estimate       S.E.  Est./S.E.    P-Value

Latent Class 1

 SLPNSSNC WITH
   WORRYNC         -0.010      0.002     -4.859      0.000
   SOLC             0.077      0.003     23.898      0.000
   SLPDURC          0.008      0.004      2.133      0.033

 WORRYNC  WITH
   SOLC            -0.048      0.002    -22.837      0.000
   SLPDURC         -0.021      0.002    -11.280      0.000

 SOLC     WITH
   SLPDURC          0.045      0.003     13.331      0.000

 Means
   SLPNSSNC         0.879      0.009     99.742      0.000
   WORRYNC          0.805      0.007    113.188      0.000
   SOLC            -0.651      0.013    -50.397      0.000
   SLPDURC         -0.723      0.014    -50.364      0.000

 Variances
   SLPNSSNC         0.451      0.005     83.217      0.000
   WORRYNC          0.052      0.001     40.914      0.000
   SOLC             0.259      0.006     45.747      0.000
   SLPDURC          0.253      0.007     36.404      0.000

Latent Class 2

 SLPNSSNC WITH
   WORRYNC         -0.010      0.002     -4.859      0.000
   SOLC             0.077      0.003     23.898      0.000
   SLPDURC          0.008      0.004      2.133      0.033

 WORRYNC  WITH
   SOLC            -0.048      0.002    -22.837      0.000
   SLPDURC         -0.021      0.002    -11.280      0.000

 SOLC     WITH
   SLPDURC          0.045      0.003     13.331      0.000

 Means
   SLPNSSNC         0.899      0.009     99.109      0.000
   WORRYNC          0.178      0.030      5.939      0.000
   SOLC            -0.160      0.014    -11.305      0.000
   SLPDURC          0.059      0.021      2.866      0.004

 Variances
   SLPNSSNC         0.469      0.005     94.190      0.000
   WORRYNC          0.273      0.017     15.609      0.000
   SOLC             0.373      0.008     44.113      0.000
   SLPDURC          0.684      0.017     39.807      0.000

Latent Class 3

 SLPNSSNC WITH
   WORRYNC         -0.010      0.002     -4.859      0.000
   SOLC             0.077      0.003     23.898      0.000
   SLPDURC          0.008      0.004      2.133      0.033

 WORRYNC  WITH
   SOLC            -0.048      0.002    -22.837      0.000
   SLPDURC         -0.021      0.002    -11.280      0.000

 SOLC     WITH
   SLPDURC          0.045      0.003     13.331      0.000

 Means
   SLPNSSNC         1.042      0.010     99.351      0.000
   WORRYNC         -1.206      0.023    -53.488      0.000
   SOLC             1.012      0.031     33.071      0.000
   SLPDURC          0.812      0.019     42.391      0.000

 Variances
   SLPNSSNC         0.479      0.006     86.226      0.000
   WORRYNC          0.803      0.017     48.499      0.000
   SOLC             1.125      0.015     73.837      0.000
   SLPDURC          1.016      0.015     68.881      0.000

Categorical Latent Variables

 Means
   C#1              0.191      0.057      3.332      0.001
   C#2              0.260      0.034      7.668      0.000

QUALITY OF NUMERICAL RESULTS

     Condition Number for the Information Matrix
0.933E-04
       (ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

     Random Starts Specifications for the k-1 Class Analysis
Model
          Number of initial stage random starts          1000
          Number of final stage optimizations             250
```

```
    VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value                -124198.073
        2 Times the Loglikelihood Difference     3849.074
        Difference in the Number of Parameters          9
        Mean                                       27.434
        Standard Deviation                         33.435
        P-Value                                    0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                                  3807.728
        P-Value                                    0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
        Number of initial stage random starts        1000
        Number of final stage optimizations           250

    Random Starts Specification for the k-1 Class Model for
Generated Data
        Number of initial stage random starts           2
        Number of final stage optimizations             1
    Random Starts Specification for the k Class Model for
Generated Data
        Number of initial stage random starts          50
        Number of final stage optimizations            10
    Number of bootstrap draws requested               250

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value                -124198.073
        2 Times the Loglikelihood Difference     3849.074
        Difference in the Number of Parameters          9
        Approximate P-Value                        0.0000
        Successful Bootstrap Draws                    250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 199
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step1_LPA3M4.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    C              F10.3
    ID             I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  15:04:04
        Ending Time:  16:37:00
       Elapsed Time:  01:32:56

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Fax: (310) 391-8971
Web: www.StatModel.com
Support: Support@StatModel.com

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```

Parametrization Model 5 - Equal variances and varying covariances

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/12/2023  10:37 AM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
```

```
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#3%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

  *** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 3 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                        MLR
```

```
Information matrix                                OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                       100
  Convergence criterion                        0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                       500
  Convergence criteria
    Loglikelihood change                       0.100D-06
    Relative loglikelihood change              0.100D-06
    Derivative                                 0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                          1
  M step convergence criterion               0.100D-05
  Basis for M step termination                ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                          1
  M step convergence criterion               0.100D-05
  Basis for M step termination                ITERATION
  Maximum value for logit thresholds                  15
  Minimum value for logit thresholds                 -15
  Minimum expected cell size for chi-square  0.100D-
01
Maximum number of iterations for H1                2000
Convergence criterion for H1                 0.100D-03
Optimization algorithm                             EMA
Random Starts Specifications
  Number of initial stage random starts              1000
  Number of final stage optimizations                 250
  Number of initial stage iterations                  500
  Initial stage convergence criterion          0.100D+01
  Random starts scale                          0.500D+01
  Random seed for generating random starts            0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC       WORRYNC        SOLC
SLPDURC
              ________       ________       ________       ________
 SLPNSSNC       1.000
 WORRYNC        1.000          1.000
 SOLC           0.976          0.976          0.976
 SLPDURC        0.963          0.963          0.940          0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

     Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
       Sample Size     Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median

     SLPNSSNC           0.933       0.086       0.000   27.10%
0.000      1.000      1.000
           27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC            0.000      -1.036      -2.825    1.71%
-0.928     0.020      0.495
           27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC               0.000       0.967      -1.054   31.63%   -
1.054     -0.072     -0.072
           27123.000       1.000       0.467       2.875    2.77%
-0.072     0.910
     SLPDURC            0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
           26763.000       1.000      -0.470       2.445    3.44%
-0.292     0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

380 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -125994.415  691234         250
      -125994.415  246794         801
      -125994.415  917702         693
      -125994.415  970689         266
      -125994.415  244349         736
      -125994.415  478421         311
      -125994.415  278661         674
      -125994.415  930872         277
      -125994.415  618000         190
      -125994.415  49910          829
      -125994.415  314034         513
      -125994.415  91231          727
      -125994.415  851945         18
      -125994.415  926797         406
      -125994.415  791285         416
      -125994.415  544077         809
      -125994.415  268896         124
      -125994.415  27071          15
      -125994.415  177175         851
      -125994.415  485256         371
      -125994.415  495490         990
      -125994.415  349263         263
      -125994.415  3607           873
      -125994.415  168762         200
      -125994.415  109357         765
      -125994.415  544009         842
      -125994.415  180889         920
      -125994.415  636396         168
      -125994.415  772131         407
      -125994.415  383979         603
      -125994.415  373702         669
      -125994.415  551340         766
      -125994.415  303834         798
      -125994.415  294811         637
      -125994.415  383902         673
      -125994.415  462228         298
      -125994.415  215353         164
```

-125994.415	200041	810	-125994.415	679832	302
-125994.415	130541	896	-125994.415	809240	543
-125994.415	616917	261	-125994.415	172913	557
-125994.415	126371	526	-125994.415	830392	35
-125994.415	849670	347	-125994.415	97300	640
-125994.415	237332	661	-125994.415	597614	284
-125994.415	114433	708	-125994.415	723035	538
-125994.415	903633	553	-125994.415	682718	733
-125994.415	202790	198	-125994.415	81951	907
-125994.415	833196	715	-125994.415	879338	309
-125994.415	137377	397	-125994.415	966499	963
-125994.415	399508	415	-125994.415	669634	335
-125994.415	862607	468	-125994.415	863691	481
-125994.415	544048	87	-125994.415	717754	180
-125994.415	414284	158	-125994.415	654136	167
-125994.415	490123	995	-125994.415	193569	440
-125994.415	937885	426	-125994.415	298201	903
-125994.415	105435	265	-125994.415	347515	24
-125994.415	46502	714	-125994.415	545108	667
-125994.415	992389	77	-125994.415	980970	894
-125994.415	308582	752	-125994.415	695155	150
-125994.415	373815	618	-125994.415	766903	505
-125994.415	856536	144	-125994.415	922596	456
-125994.415	679448	937	-125994.415	51375	148
-125994.415	505879	424	-125994.415	158612	581
-125994.415	224950	455	-125994.415	364676	27
-125994.415	260953	589	-125994.415	566739	575
-125994.415	339073	841	-125994.415	442072	625
-125994.415	575700	100	-125994.415	322790	636
-125994.415	549244	756	-125994.415	852283	616
-125994.415	391949	295	-125994.415	677062	680
-125994.415	701525	239	-125994.415	696830	668
-125994.415	576596	99	-125994.415	792389	746
-125994.415	794236	127	-125994.415	535303	923
-125994.415	484687	306	-125994.415	17896	592
-125994.415	972430	491	-125994.415	857122	889
-125994.415	971693	470	-125994.415	735928	916
-125994.415	453915	975	-125994.415	961454	665
-125994.415	710154	831	-125994.415	881886	608
-125994.415	850112	922	-125994.415	370481	742
-125994.415	443442	380	-125994.415	195353	225
-125994.415	444228	860	-125994.415	405371	569
-125994.415	179022	687	-125994.415	415931	10
-125994.415	50887	389	-125994.415	148918	682
-125994.415	70118	104	-125994.415	119513	821
-125994.415	204959	695	-125994.415	303634	169
-125994.415	570908	98	-125994.415	465160	862
-125994.415	907810	795	-125994.415	414828	322
-125994.415	705224	953	-125994.415	333082	578
-125994.415	963967	941	-125994.415	928624	981
-125994.415	923437	398	-125994.415	548245	818
-125994.415	138695	783	-125994.415	599729	658
-125994.415	124999	96	-125994.415	207896	25
-125994.415	634782	979	-125994.415	485483	498
-125994.415	563584	657	-125994.415	640833	434
-125994.415	742609	531	-125994.415	762461	425
-125994.415	836515	341	-125994.415	136842	58
-125994.415	848356	602	-125994.415	311214	64
-125994.415	298553	773	-125994.415	72662	729
-125994.415	745972	521	-125994.415	297518	166
-125994.415	965639	463	-125994.415	61587	400
-125994.415	264081	186	-125994.415	569833	85
-125994.415	213532	503	-125994.415	662718	460
-125994.415	284384	600	-125994.415	484501	163
-125994.415	673496	218	-125994.415	432513	803
-125994.415	440368	797	-125994.415	843555	952
-125994.415	628143	854	-125994.415	unperturbed	0
-125994.415	847088	750	-125994.415	626208	698
-125994.415	954914	911	-125994.415	599136	811
-125994.415	271809	846	-125994.415	721392	768

```
      -125994.415  153394         429
      -125994.415  178031         720
      -125994.415  728038         177
      -125994.415  484406         421
      -125994.415  224151         973
      -125994.415  589483         950
      -125994.415  782821         272
      -125994.415  352277         42
      -125994.415  238906         430
      -125994.415  848331         137
      -125994.415  855760         593
      -125994.415  891347         504
      -125994.415  468036         131
      -125994.415  437181         135
      -125994.415  552272         654
      -125994.415  520177         262
      -125994.415  268217         83
      -125994.415  580405         286
      -125994.415  87586          871
      -125994.415  638977         643
      -125994.415  55115          408
      -125994.415  248742         556
      -125994.415  838615         677
      -125994.415  751153         110
      -125994.415  384199         882
      -125994.415  178181         753
      -125994.415  22362          365
      -125994.415  792993         859
      -125994.415  778953         635
      -125994.415  286735         175
      -125994.415  617243         237
      -125994.415  605161         409
      -125994.415  846194         93
      -125994.415  357866         968
      -125994.415  726035         191
      -125994.415  483369         270
      -125994.415  399380         436
      -125994.415  434915         552
      -125994.415  782200         84
      -125994.415  538872         949
      -125994.415  871851         257
      -125994.415  814975         129
      -125994.415  157351         579
      -125994.415  81233          825
      -125994.415  526324         178
      -125994.415  366706         29
      -125994.415  211281         292
      -125994.415  848969         173
      -125994.415  937588         293
      -125994.415  788796         145
      -125994.415  574942         558
      -125994.415  35191          703
      -125994.415  195873         6
      -125994.415  118438         601
      -125994.415  576726         280
      -125994.415  345974         622
      -125994.415  467339         66
      -125994.415  566687         597
      -125994.415  407108         366
      -125994.415  791678         974
      -125994.415  608460         244
      -125994.415  860029         760
      -125994.415  14262          781
      -125994.415  50983          834
      -125994.415  592219         119
      -125994.415  891531         206
      -125994.415  265218         924
      -125994.415  370957         554
      -125994.415  264935         281
      -125994.415  127362         757
      -125994.415  621542         375
      -125994.415  326091         759
      -125994.415  691041         590

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       36

Loglikelihood

          H0 Value                    -125994.415
          H0 Scaling Correction Factor      1.3296
            for MLR

Information Criteria

          Akaike (AIC)                 252060.830
          Bayesian (BIC)               252357.213
          Sample-Size Adjusted BIC     252242.806
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

   Latent
  Classes

     1      5737.65936          0.20638
     2     18891.89637          0.67952
     3      3172.44427          0.11411

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

   Latent
  Classes

     1      5737.65936          0.20638
     2     18891.89637          0.67952
     3      3172.44427          0.11411

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions

   Latent
  Classes

     1          6141          0.22088
     2         18658          0.67110
     3          3003          0.10801

CLASSIFICATION QUALITY

    Entropy                         0.854
```

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2	3
1	0.822	0.116	0.063
2	0.026	0.974	0.000
3	0.071	0.001	0.928

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	0.879	0.083	0.037
2	0.038	0.962	0.000
3	0.122	0.000	0.878

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	3.164	0.809	0.000
2	5.521	8.764	0.000
3	-1.978	-10.865	0.000

MODEL RESULTS

	Estimate	S.E.	Two-Tailed Est./S.E.	P-Value
Latent Class 1				
SLPNSSNC WITH				
WORRYNC	0.015	0.006	2.633	0.008
SOLC	0.106	0.008	14.059	0.000
SLPDURC	0.019	0.009	2.191	0.028
WORRYNC WITH				
SOLC	0.088	0.017	5.295	0.000
SLPDURC	-0.048	0.010	-4.925	0.000
SOLC WITH				
SLPDURC	0.051	0.013	3.916	0.000
Means				
SLPNSSNC	0.931	0.012	78.488	0.000
WORRYNC	-0.775	0.027	-28.725	0.000
SOLC	0.353	0.018	19.838	0.000
SLPDURC	0.391	0.023	17.144	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Latent Class 2				
SLPNSSNC WITH				
WORRYNC	-0.030	0.004	-8.232	0.000
SOLC	0.118	0.005	22.000	0.000
SLPDURC	0.037	0.006	6.407	0.000
WORRYNC WITH				
SOLC	-0.192	0.008	-25.245	0.000
SLPDURC	-0.187	0.010	-18.506	0.000
SOLC WITH				
SLPDURC	0.290	0.011	27.050	0.000
Means				
SLPNSSNC	0.904	0.005	171.611	0.000
WORRYNC	0.570	0.006	101.171	0.000
SOLC	-0.364	0.009	-40.558	0.000
SLPDURC	-0.300	0.007	-40.716	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Latent Class 3				
SLPNSSNC WITH				
WORRYNC	0.009	0.006	1.533	0.125
SOLC	0.046	0.011	4.198	0.000
SLPDURC	0.013	0.012	1.153	0.249
WORRYNC WITH				
SOLC	-0.006	0.006	-0.926	0.354
SLPDURC	-0.070	0.009	-7.748	0.000
SOLC WITH				
SLPDURC	0.050	0.015	3.310	0.001
Means				
SLPNSSNC	1.112	0.015	76.093	0.000
WORRYNC	-1.994	0.027	-74.945	0.000
SOLC	1.572	0.036	43.121	0.000
SLPDURC	1.108	0.027	40.596	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Categorical Latent Variables				
Means				
C#1	0.593	0.046	12.891	0.000
C#2	1.784	0.040	44.896	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.903E-04
(ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

Random Starts Specifications for the k-1 Class Analysis Model

Number of initial stage random starts	1000
Number of final stage optimizations	250

VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO TEST FOR 2 (H0) VERSUS 3 CLASSES

H0 Loglikelihood Value	-127763.908
2 Times the Loglikelihood Difference	3538.985
Difference in the Number of Parameters	11
Mean	61.969
Standard Deviation	60.777

```
        P-Value                          0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                         3507.822
        P-Value                          0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250

    Random Starts Specification for the k-1 Class Model for
Generated Data
      Number of initial stage random starts             2
      Number of final stage optimizations               1
    Random Starts Specification for the k Class Model for
Generated Data
      Number of initial stage random starts            50
      Number of final stage optimizations              10
    Number of bootstrap draws requested               250

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value                -127763.908
        2 Times the Loglikelihood Difference     3538.985
        Difference in the Number of Parameters         11
        Approximate P-Value                       0.0000
        Successful Bootstrap Draws                   250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 230
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step1_LPA3M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    C              F10.3
    ID             I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.


     Beginning Time:  10:37:29
        Ending Time:  12:21:31
       Elapsed Time:  01:44:02

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Web: www.StatModel.com
Support: Support@StatModel.com

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```

Parametrization Model 6 - Varying variances and varying covariances

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/11/2023   5:32 PM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M6: Varying means, varying
variances and varying covariances
  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
```

```
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     slpnssNC worryNC solC slpDurC;
     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

     [slpnssNC worryNC solC slpDurC];

     slpnssNC worryNC solC slpDurC;
     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#3%

     [slpnssNC worryNC solC slpDurC];

     slpnssNC worryNC solC slpDurC;
     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 3 profile syntax: M6: Varying means, varying variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                   100
```

```
  Convergence criterion                    0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                500
  Convergence criteria
    Loglikelihood change                   0.100D-06
    Relative loglikelihood change          0.100D-06
    Derivative                             0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                   1
  M step convergence criterion           0.100D-05
  Basis for M step termination           ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                   1
  M step convergence criterion           0.100D-05
  Basis for M step termination           ITERATION
  Maximum value for logit thresholds            15
  Minimum value for logit thresholds           -15
  Minimum expected cell size for chi-square  0.100D-
01
Maximum number of iterations for H1           2000
Convergence criterion for H1              0.100D-03
Optimization algorithm                        EMA
Random Starts Specifications
  Number of initial stage random starts         1000
  Number of final stage optimizations            250
  Number of initial stage iterations             500
  Initial stage convergence criterion       0.100D+01
  Random starts scale                       0.500D+01
  Random seed for generating random starts          0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

    PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC       WORRYNC        SOLC
SLPDURC
              ________       ________       ________       ________
 SLPNSSNC       1.000
 WORRYNC        1.000          1.000
 SOLC           0.976          0.976          0.976
 SLPDURC        0.963          0.963          0.940          0.963

UNIVARIATE SAMPLE STATISTICS

    UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
        Sample Size      Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median
     SLPNSSNC              0.933       0.086       0.000   27.10%
0.000      1.000      1.000
            27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC               0.000      -1.036      -2.825    1.71%
-0.928     0.020      0.495
            27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC                  0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
            27123.000       1.000       0.467       2.875    2.77%
-0.072     0.910
     SLPDURC               0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
            26763.000       1.000      -0.470       2.445    3.44%
-0.292     0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

683 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -121739.377  459221         652
      -121739.377  278692         342
      -121739.377  508482         446
      -121739.377  55115          408
      -121739.377  39810          966
      -121739.377  465160         862
      -121739.377  673496         218
      -121739.377  415931         10
      -121739.377  765586         709
      -121739.377  479273         156
      -121739.377  985387         381
      -121739.377  96941          890
      -121739.377  589483         950
      -121739.377  76337          76
      -121739.377  140442         500
      -121739.377  704798         530
      -121739.377  702492         718
      -121739.377  179022         687
      -121739.377  654136         167
      -121739.377  51375          148
      -121739.377  392751         480
      -121739.377  315029         471
      -121739.377  1548           384
      -121739.377  712702         684
      -121739.377  200041         810
      -121739.377  77210          712
      -121739.377  805768         879
      -121739.377  296162         856
      -121739.377  57226          208
      -121739.377  35191          703
      -121739.377  425929         508
      -121739.377  992389         77
      -121739.377  318230         46
      -121739.377  471040         403
      -121739.377  638977         643
      -121739.377  215353         164
      -121739.377  751153         110
      -121739.377  964570         701
```

-121739.377	723035	538	-121739.377	798821	423
-121739.377	863094	147	-121739.377	507218	613
-121739.377	685268	596	-121739.377	903633	553
-121739.377	467561	819	-121739.377	424223	900
-121739.377	471398	74	-121739.377	81117	305
-121739.377	646573	741	-121739.377	484116	915
-121739.377	996231	310	-121739.377	86698	893
-121739.377	679832	302	-121739.377	518828	432
-121739.377	251680	794	-121739.377	70118	104
-121739.377	404042	675	-121739.377	461866	722
-121739.377	546943	865	-121739.377	850840	232
-121739.377	903420	5	-121739.377	25127	107
-121739.377	148918	682	-121739.377	131856	90
-121739.377	77571	980	-121739.377	794236	127
-121739.377	238906	430	-121739.377	402699	604
-121739.377	930872	277	-121739.377	464179	106
-121739.377	278661	674	-121739.377	178031	720
-121739.377	156536	245	-121739.377	61587	400
-121739.377	758647	951	-121739.377	797594	234
-121739.377	268217	83	-121739.377	404426	344
-121739.377	549244	756	-121739.377	545108	667
-121739.377	495366	964	-121739.377	562716	300
-121739.377	329127	185	-121739.377	391368	802
-121739.377	645052	910	-121739.377	153053	378
-121739.377	84013	598	-121739.377	995249	525
-121739.377	853781	716	-121739.377	926797	406
-121739.377	584397	428	-121739.377	458181	189
-121739.377	685657	69	-121739.377	714455	476
-121739.377	775881	778	-121739.377	829540	324
-121739.377	178475	231	-121739.377	216565	474
-121739.377	622173	992	-121739.377	462953	7
-121739.377	548245	818	-121739.377	49293	707
-121739.377	36714	201	-121739.377	478341	731
-121739.377	455617	242	-121739.377	914505	838
-121739.377	94573	983	-121739.377	266038	672
-121739.377	926762	704	-121739.377	730868	977
-121739.377	792993	859	-121739.377	478421	311
-121739.377	291149	536	-121739.377	677062	680
-121739.377	421731	886	-121739.377	544048	87
-121739.377	732596	320	-121739.377	130011	587
-121739.377	124999	96	-121739.377	690596	858
-121739.377	85734	411	-121739.377	327140	678
-121739.377	484501	163	-121739.377	484687	306
-121739.377	696830	668	-121739.377	875667	367
-121739.377	399671	13	-121739.377	42523	730
-121739.377	741888	138	-121739.377	275475	413
-121739.377	3307	735	-121739.377	168888	817
-121739.377	436806	883	-121739.377	92564	583
-121739.377	283492	435	-121739.377	534193	689
-121739.377	210139	991	-121739.377	444228	860
-121739.377	399848	220	-121739.377	344422	296
-121739.377	848163	47	-121739.377	972873	157
-121739.377	297518	166	-121739.377	264081	186
-121739.377	856536	144	-121739.377	496710	386
-121739.377	587946	120	-121739.377	535804	111
-121739.377	741484	441	-121739.377	137377	397
-121739.377	967237	48	-121739.377	626891	32
-121739.377	836515	341	-121739.377	373815	618
-121739.377	317640	437	-121739.377	534864	307
-121739.377	965639	463	-121739.377	738393	619
-121739.377	520177	262	-121739.377	376411	473
-121739.377	922596	456	-121739.377	213532	503
-121739.377	860772	174	-121739.377	153394	429
-121739.377	193042	316	-121739.377	155749	960
-121739.377	114433	708	-121739.377	136842	58
-121739.377	292884	103	-121739.377	442072	625
-121739.377	898745	466	-121739.377	724519	333
-121739.377	373505	88	-121739.377	997222	229
-121739.377	150531	154	-121739.377	650371	14
-121739.377	760599	832	-121739.377	696773	80

```
-121739.377  863691       481
-121739.377  287107       864
-121739.377  349360       464
-121739.377  66276        217
-121739.377  121425       511
-121739.377  761302       744
-121739.377  804660       260
-121739.377  950604       172
-121739.377  824956       607
-121739.377  94610        884
-121739.377  848969       173
-121739.377  350608       334
-121739.377  813779       92
-121739.377  483369       270
-121739.377  655497       376
-121739.377  814975       129
-121739.377  659832       754
-121739.377  891531       206
-121739.377  97300        640
-121739.377  312754       562
-121739.377  125727       899
-121739.377  802644       874
-121739.377  565819       65
-121739.377  501995       791
-121739.377  830392       35
-121739.377  931874       141
-121739.377  566739       575
-121739.377  576596       99
-121739.377  202790       198
-121739.377  317868       740
-121739.377  566687       597
-121739.377  535063       329
-121739.377  576783       866
-121739.377  782179       835
-121739.377  749453       33
-121739.377  840031       276
-121739.377  636396       168
-121739.377  354559       73
-121739.377  197223       332
-121739.377  303834       798
-121739.377  746978       410
-121739.377  194143       510
-121739.377  227563       63
-121739.377  39756        857
-121739.377  107446       12
-121739.377  570681       777
-121739.377  298553       773
-121739.377  403801       762
-121739.377  872743       374
-121739.377  851945       18
-121739.377  539751       459
-121739.377  468036       131
-121739.377  358488       264
-121739.377  991329       182
-121739.377  263221       447
-121739.377  379823       905
-121739.377  783165       170
-121739.377  422103       62
-121739.377  241299       912
-121739.377  536551       696
-121739.377  354395       486
-121739.377  631413       439
-121739.377  865906       641
-121739.377  383902       673
-121739.377  39136        226
-121739.377  244349       736
-121739.377  967902       52
-121739.377  347222       533
-121739.377  476295       969
-121739.377  534483       290
-121739.377  769907       457
-121739.377  954914       911

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       44

Loglikelihood

          H0 Value                    -121739.377
          H0 Scaling Correction Factor      1.0687
            for MLR

Information Criteria

          Akaike (AIC)                243566.755
          Bayesian (BIC)              243929.001
          Sample-Size Adjusted BIC    243789.170
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

   Latent
  Classes

     1      9661.77408          0.34752
     2     10017.29963          0.36031
     3      8122.92629          0.29217

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

   Latent
  Classes

     1      9661.77408          0.34752
     2     10017.29963          0.36031
     3      8122.92629          0.29217

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions

   Latent
  Classes

     1          11507          0.41389
     2           9377          0.33728
     3           6918          0.24883

CLASSIFICATION QUALITY

     Entropy                         0.651

Average Latent Class Probabilities for Most Likely Latent
Class Membership (Row)
```

by Latent Class (Column)

	1	2	3
1	0.812	0.021	0.167
2	0.010	0.908	0.082
3	0.032	0.182	0.786

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	0.968	0.010	0.023
2	0.024	0.850	0.126
3	0.236	0.095	0.669

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	3.753	-0.856	0.000
2	-1.653	1.909	0.000
3	-1.043	-1.954	0.000

MODEL RESULTS

	Estimate	S.E.	Two-Tailed Est./S.E.	P-Value
Latent Class 1				
SLPNSSNC WITH				
WORRYNC	-0.006	0.002	-2.581	0.010
SOLC	0.043	0.006	7.601	0.000
SLPDURC	-0.008	0.005	-1.854	0.064
WORRYNC WITH				
SOLC	-0.047	0.005	-10.231	0.000
SLPDURC	-0.016	0.002	-6.617	0.000
SOLC WITH				
SLPDURC	0.046	0.006	7.140	0.000
Means				
SLPNSSNC	0.855	0.011	75.023	0.000
WORRYNC	0.810	0.012	66.773	0.000
SOLC	-0.636	0.030	-21.139	0.000
SLPDURC	-0.744	0.016	-47.613	0.000
Variances				
SLPNSSNC	0.434	0.006	76.347	0.000
WORRYNC	0.051	0.002	21.918	0.000
SOLC	0.259	0.015	17.583	0.000
SLPDURC	0.236	0.005	50.873	0.000
Latent Class 2				
SLPNSSNC WITH				
WORRYNC	-0.013	0.009	-1.441	0.150
SOLC	0.157	0.010	15.261	0.000
SLPDURC	0.032	0.010	3.297	0.001
WORRYNC WITH				
SOLC	-0.245	0.012	-20.354	0.000
SLPDURC	-0.336	0.014	-23.324	0.000
SOLC WITH				
SLPDURC	0.221	0.018	12.366	0.000
Means				
SLPNSSNC	1.018	0.010	103.100	0.000
WORRYNC	-0.992	0.021	-47.491	0.000
SOLC	0.821	0.019	42.708	0.000
SLPDURC	0.643	0.015	43.949	0.000
Variances				
SLPNSSNC	0.488	0.005	95.892	0.000
WORRYNC	0.897	0.019	46.060	0.000
SOLC	1.167	0.016	72.683	0.000
SLPDURC	1.068	0.013	82.995	0.000
Latent Class 3				
SLPNSSNC WITH				
WORRYNC	0.010	0.006	1.651	0.099
SOLC	0.083	0.006	13.391	0.000
SLPDURC	0.002	0.010	0.176	0.860
WORRYNC WITH				
SOLC	-0.046	0.011	-4.199	0.000
SLPDURC	0.053	0.020	2.679	0.007
SOLC WITH				
SLPDURC	0.028	0.016	1.716	0.086
Means				
SLPNSSNC	0.921	0.015	61.046	0.000
WORRYNC	0.259	0.034	7.565	0.000
SOLC	-0.239	0.030	-7.868	0.000
SLPDURC	0.103	0.036	2.858	0.004
Variances				
SLPNSSNC	0.477	0.006	83.275	0.000
WORRYNC	0.193	0.013	14.489	0.000
SOLC	0.319	0.011	29.756	0.000
SLPDURC	0.648	0.016	40.366	0.000
Categorical Latent Variables				
Means				
C#1	0.173	0.110	1.581	0.114
C#2	0.210	0.067	3.148	0.002

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix
0.661E-05
(ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

Random Starts Specifications for the k-1 Class Analysis Model

Number of initial stage random starts	1000
Number of final stage optimizations	250

VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO TEST FOR 2 (H0) VERSUS 3 CLASSES

H0 Loglikelihood Value	-123451.625
2 Times the Loglikelihood Difference	3424.495
Difference in the Number of Parameters	15
Mean	54.570
Standard Deviation	60.046
P-Value	0.0000

```
    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                          3402.329
        P-Value                           0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          1000
      Number of final stage optimizations             250

    Random Starts Specification for the k-1 Class Model for
Generated Data
      Number of initial stage random starts             2
      Number of final stage optimizations               1
    Random Starts Specification for the k Class Model for
Generated Data
      Number of initial stage random starts            50
      Number of final stage optimizations              10
    Number of bootstrap draws requested               250

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value               -123451.625
        2 Times the Loglikelihood Difference    3424.495
        Difference in the Number of Parameters        15
        Approximate P-Value                       0.0000
        Successful Bootstrap Draws                 250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 224
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step1_LPA3M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    C              F10.3
    ID             I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  17:32:22
        Ending Time:  22:33:21
       Elapsed Time:  05:00:59

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```

Step 2: Profile Selection

Series of LPA models were conducted to assess the number of profiles based on participants' SOL, sleep duration, daytime sleepiness and worry disrupting sleep. Each model was compared against the previous model (k-1 classes) in an iterative process to decide on the number of latent profiles (one to six) to be included. Two main indices were used, in line with existing LPA guidelines, to determine the appropriate number of profiles and whether additional profiles in the LPA model improved the model fit: Bayesian Information Criterion (BIC), and the Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test (VLMR-LRT). A lower BIC value represented the preferred model. The VLMR-LRT test assists in determining when additional profiles are not an improvement and compares significance between an estimated model versus a model with one fewer profile. A non-significant VLMR-LRT

test suggests that the more parsimonious model (fewer profiles) is the better fitting and representative model. Other model fit indicators including entropy index and smallest class size were also examined as diagnostic criteria. An entropy value of > .80 is desired, but values between .60 and .80 were treated as acceptable. Smallest profile size was examined and n < 30 was considered not sufficient to support generalizability.

Two-profile model

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/13/2023   2:09 PM

INPUT INSTRUCTIONS

  TITLE: LPA 2 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (2);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

    %c#2%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;


  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step2_LPA2M5.dat;
```

```
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 2 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable           ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                   100
  Convergence criterion                          0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                   500
  Convergence criteria
    Loglikelihood change                         0.100D-06
    Relative loglikelihood change                0.100D-06
    Derivative                                   0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
  Maximum value for logit thresholds             15
  Minimum value for logit thresholds             -15
  Minimum expected cell size for chi-square      0.100D-
01
Maximum number of iterations for H1              2000
Convergence criterion for H1                     0.100D-03
Optimization algorithm                           EMA
Random Starts Specifications
  Number of initial stage random starts          1000
  Number of final stage optimizations            250
  Number of initial stage iterations             500
  Initial stage convergence criterion            0.100D+01
  Random starts scale                            0.500D+01
  Random seed for generating random starts       0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
             SLPNSSNC      WORRYNC       SOLC
SLPDURC
           ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
          Sample Size     Variance    Kurtosis    Maximum
Min/Max     20%/60%    40%/80%    Median

     SLPNSSNC           0.933       0.086       0.000   27.10%
0.000      1.000      1.000
           27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC            0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
           27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC               0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
           27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
     SLPDURC            0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
           26763.000       1.000      -0.470       2.445    3.44%
-0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

137 perturbed starting value run(s) did not converge in the
initial stage
optimizations.
```

Final stage loglikelihood values at local maxima, seeds, and initial stage start numbers:

-127763.908	512836	289
-127763.908	327140	678
-127763.908	341519	653
-127763.908	185071	370
-127763.908	265218	924
-127763.908	96617	955
-127763.908	847088	750
-127763.908	117391	710
-127763.908	580181	691
-127763.908	345726	461
-127763.908	995913	787
-127763.908	845580	805
-127763.908	728038	177
-127763.908	86651	993
-127763.908	458181	189
-127763.908	792993	859
-127763.908	715255	523
-127763.908	17359	227
-127763.908	574942	558
-127763.908	488125	368
-127763.908	599729	658
-127763.908	399848	220
-127763.908	779820	877
-127763.908	327927	908
-127763.908	496344	808
-127763.908	369602	146
-127763.908	985387	381
-127763.908	50887	389
-127763.908	546943	865
-127763.908	692169	308
-127763.908	370481	742
-127763.908	573096	20
-127763.908	629320	222
-127763.908	742609	531
-127763.908	881886	608
-127763.908	902278	21
-127763.908	150531	154
-127763.908	939870	655
-127763.908	403801	762
-127763.908	152496	123
-127763.908	440395	917
-127763.908	903633	553
-127763.908	596257	405
-127763.908	136842	58
-127763.908	77571	980
-127763.908	863094	147
-127763.908	833196	715
-127763.908	344422	296
-127763.908	529496	343
-127763.908	232559	136
-127763.908	137305	379
-127763.908	848890	95
-127763.908	723775	97
-127763.908	549244	756
-127763.908	379729	512
-127763.908	533738	11
-127763.908	699834	723
-127763.908	628143	854
-127763.908	738393	619
-127763.908	231281	542
-127763.908	645664	39
-127763.908	508445	946
-127763.908	298553	773
-127763.908	416463	467
-127763.908	690596	858
-127763.908	160326	546
-127763.908	928287	197
-127763.908	448829	938
-127763.908	392418	28
-127763.908	485483	498
-127763.908	425149	878
-127763.908	726744	939
-127763.908	314084	81
-127763.908	791285	416
-127763.908	193042	316
-127763.908	520177	262
-127763.908	816765	959
-127763.908	781489	627
-127763.908	673496	218
-127763.908	566687	597
-127763.908	297518	166
-127763.908	424223	900
-127763.908	857799	315
-127763.908	88437	761
-127763.908	252346	528
-127763.908	192071	142
-127763.908	682718	733
-127763.908	536551	696
-127763.908	217744	326
-127763.908	688839	273
-127763.908	227563	63
-127763.908	395754	388
-127763.908	519357	559
-127763.908	926762	704
-127763.908	225995	847
-127763.908	798839	312
-127763.908	206099	363
-127763.908	81117	305
-127763.908	579138	706
-127763.908	937588	293
-127763.908	686384	690
-127763.908	126371	526
-127763.908	794236	127
-127763.908	350608	334
-127763.908	484116	915
-127763.908	857122	889
-127763.908	576726	280
-127763.908	17896	592
-127763.908	518828	432
-127763.908	121425	511
-127763.908	170954	86
-127763.908	520865	763
-127763.908	677062	680
-127763.908	626087	314
-127763.908	131063	843
-127763.908	307843	664
-127763.908	405079	68
-127763.908	850840	232
-127763.908	132336	362
-127763.908	393232	152
-127763.908	836066	372
-127763.908	402699	604
-127763.908	241197	747
-127763.908	963053	43
-127763.908	105435	265
-127763.908	856612	700
-127763.908	669634	335
-127763.908	485256	371
-127763.908	552272	654
-127763.908	294669	501
-127763.908	85462	51
-127763.908	462953	7
-127763.908	668003	647
-127763.908	259507	53
-127763.908	715561	125
-127763.908	804660	260
-127763.908	967237	48

```
      -127763.908  625191         350
      -127763.908  954914         911
      -127763.908  288738         940
      -127763.908  802682         419
      -127763.908  622173         992
      -127763.908  85114          385
      -127763.908  30098          209
      -127763.908  231400         738
      -127763.908  96941          890
      -127763.908  407108         366
      -127763.908  972430         491
      -127763.908  760878         249
      -127763.908  838615         677
      -127763.908  872743         374
      -127763.908  742688         594
      -127763.908  882750         646
      -127763.908  425982         485
      -127763.908  400319         887
      -127763.908  915107         54
      -127763.908  761302         744
      -127763.908  695453         902
      -127763.908  622290         880
      -127763.908  134830         780
      -127763.908  22874          588
      -127763.908  995249         525
      -127763.908  992389         77
      -127763.908  650371         14
      -127763.908  685657         69
      -127763.908  399508         415
      -127763.908  907810         795
      -127763.908  264081         186
      -127763.908  298201         903
      -127763.908  751153         110
      -127763.908  347222         533
      -127763.908  527050         948
      -127763.908  535063         329
      -127763.908  735928         916
      -127763.908  399380         436
      -127763.908  246575         291
      -127763.908  147440         514
      -127763.908  739214         807
      -127763.908  197223         332
      -127763.908  871438         561
      -127763.908  659832         754
      -127763.908  63231          935
      -127763.908  414828         322
      -127763.908  153053         378
      -127763.908  345974         622
      -127763.908  942358         644
      -127763.908  848331         137
      -127763.908  481835         57
      -127763.908  459221         652
      -127763.908  210139         991
      -127763.908  848969         173
      -127763.908  213532         503
      -127763.908  939021         8
      -127763.908  326091         759
      -127763.908  829540         324
      -127763.908  442072         625
      -127763.908  860772         174
      -127763.908  505244         582
      -127763.908  580539         786
      -127763.908  97300          640
      -127763.908  790452         303
      -127763.908  830292         527
      -127763.908  852283         616
      -127763.908  421731         886
      -127763.908  897782         545
      -127763.908  595153         230
      -127763.908  422103         62
      -127763.908  712702         684
      -127763.908  217130         443
      -127763.908  462662         872
      -127763.908  466971         109
      -127763.908  836515         341
      -127763.908  360419         356
      -127763.908  163110         584
      -127763.908  287107         864
      -127763.908  264521         929
      -127763.908  354395         486
      -127763.908  220492         743
      -127763.908  11397          944
      -127763.908  180889         920
      -127763.908  238906         430
      -127763.908  358488         264
      -127763.908  648035         836
      -127763.908  563584         657
      -127763.908  618760         489
      -127763.908  758647         951
      -127763.908  862607         468
      -127763.908  314757         345
      -127763.908  193847         354
      -127763.908  914505         838
      -127763.908  327475         518
      -127763.908  264901         634
      -127763.908  373815         618
      -127763.908  957392         79
      -127763.908  521575         313
      -127763.908  971853         402
      -127763.908  548245         818
      -127763.908  474357         789
      -127763.908  268896         124
      -127763.908  856536         144
      -127763.908  963967         941
      -127763.908  42523          730
      -127763.908  411615         171
      -127763.908  804561         59
      -127763.908  372176         23
      -127763.908  425929         508
      -127763.908  376411         473
      -127763.908  569131         26
      -127763.908  748692         204
      -127763.908  562716         300

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       25

Loglikelihood

          H0 Value                    -127763.908
          H0 Scaling Correction Factor      1.1651
            for MLR

Information Criteria

          Akaike (AIC)                 255577.815
          Bayesian (BIC)               255783.637
          Sample-Size Adjusted BIC     255704.188
            (n* = (n + 2) / 24)
```

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON THE ESTIMATED MODEL

Latent Classes		
1	6498.62894	0.23375
2	21303.37106	0.76625

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

Latent Classes		
1	6498.62894	0.23375
2	21303.37106	0.76625

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS MEMBERSHIP

Class Counts and Proportions

Latent Classes		
1	6336	0.22790
2	21466	0.77210

CLASSIFICATION QUALITY

Entropy	0.878

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2
1	0.940	0.060
2	0.025	0.975

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2
1	0.917	0.083
2	0.018	0.982

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2
1	2.399	0.000
2	-4.013	0.000

MODEL RESULTS

	Estimate	S.E.	Two-Tailed Est./S.E.	P-Value
Latent Class 1				
SLPNSSNC WITH				
WORRYNC	-0.024	0.005	-5.002	0.000
SOLC	0.113	0.007	16.449	0.000
SLPDURC	0.042	0.008	5.542	0.000
WORRYNC WITH				
SOLC	-0.175	0.007	-25.662	0.000
SLPDURC	-0.139	0.007	-20.205	0.000
SOLC WITH				
SLPDURC	0.169	0.010	17.225	0.000
Means				
SLPNSSNC	0.989	0.010	100.111	0.000
WORRYNC	-1.520	0.012	-122.617	0.000
SOLC	0.816	0.018	45.861	0.000
SLPDURC	0.743	0.016	46.134	0.000
Variances				
SLPNSSNC	0.471	0.003	155.408	0.000
WORRYNC	0.305	0.003	99.427	0.000
SOLC	0.820	0.009	92.599	0.000
SLPDURC	0.859	0.008	105.661	0.000
Latent Class 2				
SLPNSSNC WITH				
WORRYNC	-0.039	0.003	-11.465	0.000
SOLC	0.136	0.005	26.590	0.000
SLPDURC	0.042	0.005	8.336	0.000
WORRYNC WITH				
SOLC	-0.283	0.005	-52.165	0.000
SLPDURC	-0.252	0.005	-46.861	0.000
SOLC WITH				
SLPDURC	0.357	0.008	42.220	0.000
Means				
SLPNSSNC	0.916	0.005	189.197	0.000
WORRYNC	0.464	0.005	102.502	0.000
SOLC	-0.243	0.006	-39.804	0.000
SLPDURC	-0.222	0.007	-33.454	0.000
Variances				
SLPNSSNC	0.471	0.003	155.408	0.000
WORRYNC	0.305	0.003	99.427	0.000
SOLC	0.820	0.009	92.599	0.000
SLPDURC	0.859	0.008	105.661	0.000
Categorical Latent Variables				
Means				
C#1	-1.187	0.018	-67.816	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix
0.563E-02
(ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

Random Starts Specifications for the k-1 Class Analysis Model

```
        Number of initial stage random starts                1000
        Number of final stage optimizations                   250

    VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 1 (H0) VERSUS 2 CLASSES

        H0 Loglikelihood Value                       -132903.306
        2 Times the Loglikelihood Difference          10278.796
        Difference in the Number of Parameters               11
        Mean                                          17.872
        Standard Deviation                            10.707
        P-Value                                       0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                                         10188.283
        P-Value                                       0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
        Number of initial stage random starts                1000
        Number of final stage optimizations                   250

    Random Starts Specification for the k-1 Class Model for
Generated Data
        Number of initial stage random starts                   2
        Number of final stage optimizations                     1
    Random Starts Specification for the k Class Model for
Generated Data
        Number of initial stage random starts                  50
        Number of final stage optimizations                    10
    Number of bootstrap draws requested                       250


    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 1 (H0) VERSUS 2 CLASSES

        H0 Loglikelihood Value                       -132903.306
        2 Times the Loglikelihood Difference          10278.796
        Difference in the Number of Parameters               11
        Approximate P-Value                           0.0000
        Successful Bootstrap Draws                       249

    WARNING:  OF THE 249 BOOTSTRAP DRAWS, 225
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 2-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

    WARNING:  1 OUT OF 250 BOOTSTRAP DRAWS DID
NOT CONVERGE.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step2_LPA2M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    C              F10.3
    ID             I6

  Save file format
    7F10.3 I6

  Save file record length    10000

  Save missing symbol       *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  14:09:11
        Ending Time:  15:19:05
       Elapsed Time:  01:09:54

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Fax: (310) 391-8971
Web: www.StatModel.com
Support: Support@StatModel.com

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```

Three-profile model

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/20/2023   9:24 AM

INPUT INSTRUCTIONS

  TITLE: LPA 3 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
```

```
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (3);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

    [slpnssNC worryNC solC slpDurC];

    !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

    [slpnssNC worryNC solC slpDurC];

    !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#3%

    [slpnssNC worryNC solC slpDurC];

    !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step1_LPA3M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 3 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C
```

```
Variables with special functions

  ID variable           ID

Estimator                                       MLR
Information matrix                              OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                  100
  Convergence criterion                         0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                  500
  Convergence criteria
    Loglikelihood change                        0.100D-06
    Relative loglikelihood change               0.100D-06
    Derivative                                  0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                   1
  M step convergence criterion                  0.100D-05
  Basis for M step termination                  ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                   1
  M step convergence criterion                  0.100D-05
  Basis for M step termination                  ITERATION
  Maximum value for logit thresholds            15
  Minimum value for logit thresholds            -15
  Minimum expected cell size for chi-square     0.100D-
01
Maximum number of iterations for H1             2000
Convergence criterion for H1                    0.100D-03
Optimization algorithm                          EMA
Random Starts Specifications
  Number of initial stage random starts         1000
  Number of final stage optimizations           250
  Number of initial stage iterations            500
  Initial stage convergence criterion           0.100D+01
  Random starts scale                           0.500D+01
  Random seed for generating random starts      0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns            4
     Number of y missing data patterns          4
     Number of u missing data patterns          0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC      WORRYNC       SOLC
SLPDURC
              ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
           Sample Size    Variance   Kurtosis    Maximum
Min/Max     20%/60%    40%/80%    Median

     SLPNSSNC              0.933       0.086       0.000   27.10%
0.000      1.000      1.000
            27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC               0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
            27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC                  0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
            27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
     SLPDURC               0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
            26763.000       1.000      -0.470       2.445    3.44%
-0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

380 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

        -125994.415  691234         250
        -125994.415  246794         801
        -125994.415  917702         693
        -125994.415  970689         266
        -125994.415  244349         736
        -125994.415  478421         311
        -125994.415  278661         674
        -125994.415  930872         277
        -125994.415  618000         190
        -125994.415  49910          829
        -125994.415  314034         513
        -125994.415  91231          727
        -125994.415  851945         18
        -125994.415  926797         406
        -125994.415  791285         416
        -125994.415  544077         809
        -125994.415  268896         124
        -125994.415  27071          15
        -125994.415  177175         851
        -125994.415  485256         371
        -125994.415  495490         990
        -125994.415  349263         263
        -125994.415  3607           873
        -125994.415  168762         200
        -125994.415  109357         765
        -125994.415  544009         842
        -125994.415  180889         920
        -125994.415  636396         168
        -125994.415  772131         407
        -125994.415  383979         603
        -125994.415  373702         669
```

-125994.415	551340	766	-125994.415	673496	218
-125994.415	303834	798	-125994.415	440368	797
-125994.415	294811	637	-125994.415	628143	854
-125994.415	383902	673	-125994.415	847088	750
-125994.415	462228	298	-125994.415	954914	911
-125994.415	215353	164	-125994.415	271809	846
-125994.415	200041	810	-125994.415	679832	302
-125994.415	130541	896	-125994.415	809240	543
-125994.415	616917	261	-125994.415	172913	557
-125994.415	126371	526	-125994.415	830392	35
-125994.415	849670	347	-125994.415	97300	640
-125994.415	237332	661	-125994.415	597614	284
-125994.415	114433	708	-125994.415	723035	538
-125994.415	903633	553	-125994.415	682718	733
-125994.415	202790	198	-125994.415	81951	907
-125994.415	833196	715	-125994.415	879338	309
-125994.415	137377	397	-125994.415	966499	963
-125994.415	399508	415	-125994.415	669634	335
-125994.415	862607	468	-125994.415	863691	481
-125994.415	544048	87	-125994.415	717754	180
-125994.415	414284	158	-125994.415	654136	167
-125994.415	490123	995	-125994.415	193569	440
-125994.415	937885	426	-125994.415	298201	903
-125994.415	105435	265	-125994.415	347515	24
-125994.415	46502	714	-125994.415	545108	667
-125994.415	992389	77	-125994.415	980970	894
-125994.415	308582	752	-125994.415	695155	150
-125994.415	373815	618	-125994.415	766903	505
-125994.415	856536	144	-125994.415	922596	456
-125994.415	679448	937	-125994.415	51375	148
-125994.415	505879	424	-125994.415	158612	581
-125994.415	224950	455	-125994.415	364676	27
-125994.415	260953	589	-125994.415	566739	575
-125994.415	339073	841	-125994.415	442072	625
-125994.415	575700	100	-125994.415	322790	636
-125994.415	549244	756	-125994.415	852283	616
-125994.415	391949	295	-125994.415	677062	680
-125994.415	701525	239	-125994.415	696830	668
-125994.415	576596	99	-125994.415	792389	746
-125994.415	794236	127	-125994.415	535303	923
-125994.415	484687	306	-125994.415	17896	592
-125994.415	972430	491	-125994.415	857122	889
-125994.415	971693	470	-125994.415	735928	916
-125994.415	453915	975	-125994.415	961454	665
-125994.415	710154	831	-125994.415	881886	608
-125994.415	850112	922	-125994.415	370481	742
-125994.415	443442	380	-125994.415	195353	225
-125994.415	444228	860	-125994.415	405371	569
-125994.415	179022	687	-125994.415	415931	10
-125994.415	50887	389	-125994.415	148918	682
-125994.415	70118	104	-125994.415	119513	821
-125994.415	204959	695	-125994.415	303634	169
-125994.415	570908	98	-125994.415	465160	862
-125994.415	907810	795	-125994.415	414828	322
-125994.415	705224	953	-125994.415	333082	578
-125994.415	963967	941	-125994.415	928624	981
-125994.415	923437	398	-125994.415	548245	818
-125994.415	138695	783	-125994.415	599729	658
-125994.415	124999	96	-125994.415	207896	25
-125994.415	634782	979	-125994.415	485483	498
-125994.415	563584	657	-125994.415	640833	434
-125994.415	742609	531	-125994.415	762461	425
-125994.415	836515	341	-125994.415	136842	58
-125994.415	848356	602	-125994.415	311214	64
-125994.415	298553	773	-125994.415	72662	729
-125994.415	745972	521	-125994.415	297518	166
-125994.415	965639	463	-125994.415	61587	400
-125994.415	264081	186	-125994.415	569833	85
-125994.415	213532	503	-125994.415	662718	460
-125994.415	284384	600	-125994.415	484501	163

```
-125994.415  432513         803
-125994.415  843555         952
-125994.415  unperturbed     0
-125994.415  626208         698
-125994.415  599136         811
-125994.415  721392         768
-125994.415  153394         429
-125994.415  178031         720
-125994.415  728038         177
-125994.415  484406         421
-125994.415  224151         973
-125994.415  589483         950
-125994.415  782821         272
-125994.415  352277         42
-125994.415  238906         430
-125994.415  848331         137
-125994.415  855760         593
-125994.415  891347         504
-125994.415  468036         131
-125994.415  437181         135
-125994.415  552272         654
-125994.415  520177         262
-125994.415  268217         83
-125994.415  580405         286
-125994.415  87586          871
-125994.415  638977         643
-125994.415  55115          408
-125994.415  248742         556
-125994.415  838615         677
-125994.415  751153         110
-125994.415  384199         882
-125994.415  178181         753
-125994.415  22362          365
-125994.415  792993         859
-125994.415  778953         635
-125994.415  286735         175
-125994.415  617243         237
-125994.415  605161         409
-125994.415  846194         93
-125994.415  357866         968
-125994.415  726035         191
-125994.415  483369         270
-125994.415  399380         436
-125994.415  434915         552
-125994.415  782200         84
-125994.415  538872         949
-125994.415  871851         257
-125994.415  814975         129
-125994.415  157351         579
-125994.415  81233          825
-125994.415  526324         178
-125994.415  366706         29
-125994.415  211281         292
-125994.415  848969         173
-125994.415  937588         293
-125994.415  788796         145
-125994.415  574942         558
-125994.415  35191          703
-125994.415  195873         6
-125994.415  118438         601
-125994.415  576726         280
-125994.415  345974         622
-125994.415  467339         66
-125994.415  566687         597
-125994.415  407108         366
-125994.415  791678         974
-125994.415  608460         244
-125994.415  860029         760
-125994.415  14262          781
-125994.415  50983          834
-125994.415  592219         119
-125994.415  891531         206
-125994.415  265218         924
-125994.415  370957         554
-125994.415  264935         281
-125994.415  127362         757
-125994.415  621542         375
-125994.415  326091         759
-125994.415  691041         590

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       36

Loglikelihood

        H0 Value                       -125994.415
        H0 Scaling Correction Factor      1.3296
          for MLR

Information Criteria

        Akaike (AIC)                   252060.830
        Bayesian (BIC)                 252357.213
        Sample-Size Adjusted BIC       252242.806
          (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

    Latent
   Classes

       1      5737.65936          0.20638
       2     18891.89637          0.67952
       3      3172.44427          0.11411

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

    Latent
   Classes

       1      5737.65936          0.20638
       2     18891.89637          0.67952
       3      3172.44427          0.11411

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions

    Latent
   Classes

       1           6141          0.22088
       2          18658          0.67110
       3           3003          0.10801
```

CLASSIFICATION QUALITY

Entropy 0.854

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2	3
1	0.822	0.116	0.063
2	0.026	0.974	0.000
3	0.071	0.001	0.928

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	0.879	0.083	0.037
2	0.038	0.962	0.000
3	0.122	0.000	0.878

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3
1	3.164	0.809	0.000
2	5.521	8.764	0.000
3	-1.978	-10.865	0.000

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Latent Class 1				
SLPNSSNC WITH				
WORRYNC	0.015	0.006	2.633	0.008
SOLC	0.106	0.008	14.059	0.000
SLPDURC	0.019	0.009	2.191	0.028
WORRYNC WITH				
SOLC	0.088	0.017	5.295	0.000
SLPDURC	-0.048	0.010	-4.925	0.000
SOLC WITH				
SLPDURC	0.051	0.013	3.916	0.000
Means				
SLPNSSNC	0.931	0.012	78.488	0.000
WORRYNC	-0.775	0.027	-28.725	0.000
SOLC	0.353	0.018	19.838	0.000
SLPDURC	0.391	0.023	17.144	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Latent Class 2				
SLPNSSNC WITH				
WORRYNC	-0.030	0.004	-8.232	0.000
SOLC	0.118	0.005	22.000	0.000
SLPDURC	0.037	0.006	6.407	0.000
WORRYNC WITH				
SOLC	-0.192	0.008	-25.245	0.000
SLPDURC	-0.187	0.010	-18.506	0.000
SOLC WITH				
SLPDURC	0.290	0.011	27.050	0.000
Means				
SLPNSSNC	0.904	0.005	171.611	0.000
WORRYNC	0.570	0.006	101.171	0.000
SOLC	-0.364	0.009	-40.558	0.000
SLPDURC	-0.300	0.007	-40.716	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Latent Class 3				
SLPNSSNC WITH				
WORRYNC	0.009	0.006	1.533	0.125
SOLC	0.046	0.011	4.198	0.000
SLPDURC	0.013	0.012	1.153	0.249
WORRYNC WITH				
SOLC	-0.006	0.006	-0.926	0.354
SLPDURC	-0.070	0.009	-7.748	0.000
SOLC WITH				
SLPDURC	0.050	0.015	3.310	0.001
Means				
SLPNSSNC	1.112	0.015	76.093	0.000
WORRYNC	-1.994	0.027	-74.945	0.000
SOLC	1.572	0.036	43.121	0.000
SLPDURC	1.108	0.027	40.596	0.000
Variances				
SLPNSSNC	0.468	0.003	152.809	0.000
WORRYNC	0.210	0.009	23.619	0.000
SOLC	0.626	0.013	47.707	0.000
SLPDURC	0.798	0.010	76.790	0.000
Categorical Latent Variables				
Means				
C#1	0.593	0.046	12.891	0.000
C#2	1.784	0.040	44.896	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.903E-04
(ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

Random Starts Specifications for the k-1 Class Analysis Model
Number of initial stage random starts 1000
Number of final stage optimizations 250

VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO TEST FOR 2 (H0) VERSUS 3 CLASSES

```
        H0 Loglikelihood Value                -127763.908
        2 Times the Loglikelihood Difference     3538.985
        Difference in the Number of Parameters         11
        Mean                                       61.969
        Standard Deviation                         60.777
        P-Value                                    0.0000

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

        Value                                  3507.822
        P-Value                                    0.0000

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
        Number of initial stage random starts       1000
        Number of final stage optimizations          250

    Random Starts Specification for the k-1 Class Model for
Generated Data
        Number of initial stage random starts          2
        Number of final stage optimizations            1
    Random Starts Specification for the k Class Model for
Generated Data
        Number of initial stage random starts         50
        Number of final stage optimizations           10
    Number of bootstrap draws requested              250

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 2 (H0) VERSUS 3 CLASSES

        H0 Loglikelihood Value                -127763.908
        2 Times the Loglikelihood Difference     3538.985
        Difference in the Number of Parameters         11
        Approximate P-Value                        0.0000
        Successful Bootstrap Draws                    250

    WARNING:  OF THE 250 BOOTSTRAP DRAWS, 230
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
    OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 3-CLASS
MODEL.
    THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
    INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step1_LPA3M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    C              F10.3
    ID             I6

  Save file format
    8F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  09:24:01
        Ending Time:  11:07:04
       Elapsed Time:  01:43:03

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```

Four-profile model

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/25/2023   1:46 PM

INPUT INSTRUCTIONS

  TITLE: LPA 4 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (4);
```

```
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(999999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 1000 250;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 2 1 50 10;
  LRTBOOTSTRAP = 250;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  %c#3%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#4%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step2_LPA4M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 4 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C
```

```
Variables with special functions

  ID variable           ID

Estimator                                       MLR
Information matrix                              OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                  100
  Convergence criterion                         0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                  500
  Convergence criteria
    Loglikelihood change                        0.100D-06
    Relative loglikelihood change               0.100D-06
    Derivative                                  0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                   1
  M step convergence criterion                  0.100D-05
  Basis for M step termination                  ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                   1
  M step convergence criterion                  0.100D-05
  Basis for M step termination                  ITERATION
  Maximum value for logit thresholds            15
  Minimum value for logit thresholds            -15
  Minimum expected cell size for chi-square     0.100D-
01
Maximum number of iterations for H1             2000
Convergence criterion for H1                    0.100D-03
Optimization algorithm                          EMA
Random Starts Specifications
  Number of initial stage random starts         1000
  Number of final stage optimizations           250
  Number of initial stage iterations            500
  Initial stage convergence criterion           0.100D+01
  Random starts scale                           0.500D+01
  Random seed for generating random starts      0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns            4
     Number of y missing data patterns          4
     Number of u missing data patterns          0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC      WORRYNC       SOLC
SLPDURC
              ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
           Sample Size     Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median

     SLPNSSNC             0.933       0.086       0.000   27.10%
0.000      1.000      1.000
           27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC              0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
           27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC                 0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
           27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
     SLPDURC              0.000       0.568      -1.205   25.70%
-1.205     -0.292     -0.292
           26763.000       1.000      -0.470       2.445    3.44%
-0.292      0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

696 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -124709.900  182524        373
      -124709.900  42523         730
      -124709.900  512836        289
      -124709.900  373702        669
      -124709.900  497522        502
      -124709.900  299977        956
      -124709.900  298201        903
      -124709.900  944186        541
      -124709.900  319144        176
      -124709.900  402224        91
      -124709.900  73576         213
      -124709.900  863691        481
      -124709.900  246261        38
      -124709.900  790452        303
      -124709.900  252346        528
      -124709.900  407108        366
      -124709.900  461687        833
      -124709.900  798821        423
      -124709.900  997222        229
      -124709.900  782179        835
      -124709.900  848969        173
      -124709.900  739214        807
      -124709.900  317868        740
      -124709.900  415931        10
      -124709.900  190339        102
      -124709.900  781489        627
      -124709.900  875667        367
      -124709.900  685657        69
```

-124709.900	383986	159	-124709.900	484406	421
-124709.900	566739	575	-124709.900	97300	640
-124709.900	579995	183	-124709.900	966499	963
-124709.900	443917	60	-124709.900	584397	428
-124709.900	266038	672	-124709.900	746978	410
-124709.900	301428	885	-124709.900	259507	53
-124709.900	384199	882	-124709.900	876056	1000
-124709.900	50887	389	-124709.900	965994	396
-124709.900	724519	333	-124709.900	173191	422
-124709.900	853195	431	-124709.900	406935	958
-124709.900	165853	105	-124709.900	266340	683
-124709.900	464179	106	-124709.900	604861	800
-124709.900	699554	427	-124709.900	471398	74
-124709.900	207896	25	-124709.900	644297	340
-124709.900	637095	207	-124709.900	804104	566
-124709.900	679448	937	-124709.900	726035	191
-124709.900	87586	871	-124709.900	907810	795
-124709.900	529455	268	-124709.900	195873	6
-124709.900	779820	877	-124709.900	694303	282
-124709.900	769907	457	-124709.900	284384	600
-124709.900	535303	923	-124709.900	544048	87
-124709.900	574412	679	-124709.900	153394	429
-124709.900	3307	735	-124709.900	563584	657
-124709.900	276102	599	-124709.900	847088	750
-124709.900	486622	522	-124709.900	954354	840
-124709.900	349360	464	-124709.900	688839	273
-124709.900	603842	61	-124709.900	950604	172
-124709.900	575700	100	-124709.900	436806	883
-124709.900	232559	136	-124709.900	576726	280
-124709.900	481835	57	-124709.900	539389	544
-124709.900	544009	842	-124709.900	673496	218
-124709.900	928624	981	-124709.900	552272	654
-124709.900	547702	767	-124709.900	561664	392
-124709.900	59963	670	-124709.900	66276	217
-124709.900	246794	801	-124709.900	371246	101
-124709.900	291112	645	-124709.900	647617	725
-124709.900	728038	177	-124709.900	177936	726
-124709.900	357866	968	-124709.900	549244	756
-124709.900	197223	332	-124709.900	227563	63
-124709.900	741888	138	-124709.900	392418	28
-124709.900	192191	629	-124709.900	49293	707
-124709.900	780698	337	-124709.900	392407	221
-124709.900	891347	504	-124709.900	94610	884
-124709.900	349263	263	-124709.900	931558	898
-124709.900	576783	866	-124709.900	178181	753
-124709.900	81951	907	-124709.900	501995	791
-124709.900	879338	309	-124709.900	158612	581
-124709.900	499150	216	-124709.900	833196	715
-124709.900	204959	695	-124709.900	995648	936
-124709.900	3607	873	-124709.900	858804	534
-124709.900	607072	717	-124709.900	364676	27
-124709.900	321390	133	-124709.900	602032	648
-124709.900	84013	598	-124709.900	850112	922
-124709.900	814975	129	-124709.900	869564	869
-124709.900	640833	434	-124709.900	948615	140
-124709.900	375590	438	-124709.900	76974	16
-124709.900	872743	374	-124709.900	427006	839
-124709.900	140442	500	-124709.900	508482	446
-124709.900	315029	471	-124709.900	263268	165
-124709.900	467339	66	-124709.900	46437	153
-124709.900	59674	240	-124709.900	758647	951
-124709.900	473343	844	-124709.900	414284	158
-124709.900	526324	178	-124709.900	118421	139
-124709.900	424223	900	-124709.900	995875	547
-124709.900	11397	944	-124709.900	188498	258
-124709.900	404042	675	-124709.900	545108	667
-124709.900	391949	295	-124709.900	645052	910
-124709.900	937588	293	-124709.900	862607	468
-124709.900	648035	836	-124709.900	840031	276
-124709.900	496703	758	-124709.900	569833	85

```
-124709.900  863094        147
-124709.900  506886        576
-124709.900  638611        524
-124709.900  271809        846
-124709.900  244349        736
-124709.900  597614        284
-124709.900  579138        706
-124709.900  455617        242
-124709.900  852283        616
-124709.900  193042        316
-124709.900  370466         41
-124709.900   23012        352
-124709.900  407168         44
-124709.900  178031        720
-124709.900  789985         67
-124709.900  509733        130
-124709.900  339073        841
-124709.900  804660        260
-124709.900  947714        573
-124709.900  692169        308
-124709.900  922596        456
-124709.900   53621        483
-124709.900  505244        582
-124709.900  915107         54
-124709.900  638577        769
-124709.900  715255        523
-124709.900  475419        987
-124709.900  125727        899
-124709.900  954914        911
-124709.900  442072        625
-124709.900  851945         18
-124709.900  978781        497
-124709.900  432148         30
-124709.900  297518        166
-124709.900  177175        851
-124709.900  376411        473
-124709.900  650371         14
-124709.900  215353        164
-124709.900  930872        277
-124709.900  478421        311
-124709.900  766903        505
-124709.900  301180        236
-124709.900  848163         47
-124709.900  326091        759
-124709.900  700846        867
-124709.900   39136        226
-124709.900  306768        978
-124709.900  466971        109
-124709.900  292884        103
-124709.900  926283        269
-124709.900  629320        222
-124709.900  871438        561
-124709.900  574942        558
-124709.900  311214         64
-124709.900  440395        917
-124709.900  843555        952
-124709.900  626891         32
-124709.900  403801        762
-124709.900  677720        681
-124709.900  717754        180
-124709.900  655497        376
-124709.900  387701        275
-124709.900  391368        802
-124709.900  798839        312
-124709.900  996231        310
-124709.900  636396        168
-124709.900  193847        354
-124709.900  393232        152
-124709.900   61587        400
-124709.900   98068        998
-124709.900  399848        220
-124709.900  961454        665
-124709.900  314757        345
-124709.900  618760        489
-124709.900  760878        249
-124709.900  172913        557
-124709.900  345726        461
-124709.900  638977        643
-124709.900  856536        144
-124709.900  860772        174
-124709.900  781190        219
-124709.900  967902         52

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       47

Loglikelihood

          H0 Value                    -124709.900
          H0 Scaling Correction Factor      1.1775
            for MLR

Information Criteria

          Akaike (AIC)                 249513.801
          Bayesian (BIC)               249900.745
          Sample-Size Adjusted BIC     249751.380
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

    Latent
   Classes

      1      4456.90910          0.16031
      2      2657.87540          0.09560
      3      1910.44951          0.06872
      4     18776.76599          0.67537


FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

    Latent
   Classes

      1      4456.90910          0.16031
      2      2657.87540          0.09560
      3      1910.44951          0.06872
      4     18776.76599          0.67537

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions
```

```
  Latent
 Classes

    1          4162        0.14970
    2          2502        0.08999
    3          1451        0.05219
    4         19687        0.70811

CLASSIFICATION QUALITY

    Entropy                         0.855

Average Latent Class Probabilities for Most Likely Latent
Class Membership (Row)
by Latent Class (Column)

        1      2      3      4

   1  0.862  0.055  0.011  0.072
   2  0.071  0.912  0.016  0.001
   3  0.023  0.097  0.797  0.083
   4  0.034  0.000  0.034  0.932

Classification Probabilities for the Most Likely Latent Class
Membership (Column)
by Latent Class (Row)

        1      2      3      4

   1  0.805  0.040  0.007  0.148
   2  0.087  0.859  0.053  0.001
   3  0.025  0.021  0.605  0.350
   4  0.016  0.000  0.006  0.978

Logits for the Classification Probabilities for the Most Likely
Latent Class Membership (Column)
by Latent Class (Row)

         1      2      3      4

   1   1.691  -1.315  -3.000  0.000
   2   4.229   6.523   3.740  0.000
   3  -2.648  -2.830   0.548  0.000
   4  -4.119  -8.984  -5.021  0.000

MODEL RESULTS

                                                Two-Tailed
                Estimate       S.E.  Est./S.E.    P-Value

Latent Class 1

 SLPNSSNC WITH
   WORRYNC        -0.002      0.006     -0.280      0.780
   SOLC            0.081      0.007     10.882      0.000
   SLPDURC         0.030      0.009      3.201      0.001

 WORRYNC  WITH
   SOLC           -0.007      0.005     -1.446      0.148
   SLPDURC        -0.076      0.009     -8.952      0.000

 SOLC     WITH
   SLPDURC         0.063      0.010      6.438      0.000

 Means
   SLPNSSNC        0.872      0.014     64.494      0.000
   WORRYNC        -1.107      0.021    -52.403      0.000
   SOLC            0.029      0.017      1.766      0.077
   SLPDURC         0.455      0.022     21.037      0.000

 Variances
   SLPNSSNC        0.460      0.003    150.050      0.000
   WORRYNC         0.245      0.004     55.585      0.000
   SOLC            0.405      0.006     72.186      0.000
   SLPDURC         0.797      0.008     98.354      0.000

Latent Class 2

 SLPNSSNC WITH
   WORRYNC         0.003      0.007      0.398      0.691
   SOLC            0.007      0.011      0.686      0.492
   SLPDURC         0.012      0.012      0.968      0.333

 WORRYNC  WITH
   SOLC           -0.042      0.008     -5.604      0.000
   SLPDURC        -0.089      0.010     -8.966      0.000

 SOLC     WITH
   SLPDURC         0.029      0.013      2.263      0.024

 Means
   SLPNSSNC        1.148      0.015     75.059      0.000
   WORRYNC        -1.962      0.022    -88.615      0.000
   SOLC            1.874      0.022     85.791      0.000
   SLPDURC         1.137      0.025     46.280      0.000

 Variances
   SLPNSSNC        0.460      0.003    150.050      0.000
   WORRYNC         0.245      0.004     55.585      0.000
   SOLC            0.405      0.006     72.186      0.000
   SLPDURC         0.797      0.008     98.354      0.000

Latent Class 3

 SLPNSSNC WITH
   WORRYNC        -0.019      0.010     -1.946      0.052
   SOLC            0.010      0.015      0.653      0.514
   SLPDURC        -0.022      0.017     -1.290      0.197

 WORRYNC  WITH
   SOLC           -0.075      0.012     -6.420      0.000
   SLPDURC        -0.102      0.014     -7.163      0.000

 SOLC     WITH
   SLPDURC         0.049      0.020      2.429      0.015

 Means
   SLPNSSNC        1.189      0.021     56.070      0.000
   WORRYNC         0.017      0.049      0.341      0.733
   SOLC            1.520      0.047     32.307      0.000
   SLPDURC         0.303      0.047      6.470      0.000

 Variances
   SLPNSSNC        0.460      0.003    150.050      0.000
   WORRYNC         0.245      0.004     55.585      0.000
   SOLC            0.405      0.006     72.186      0.000
   SLPDURC         0.797      0.008     98.354      0.000

Latent Class 4

 SLPNSSNC WITH
   WORRYNC        -0.022      0.004     -6.262      0.000
   SOLC            0.075      0.004     18.458      0.000
   SLPDURC         0.022      0.005      4.056      0.000

 WORRYNC  WITH
   SOLC           -0.170      0.005    -37.049      0.000
   SLPDURC        -0.207      0.006    -33.958      0.000

 SOLC     WITH
```

```
    SLPDURC            0.217      0.007     33.011      0.000

 Means
    SLPNSSNC           0.891      0.005    164.073      0.000
    WORRYNC            0.539      0.005     99.557      0.000
    SOLC              -0.420      0.008    -54.829      0.000
    SLPDURC           -0.294      0.007    -41.098      0.000

 Variances
    SLPNSSNC           0.460      0.003    150.050      0.000
    WORRYNC            0.245      0.004     55.585      0.000
    SOLC               0.405      0.006     72.186      0.000
    SLPDURC            0.797      0.008     98.354      0.000

Categorical Latent Variables

 Means
    C#1               -1.438      0.027    -54.013      0.000
    C#2               -1.955      0.033    -60.126      0.000
    C#3               -2.285      0.055    -41.873      0.000

QUALITY OF NUMERICAL RESULTS

     Condition Number for the Information Matrix
0.201E-04
       (ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

     Random Starts Specifications for the k-1 Class Analysis
Model
       Number of initial stage random starts                1000
       Number of final stage optimizations                   250

     VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 3 (H0) VERSUS 4 CLASSES

         H0 Loglikelihood Value                    -125994.415
         2 Times the Loglikelihood Difference        2569.029
         Difference in the Number of Parameters            11
         Mean                                         -20.016
         Standard Deviation                            62.940
         P-Value                                       0.0000

     LO-MENDELL-RUBIN ADJUSTED LRT TEST

         Value                                       2546.407
         P-Value                                       0.0000

TECHNICAL 14 OUTPUT

     Random Starts Specifications for the k-1 Class Analysis
Model
       Number of initial stage random starts                1000
       Number of final stage optimizations                   250

     Random Starts Specification for the k-1 Class Model for
Generated Data
       Number of initial stage random starts                   2
       Number of final stage optimizations                     1
     Random Starts Specification for the k Class Model for
Generated Data
       Number of initial stage random starts                  50
       Number of final stage optimizations                    10
     Number of bootstrap draws requested                     250

     PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 3 (H0) VERSUS 4 CLASSES

         H0 Loglikelihood Value                    -125994.415
         2 Times the Loglikelihood Difference        2569.029
         Difference in the Number of Parameters            11
         Approximate P-Value                           0.0000
         Successful Bootstrap Draws                       250

     WARNING:  OF THE 250 BOOTSTRAP DRAWS, 233
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
     OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 4-CLASS
MODEL.
     THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
     INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step2_LPA4M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    CPROB4         F10.3
    C              F10.3
    ID             I6

  Save file format
    9F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  13:46:02
        Ending Time:  16:52:39
       Elapsed Time:  03:06:37

MUTHEN & MUTHEN
3463 Stoner Ave.
Los Angeles, CA  90066

Tel: (310) 391-9971
Fax: (310) 391-8971
Web: www.StatModel.com
```

Five-profile model

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/13/2023   8:14 PM

INPUT INSTRUCTIONS

  TITLE: LPA 5 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (5);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 2000 500;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 4 2 100 20;
  LRTBOOTSTRAP = 500;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  %c#3%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#4%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#5%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
```

```
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step2_LPA5M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 5 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                   100
  Convergence criterion                          0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                   500
  Convergence criteria
    Loglikelihood change                         0.100D-06
    Relative loglikelihood change                0.100D-06
    Derivative                                   0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
  Maximum value for logit thresholds             15
  Minimum value for logit thresholds             -15
  Minimum expected cell size for chi-square      0.100D-
01
Maximum number of iterations for H1              2000
Convergence criterion for H1                     0.100D-03
Optimization algorithm                           EMA
Random Starts Specifications
  Number of initial stage random starts          2000
  Number of final stage optimizations            500
  Number of initial stage iterations             500
  Initial stage convergence criterion            0.100D+01
  Random starts scale                            0.500D+01
  Random seed for generating random starts       0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              SLPNSSNC      WORRYNC       SOLC
SLPDURC
              ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

        Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
        Sample Size      Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median

     SLPNSSNC              0.933       0.086       0.000   27.10%
0.000      1.000      1.000
          27802.000       0.471      -0.878       2.000   20.40%
1.000      2.000
     WORRYNC               0.000      -1.036      -2.825    1.71%
-0.928      0.020      0.495
          27802.000       1.000       0.165       0.969   28.55%
0.495      0.969
     SOLC                  0.000       0.967      -1.054   31.63%    -
1.054     -0.072     -0.072
          27123.000       1.000       0.467       2.875    2.77%
-0.072      0.910
```

```
     SLPDURC            0.000      0.568     -1.205   25.70%
-1.205    -0.292    -0.292
          26763.000      1.000     -0.470      2.445    3.44%
-0.292     0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

1760 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -124083.504  285763        1486
      -124083.504  530559        1845
      -124083.504  464810        1424
      -124083.504  453260        1106
      -124083.504  627151        1601
      -124083.504  317868        740
      -124083.504  628997        1188
      -124083.504  393453        1355
      -124083.504  153942        31
      -124083.504  884619        1441
      -124083.504  848331        137
      -124083.504  929823        1205
      -124083.504  922596        456
      -124083.504  716616        1159
      -124083.504  718876        1104
      -124083.504  539389        544
      -124083.504  268664        1784
      -124083.504  225932        1285
      -124083.504  712531        631
      -124083.504  626208        698
      -124083.504  210870        383
      -124083.504  185331        1162
      -124083.504  778331        1280
      -124083.504  881886        608
      -124083.504  930872        277
      -124083.504  685657        69
      -124083.504  526265        1962
      -124083.504  760599        832
      -124083.504  175820        1040
      -124083.504  696830        668
      -124083.504  879211        453
      -124083.504  676560        1250
      -124083.504  507218        613
      -124083.504  327927        908
      -124083.504  927045        1994
      -124083.504  273669        1118
      -124083.504  188498        258
      -124083.504  291112        645
      -124083.504  276243        1768
      -124083.504  782821        272
      -124083.504  266349        1989
      -124083.504  645052        910
      -124083.504  399071        1007
      -124083.504  547354        1357
      -124083.504  165822        1803
      -124083.504  61710         1327
      -124083.504  16096         1147
      -124083.504  967902        52
      -124083.504  384859        1530
      -124083.504  424280        1245
      -124083.504  680987        1926
      -124083.504  300844        1405
      -124083.504  301180        236
      -124083.504  583281        1907
      -124083.504  256197        1923
      -124083.504  908674        1748
      -124083.504  793487        595
      -124083.504  992389        77
      -124083.504  150531        154
      -124083.504  929361        1971
      -124083.504  964999        1522
      -124083.504  325724        1043
      -124083.504  876943        650
      -124083.504  568279        1580
      -124083.504  306768        978
      -124083.504  547702        767
      -124083.504  549244        756
      -124083.504  526742        1546
      -124083.504  922042        492
      -124083.504  848163        47
      -124083.504  105435        265
      -124083.504  393232        152
      -124083.504  501995        791
      -124083.504  222513        1088
      -124083.504  59963         670
      -124083.504  919217        1501
      -124083.504  238317        812
      -124083.504  354208        196
      -124083.504  290210        1620
      -124083.504  855963        1408
      -124083.504  990504        827
      -124083.504  81951         907
      -124083.504  251680        794
      -124083.504  51375         148
      -124083.504  856347        1927
      -124083.504  760850        739
      -124083.504  981480        1025
      -124096.895  702409        1227
      -124096.895  117891        1818
      -124096.895  669634        335
      -124096.895  131063        843
      -124096.895  126922        1124
      -124096.895  331689        1872
      -124096.895  303429        1016
      -124096.895  765589        1140
      -124096.895  165853        105
      -124096.895  570681        777
      -124096.895  84927         1511
      -124096.895  349263        263
      -124096.895  928085        1946
      -124096.895  956446        1081
      -124096.895  164643        1941
      -124096.895  358115        1724
      -124096.895  197904        1782
      -124096.895  769907        457
      -124096.895  341041        34
      -124096.895  765372        1123
      -124096.895  159216        1423
      -124096.895  441118        1091
      -124096.895  63231         935
      -124096.895  964389        1223
      -124096.895  813351        1507
      -124096.895  95624         1605
      -124096.895  674786        1496
      -124096.895  879338        309
      -124096.895  629320        222
      -124096.895  662718        460
      -124096.895  644297        340
      -124096.895  558208        1403
      -124096.895  53089         1660
      -124096.895  471398        74
```

```
      -124096.895  933578         506
      -124096.895  814975         129
      -124096.895  518828         432
      -124096.895  166220        1502
      -124096.895  96617          955
      -124096.895  496710         386
      -124096.895  510491        1275
      -124096.895  752847        1109
      -124096.895  848356         602
      -124096.895  654377        1684
      -124096.895  271809         846
      -124096.895  699748        1120
      -124096.895  678813        1881
      -124096.895  621542         375
      -124096.895  358688        1573
      -124096.895  937885         426
      -124096.895  435506         988
      -124096.895  521770         945
      -124096.895  188490        1460
      -124096.895  493775        1402
      -124096.895  910119        1886
      -124096.895  246261          38
      -124096.895  792993         859
      -124096.895  51011          1111
      -124096.895  153053         378
      -124096.895  970689         266
      -124096.895  528938        1898
      -124709.900  945711        1419
      -124709.900  996231         310
      -124709.900  611687        1933
      -124709.900  569833          85
      -124709.900  469158        1145
      -124709.900  451258         848
      -124709.900  137305         379
      -124709.900  531546         702
      -124709.900  207299        1039
      -124709.900  938409        1144
      -124709.900  135076        1692
      -125293.398  842091        1373
      -125293.398  677720         681
      -125394.935  232559         136
      -125394.935  881268        1299
      -125994.415  489927         520
      -125994.415  181178        1069
      -126943.690  91231          727

334 perturbed starting value run(s) did not converge or were
rejected in the third stage.

THE BEST LOGLIKELIHOOD VALUE HAS BEEN
REPLICATED.  RERUN WITH AT LEAST TWICE THE
RANDOM STARTS TO CHECK THAT THE BEST
LOGLIKELIHOOD IS STILL OBTAINED AND
REPLICATED.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       58

Loglikelihood

          H0 Value                    -124083.504
          H0 Scaling Correction Factor      1.1989
            for MLR

Information Criteria

          Akaike (AIC)                 248283.007
          Bayesian (BIC)               248760.513
          Sample-Size Adjusted BIC     248576.190
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

   Latent
   Classes

      1      1300.32515          0.04677
      2      4426.85090          0.15923
      3      1645.56536          0.05919
      4      2323.29222          0.08357
      5     18105.96637          0.65125

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

   Latent
   Classes

      1      1300.32515          0.04677
      2      4426.85090          0.15923
      3      1645.56536          0.05919
      4      2323.29222          0.08357
      5     18105.96637          0.65125

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS
MEMBERSHIP

Class Counts and Proportions

   Latent
   Classes

      1           1037          0.03730
      2           4825          0.17355
      3           1250          0.04496
      4           2335          0.08399
      5          18355          0.66020

CLASSIFICATION QUALITY

     Entropy                         0.860

Average Latent Class Probabilities for Most Likely Latent
Class Membership (Row)
by Latent Class (Column)

          1      2      3      4      5

   1  0.782  0.142  0.001  0.075  0.000
   2  0.061  0.778  0.052  0.023  0.085
   3  0.002  0.036  0.905  0.043  0.014
   4  0.081  0.019  0.008  0.891  0.000
   5  0.000  0.024  0.013  0.000  0.963

Classification Probabilities for the Most Likely Latent Class
Membership (Column)
by Latent Class (Row)

          1      2      3      4      5

   1  0.624  0.228  0.002  0.146  0.000
   2  0.033  0.848  0.010  0.010  0.098
```

```
   3  0.000    0.152    0.687    0.012    0.148
   4  0.033    0.048    0.023    0.896    0.000
   5  0.000    0.023    0.001    0.000    0.976

Logits for the Classification Probabilities for the Most Likely
Latent Class Membership (Column)
by Latent Class (Row)

              1        2        3        4        5

   1      9.660    8.655    3.760    8.210    0.000
   2     -1.078    2.158   -2.261   -2.280    0.000
   3     -5.926    0.029    1.535   -2.541    0.000
   4      9.727   10.084    9.366   13.018    0.000
   5    -13.507   -3.761   -6.925  -12.691    0.000

MODEL RESULTS

                                                    Two-Tailed
                Estimate       S.E.  Est./S.E.    P-Value

Latent Class 1

 SLPNSSNC WITH
   WORRYNC          0.028      0.014      2.097      0.036
   SOLC             0.054      0.019      2.863      0.004
   SLPDURC         -0.004      0.021     -0.173      0.863

 WORRYNC  WITH
   SOLC             0.018      0.023      0.760      0.447
   SLPDURC          0.011      0.017      0.603      0.546

 SOLC     WITH
   SLPDURC          0.029      0.023      1.279      0.201

 Means
   SLPNSSNC         0.941      0.041     23.047      0.000
   WORRYNC         -1.812      0.077    -23.556      0.000
   SOLC             0.058      0.078      0.741      0.459
   SLPDURC          0.950      0.069     13.849      0.000

 Variances
   SLPNSSNC         0.460      0.003    150.607      0.000
   WORRYNC          0.183      0.003     66.958      0.000
   SOLC             0.414      0.004     99.215      0.000
   SLPDURC          0.752      0.009     82.198      0.000

Latent Class 2

 SLPNSSNC WITH
   WORRYNC          0.009      0.009      1.072      0.284
   SOLC             0.088      0.008     10.716      0.000
   SLPDURC          0.029      0.010      2.814      0.005

 WORRYNC  WITH
   SOLC            -0.074      0.009     -8.090      0.000
   SLPDURC         -0.007      0.014     -0.457      0.648

 SOLC     WITH
   SLPDURC          0.096      0.013      7.505      0.000

 Means
   SLPNSSNC         0.875      0.015     58.846      0.000
   WORRYNC         -0.749      0.035    -21.694      0.000
   SOLC             0.032      0.029      1.135      0.256
   SLPDURC          0.332      0.033      9.996      0.000

 Variances
   SLPNSSNC         0.460      0.003    150.607      0.000
   WORRYNC          0.183      0.003     66.958      0.000
   SOLC             0.414      0.004     99.215      0.000
   SLPDURC          0.752      0.009     82.198      0.000

Latent Class 3

 SLPNSSNC WITH
   WORRYNC         -0.002      0.007     -0.314      0.753
   SOLC            -0.015      0.019     -0.760      0.447
   SLPDURC         -0.030      0.016     -1.880      0.060

 WORRYNC  WITH
   SOLC            -0.004      0.008     -0.475      0.635
   SLPDURC         -0.076      0.010     -7.544      0.000

 SOLC     WITH
   SLPDURC          0.012      0.020      0.592      0.554

 Means
   SLPNSSNC         1.209      0.022     54.036      0.000
   WORRYNC         -0.224      0.037     -5.997      0.000
   SOLC             1.723      0.027     63.438      0.000
   SLPDURC          0.439      0.044      9.899      0.000

 Variances
   SLPNSSNC         0.460      0.003    150.607      0.000
   WORRYNC          0.183      0.003     66.958      0.000
   SOLC             0.414      0.004     99.215      0.000
   SLPDURC          0.752      0.009     82.198      0.000

Latent Class 4

 SLPNSSNC WITH
   WORRYNC          0.004      0.006      0.633      0.527
   SOLC            -0.007      0.014     -0.517      0.605
   SLPDURC          0.013      0.013      1.000      0.317

 WORRYNC  WITH
   SOLC            -0.050      0.007     -6.747      0.000
   SLPDURC         -0.072      0.008     -9.171      0.000

 SOLC     WITH
   SLPDURC          0.024      0.014      1.765      0.078

 Means
   SLPNSSNC         1.167      0.017     69.498      0.000
   WORRYNC         -2.030      0.021    -97.318      0.000
   SOLC             1.944      0.024     81.105      0.000
   SLPDURC          1.173      0.026     45.965      0.000

 Variances
   SLPNSSNC         0.460      0.003    150.607      0.000
   WORRYNC          0.183      0.003     66.958      0.000
   SOLC             0.414      0.004     99.215      0.000
   SLPDURC          0.752      0.009     82.198      0.000

Latent Class 5

 SLPNSSNC WITH
   WORRYNC         -0.016      0.003     -5.075      0.000
   SOLC             0.074      0.004     19.537      0.000
   SLPDURC          0.017      0.005      3.071      0.002

 WORRYNC  WITH
   SOLC            -0.136      0.003    -43.443      0.000
   SLPDURC         -0.150      0.005    -32.481      0.000

 SOLC     WITH
   SLPDURC          0.195      0.006     33.001      0.000

 Means
```

```
    SLPNSSNC           0.892      0.005    163.537      0.000
    WORRYNC            0.594      0.005    123.078      0.000
    SOLC              -0.411      0.006    -74.068      0.000
    SLPDURC           -0.334      0.007    -45.482      0.000

  Variances
    SLPNSSNC           0.460      0.003    150.607      0.000
    WORRYNC            0.183      0.003     66.958      0.000
    SOLC               0.414      0.004     99.215      0.000
    SLPDURC            0.752      0.009     82.198      0.000

Categorical Latent Variables

  Means
    C#1               -2.634      0.144    -18.330      0.000
    C#2               -1.409      0.032    -44.014      0.000
    C#3               -2.398      0.042    -56.710      0.000
    C#4               -2.053      0.032    -63.375      0.000


QUALITY OF NUMERICAL RESULTS

     Condition Number for the Information Matrix
0.996E-05
       (ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

     Random Starts Specifications for the k-1 Class Analysis
Model
       Number of initial stage random starts                2000
       Number of final stage optimizations                   500

     VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 4 (H0) VERSUS 5 CLASSES

         H0 Loglikelihood Value                    -124709.900
         2 Times the Loglikelihood Difference         1252.794
         Difference in the Number of Parameters             11
         Mean                                           26.542
         Standard Deviation                             38.528
         P-Value                                        0.0000

     LO-MENDELL-RUBIN ADJUSTED LRT TEST

         Value                                        1241.762
         P-Value                                        0.0000

TECHNICAL 14 OUTPUT

     Random Starts Specifications for the k-1 Class Analysis
Model
       Number of initial stage random starts                2000
       Number of final stage optimizations                   500

     Random Starts Specification for the k-1 Class Model for
Generated Data
       Number of initial stage random starts                   4
       Number of final stage optimizations                     2
     Random Starts Specification for the k Class Model for
Generated Data
       Number of initial stage random starts                 100
       Number of final stage optimizations                    20
     Number of bootstrap draws requested                     500

     PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 4 (H0) VERSUS 5 CLASSES

         H0 Loglikelihood Value                    -124709.900
         2 Times the Loglikelihood Difference         1252.794
         Difference in the Number of Parameters             11
         Approximate P-Value                            0.0000
         Successful Bootstrap Draws                        500

     WARNING:  OF THE 500 BOOTSTRAP DRAWS, 459
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
     OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 5-CLASS
MODEL.
     THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
     INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step2_LPA5M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    CPROB4         F10.3
    CPROB5         F10.3
    C              F10.3
    ID             I6

  Save file format
    10F10.3 I6

  Save file record length    10000

  Save missing symbol       *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  20:14:35
        Ending Time:  20:57:03
       Elapsed Time:  24:42:28

MUTHEN & MUTHEN
3463 Stoner Ave.
Los Angeles, CA  90066

Tel: (310) 391-9971
Fax: (310) 391-8971
Web: www.StatModel.com
```

Six-profile model

```
Mplus VERSION 8.7
MUTHEN & MUTHEN
07/15/2023   1:26 PM

INPUT INSTRUCTIONS

  TITLE: LPA 6 profile syntax: M5: Varying means, equal
variances, and varying covariances

  DATA:
  FILE IS mplus2.csv;
  ! Specifies file location for data file. Make sure data is in
format appropriate for Mplus
  ! per Mplus manual. This data file is in individual format
(one row of data per participan
  VARIABLE:
  NAMES ARE ID SCI_02 SCI_02B slpnssN worryN sol
slpDur gender genderN yrgrp yrgrpN SCI_02C
  slpnssNC worryNC solC slpDurC;

  ! All variables included in data file should be named here.
  USEVARIABLES ARE slpnssNC worryNC solC slpDurC;
  ! Only variables intended for use in the analysis should be
listed here
  IDVARIABLE IS ID;
  CLASSES = c (6);
  ! This is where you instruct Mplus on how many
classes/profiles are being estimated. Initi
  ! model contains only one class/profile, thus it would be
CLASSES = c (1). Above specifies
  !profiles, and for each further iterative models the number
in parentheses increases by on
  !three profiles/classes would be c (3), and so on.
  MISSING ARE ALL(9999);
  ! Used to communicate how missing data is coded in data
file. Here shown with a "." which
  ! all that is included in each cell with missing data in the
data file
  ANALYSIS:
  TYPE = MIXTURE;
  ! LPA is a version of mixture modeling, and this instructs
Mplus to analyze in this way
  ESTIMATOR = MLR;
  !FIML robust to non-normal data
  STARTS = 8000 2000;
  STITERATIONS = 500;
  ! Default number of starts for each step of the ML
estimation. First STARTS value specifie
  !number of unique start values to start with, the 250
represents the 250 best unique start
  !carrying forward to completion. The STITERATIONS
specifies the number of ML iteration
  !steps for those 250 selected start values to go through to
be able to converge. This is a
  !maximum number of iteration; if a model converges in less
than 500 iterations it will sto
  !before reaching 500 iterations.
  !These values can be increased … see "Four-Profile Final
Model with Covariate Analysis
  !Syntax" for an example.
  LRTSTARTS = 16 8 400 80;
  LRTBOOTSTRAP = 500;
  !The above start values are for the defaults for the LRT
statistic being run to compare th
  !model fit with the model fit of a model with one less class
(k-1). The BOOTSTRAP statemen
  !specifies the number of bootstrap draws to inform Mplus'
bootstrapped LRT results.
  MODEL:
  !For a default Mplus model the LPA model does not need
to be specified. However, it can be
  !The model can also be modified from the Mplus default of
estimating the indicator means
  !(uniquely across profiles) and variances (constrained
across profiles), as well as the la
  !profile mean.
  %OVERALL%
  [slpnssNC worryNC solC slpDurC]; !estimates the
indicators means for each profile. Without
  !the means are freely estimated in each profile, not
constrained.
  slpnssNC worryNC solC slpDurC; !Label Var1-Var5
constrains the estimates of the variances
  !profiles to be equal.

  %c#1%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#2%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  %c#3%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#4%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

   %c#5%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
```

```
  solC WITH slpDurC;

   %c#6%

     [slpnssNC worryNC solC slpDurC];

     !covariances
  slpnssNC WITH worryNC solC slpDurC;
  worryNC WITH solC slpDurC;
  solC WITH slpDurC;

  OUTPUT:
  TECH11 TECH14;
  ! TECH1 provides parameter specifications and starting
values for the analysis
  ! TECH8 provides optimization history for this analysis type
  !TECH11 provides LRT results
  !TECH14 provides bootstrapped LRT test
  PLOT: SERIES=slpnssNC worryNC solC slpDurC(*);
  TYPE=PLOT3;
  SAVEDATA:
  FILE IS Step2_LPA6M5.dat;
  ! Tells Mplus where to save the output files from the
analysis
  SAVE = CPROBABILITIES;
  ! The above command lines are to save the most likely
profile membership for each particip
  ! and the posterior probabilities for their membership in
each latent profile.

*** WARNING in MODEL command
  All variables are uncorrelated with all other variables within
class.
  Check that this is what is intended.

LPA 6 profile syntax: M5: Varying means, equal variances,
and varying covariances

SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                           27802

Number of dependent variables                    4
Number of independent variables                  0
Number of continuous latent variables            0
Number of categorical latent variables           1

Observed dependent variables

  Continuous
   SLPNSSNC    WORRYNC     SOLC        SLPDURC

Categorical latent variables
   C

Variables with special functions

  ID variable          ID

Estimator                                        MLR
Information matrix                               OBSERVED
Optimization Specifications for the Quasi-Newton Algorithm
for
Continuous Outcomes
  Maximum number of iterations                   100
  Convergence criterion                          0.100D-05
Optimization Specifications for the EM Algorithm
  Maximum number of iterations                   500
  Convergence criteria
     Loglikelihood change                        0.100D-06
     Relative loglikelihood change               0.100D-06
     Derivative                                  0.100D-05
Optimization Specifications for the M step of the EM
Algorithm for
Categorical Latent variables
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
Optimization Specifications for the M step of the EM
Algorithm for
Censored, Binary or Ordered Categorical (Ordinal),
Unordered
Categorical (Nominal) and Count Outcomes
  Number of M step iterations                    1
  M step convergence criterion                   0.100D-05
  Basis for M step termination                   ITERATION
  Maximum value for logit thresholds             15
  Minimum value for logit thresholds             -15
  Minimum expected cell size for chi-square      0.100D-
01
Maximum number of iterations for H1              2000
Convergence criterion for H1                     0.100D-03
Optimization algorithm                           EMA
Random Starts Specifications
  Number of initial stage random starts          8000
  Number of final stage optimizations            2000
  Number of initial stage iterations             500
  Initial stage convergence criterion            0.100D+01
  Random starts scale                            0.500D+01
  Random seed for generating random starts       0

Input data file(s)
  mplus2.csv
Input data format  FREE

SUMMARY OF DATA

     Number of missing data patterns             4
     Number of y missing data patterns           4
     Number of u missing data patterns           0

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT FOR Y


           Covariance Coverage
              SLPNSSNC      WORRYNC       SOLC
SLPDURC
              ________      ________      ________      ________
 SLPNSSNC       1.000
 WORRYNC        1.000         1.000
 SOLC           0.976         0.976         0.976
 SLPDURC        0.963         0.963         0.940         0.963

UNIVARIATE SAMPLE STATISTICS

     UNIVARIATE HIGHER-ORDER MOMENT
DESCRIPTIVE STATISTICS

         Variable/         Mean/     Skewness/   Minimum/ % with
Percentiles
        Sample Size     Variance    Kurtosis    Maximum
Min/Max      20%/60%    40%/80%    Median

     SLPNSSNC            0.933       0.086       0.000   27.10%
0.000      1.000      1.000
```

```
          27802.000      0.471     -0.878      2.000   20.40%
1.000     2.000
    WORRYNC             0.000     -1.036     -2.825    1.71%
-0.928     0.020     0.495
          27802.000      1.000      0.165      0.969   28.55%
0.495     0.969
    SOLC                0.000      0.967     -1.054   31.63%    -
1.054    -0.072    -0.072
          27123.000      1.000      0.467      2.875    2.77%
-0.072     0.910
    SLPDURC             0.000      0.568     -1.205   25.70%
-1.205    -0.292    -0.292
          26763.000      1.000     -0.470      2.445    3.44%
-0.292     0.620

RANDOM STARTS RESULTS RANKED FROM THE BEST
TO THE WORST LOGLIKELIHOOD VALUES

Unperturbed starting value run did not converge in the initial
stage
optimizations.

7502 perturbed starting value run(s) did not converge in the
initial stage
optimizations.

Final stage loglikelihood values at local maxima, seeds, and
initial stage start numbers:

      -105840.802  102504         7215
      -123380.204  347110         3761
      -123380.204  366872         1169
      -123380.204  630834         2964
      -123380.204  45556          3294
      -123380.204  530305         6477
      -123380.204  209545         7123
      -123380.204  689589         3947
      -123380.204  419979         5094
      -123380.204  632565         4724
      -123380.204  460630         3542
      -123380.204  470921         2993
      -123380.204  929499         3974
      -123380.204  166700         7162
      -123380.204  231366         1137
      -123380.204  640797         4654
      -123380.204  474013         7485
      -123380.204  977507         1716
      -123380.204  110260         2535
      -123380.204  231986         7210
      -123380.204  81598          7240
      -123380.204  855715         6992
      -123380.204  607148         6862
      -123380.204  29275          6028
      -123380.204  863480         5377
      -123380.204  25584          7402
      -123380.204  466035         6850
      -123380.204  933578         506
      -123380.204  690608         1800
      -123380.204  848969         173
      -123380.204  220633         5604
      -123380.204  567252         1843
      -123380.204  978671         5259
      -123380.204  789564         2275
      -123380.204  719104         6684
      -123380.204  12814          4104
      -123380.204  899062         3493
      -123380.204  165822         1803
      -123380.204  42278          1305
      -123380.204  88178          5619
      -123380.204  473869         3707
      -123380.204  279725         5288
      -123380.204  548301         5906
      -123380.204  270257         5176
      -123380.204  682047         2666
      -123380.204  9427           4643
      -123380.204  880807         6726
      -123380.204  550354         4790
      -123380.204  120368         6622
      -123380.204  797872         7655
      -123380.204  463894         1733
      -123380.204  876943         650
      -123380.204  400299         4782
      -123380.204  854941         6096
      -123380.204  217990         1077
      -123380.204  907407         2624
      -123380.204  54085          5617
      -123380.204  755611         3182
      -123380.204  551340         766
      -123380.204  542577         1004
      -123380.204  766178         1937
      -123380.204  512048         3172
      -123380.204  678595         5688
      -123380.204  153053         378
      -123380.204  444228         860
      -123380.204  129163         4601
      -123380.204  139941         3271
      -123380.204  563452         7834
      -123380.204  846789         7904
      -123380.204  715466         5857
      -123380.204  728282         5901
      -123380.204  430691         7901
      -123380.204  8370           4917
      -123380.204  776607         7866
      -123380.204  254297         4551
      -123380.204  420298         1222
      -123380.204  407520         2854
      -123380.204  294397         7351
      -123380.204  352277         42
      -123380.204  62571          3923
      -123380.204  937651         5704
      -123380.204  280104         1875
      -123380.204  848163         47
      -123380.204  953815         1347
      -123380.204  510814         3219
      -123380.204  988209         7713
      -123380.204  530559         1845
      -123380.204  354693         2038
      -123380.204  736635         7286
      -123380.204  666720         671
      -123380.204  970838         3615
      -123380.204  357565         7348
      -123380.204  697272         2010
      -123380.204  480926         1824
      -123380.204  748083         4737
      -123380.204  413363         2884
      -123380.204  751592         3458
      -123380.204  876447         6025
      -123380.204  37806          4535
      -123380.204  634782         979
      -123380.204  485948         3188
      -123380.204  908524         6156
      -123380.204  314551         3955
      -123380.204  619187         7233
      -123380.204  937476         7543
      -123380.204  760850         739
      -123380.204  717754         180
      -123380.204  390788         3191
      -123380.204  564582         7832
      -123380.204  938366         6817
      -123380.204  356418         7958
```

-123380.204	787782	3419	-123380.204	692399	3763
-123380.204	634094	7507	-123380.204	463203	5945
-123380.204	829063	2276	-123380.204	120100	5289
-123380.204	739458	1963	-123380.204	832850	2779
-123380.204	362529	2736	-123380.204	173191	422
-123380.204	321363	1095	-123380.204	885436	4377
-123380.204	337438	4320	-123380.204	626490	4476
-123380.204	734978	5042	-123380.204	749808	3344
-123380.204	286505	2416	-123380.204	140694	5735
-123380.204	794411	5790	-123380.204	323788	3307
-123380.204	721907	4479	-123380.204	573976	1217
-123380.204	76422	5258	-123380.204	42579	4794
-123380.204	310591	4901	-123380.204	882244	6464
-123380.204	925741	1567	-123380.204	703618	7115
-123380.204	450584	3772	-123380.204	566784	6618
-123380.204	244349	736	-123380.204	469648	6565
-123380.204	513053	5961	-123380.204	670998	1876
-123380.204	900041	3785	-123380.204	655088	7777
-123380.204	821111	6824	-123380.204	412313	6615
-123380.204	402776	7710	-123380.204	477242	4717
-123380.204	687000	5863	-123380.204	627224	4579
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-123380.204	25294	2192	-123380.204	683728	5363
-123380.204	803696	1340	-123380.204	681079	3005
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-123380.204	164467	2047	-123380.204	576306	3678
-123380.204	501995	791	-123380.204	695314	6891
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-123380.204	757590	2804	-123380.204	669634	335
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-123380.204	726787	1550	-123380.204	395914	5801
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-123380.204	922042	492	-123380.204	754616	4405
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-123380.204	303628	7673	-123380.204	949086	1426
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-123380.204	612837	3056	-123793.364	393453	1355
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-123380.204	911887	6629	-123817.802	188498	258
-123380.204	170485	6091	-123817.802	156983	5262
-123380.204	317070	7733	-123817.802	202790	198
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-123380.204	662807	4554	-123817.802	84256	2662

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-123817.802  896300       5588
-123817.802  100054       1225
-123817.802  704526       6256
-123817.802  247709       6305
-123817.802  810668       4172
-123817.802  789701       6909
-123817.802  654884       1352
-123817.802  818908       5898
-123817.802  368364       4774
-123817.802  421731       886
-123817.802  662359       1954
-123817.802  218683       5325
-123817.802  462159       6130
-123817.802  362536       7653
-123817.802  402049       4468
-123817.802  763134       4903
-123817.802  157736       1524
-123817.802  115267       2689
-123817.802  667120       2859
-123817.802  515742       7693
-123817.802  940517       2728
-123817.802  167220       2608
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-124083.504  450164       5105
-124083.504  975027       1552
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-124083.504  429802       3983
-124083.504  924648       6655
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-124117.383  676560       1250
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-124241.254  808639       5924
-124241.254  887941       2425
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-124241.254  187594       3708
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-124608.382  406734       2605
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-124709.900  970728       1371
-124709.900  517917       5157
-124709.900  933596       2349
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-124709.900  472141       5833
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-124709.900  767778       7158
-124709.900  124303       7695
-124709.900  21345        199

1541 perturbed starting value run(s) did not converge or
were rejected in the third stage.

    WARNING:  THE BEST LOGLIKELIHOOD VALUE WAS
NOT REPLICATED.  THE
    SOLUTION MAY NOT BE TRUSTWORTHY DUE TO
LOCAL MAXIMA.  INCREASE THE
    NUMBER OF RANDOM STARTS.

    THE STANDARD ERRORS OF THE MODEL
PARAMETER ESTIMATES MAY NOT BE
    TRUSTWORTHY FOR SOME PARAMETERS DUE TO
A NON-POSITIVE DEFINITE
    FIRST-ORDER DERIVATIVE PRODUCT MATRIX.  THIS
MAY BE DUE TO THE STARTING
    VALUES BUT MAY ALSO BE AN INDICATION OF
MODEL NONIDENTIFICATION.  THE
    CONDITION NUMBER IS      0.573D-10.  PROBLEM
INVOLVING THE FOLLOWING PARAMETER:
    Parameter 62, %C#6%: SLPDURC WITH SLPNSSNC


THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters                       69

Loglikelihood

          H0 Value                    -105840.802
          H0 Scaling Correction Factor      1.1409
            for MLR

Information Criteria

          Akaike (AIC)                 211819.605
          Bayesian (BIC)               212387.673
          Sample-Size Adjusted BIC     212168.392
            (n* = (n + 2) / 24)

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON THE ESTIMATED MODEL

   Latent
  Classes

     1     6256.52283        0.22504
     2     2512.95967        0.09039
     3     3788.57316        0.13627
     4     7106.88021        0.25562
     5     3150.58120        0.11332
     6     4986.48292        0.17936

FINAL CLASS COUNTS AND PROPORTIONS FOR THE
LATENT CLASSES
BASED ON ESTIMATED POSTERIOR PROBABILITIES

   Latent
  Classes

     1     6256.52283        0.22504
     2     2512.95967        0.09039
     3     3788.57316        0.13627
     4     7106.88021        0.25562
     5     3150.58120        0.11332
     6     4986.48292        0.17936
```

FINAL CLASS COUNTS AND PROPORTIONS FOR THE LATENT CLASSES
BASED ON THEIR MOST LIKELY LATENT CLASS MEMBERSHIP

Class Counts and Proportions

Latent Classes		
1	6431	0.23131
2	2290	0.08237
3	3705	0.13326
4	7760	0.27912
5	3166	0.11388
6	4450	0.16006

CLASSIFICATION QUALITY

Entropy	0.878

Average Latent Class Probabilities for Most Likely Latent Class Membership (Row)
by Latent Class (Column)

	1	2	3	4	5	6
1	0.928	0.063	0.001	0.007	0.000	0.001
2	0.093	0.900	0.001	0.001	0.001	0.004
3	0.000	0.000	0.996	0.001	0.001	0.001
4	0.008	0.002	0.004	0.852	0.002	0.132
5	0.001	0.001	0.007	0.002	0.981	0.007
6	0.002	0.005	0.008	0.099	0.006	0.880

Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3	4	5	6
1	0.954	0.034	0.000	0.009	0.001	0.001
2	0.161	0.820	0.001	0.007	0.001	0.010
3	0.001	0.001	0.974	0.009	0.006	0.009
4	0.006	0.000	0.000	0.930	0.001	0.062
5	0.000	0.001	0.001	0.004	0.986	0.008
6	0.002	0.002	0.001	0.206	0.005	0.785

Logits for the Classification Probabilities for the Most Likely Latent Class Membership (Column)
by Latent Class (Row)

	1	2	3	4	5	6
1	6.500	3.171	-1.890	1.869	-0.946	0.000
2	2.821	4.447	-2.894	-0.260	-2.318	0.000
3	-2.122	-2.648	4.647	-0.068	-0.441	0.000
4	-2.335	-5.695	-4.844	2.710	-4.048	0.000
5	-3.300	-2.693	-1.970	-0.648	4.827	0.000
6	-6.242	-6.076	-6.711	-1.340	-5.134	0.000

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Latent Class 1				
SLPNSSNC WITH				
WORRYNC	-0.223	0.017	-12.898	0.000
SOLC	-0.033	0.003	-12.984	0.000
SLPDURC	0.199	0.017	11.802	0.000
WORRYNC WITH				
SOLC	0.138	0.002	56.172	0.000
SLPDURC	-0.911	0.017	-52.271	0.000
SOLC WITH				
SLPDURC	-0.131	0.003	-48.309	0.000
Means				
SLPNSSNC	0.787	0.009	86.467	0.000
WORRYNC	0.855	0.004	196.544	0.000
SOLC	-1.055	0.000	*********	0.000
SLPDURC	-0.752	0.014	-55.549	0.000
Variances				
SLPNSSNC	0.473	0.005	88.730	0.000
WORRYNC	0.988	0.020	49.163	0.000
SOLC	0.020	0.001	36.573	0.000
SLPDURC	1.115	0.022	49.574	0.000
Latent Class 2				
SLPNSSNC WITH				
WORRYNC	0.107	0.027	3.924	0.000
SOLC	-0.016	0.007	-2.437	0.015
SLPDURC	0.066	0.025	2.581	0.010
WORRYNC WITH				
SOLC	-0.076	0.004	-17.336	0.000
SLPDURC	0.208	0.040	5.254	0.000
SOLC WITH				
SLPDURC	-0.058	0.006	-9.098	0.000
Means				
SLPNSSNC	0.679	0.017	39.866	0.000
WORRYNC	-0.080	0.027	-2.949	0.003
SOLC	-1.054	0.000	-6158.720	0.000
SLPDURC	0.157	0.022	6.983	0.000
Variances				
SLPNSSNC	0.473	0.005	88.730	0.000
WORRYNC	0.988	0.020	49.163	0.000
SOLC	0.020	0.001	36.573	0.000
SLPDURC	1.115	0.022	49.574	0.000
Latent Class 3				
SLPNSSNC WITH				
WORRYNC	0.097	0.015	6.565	0.000
SOLC	0.029	0.003	8.616	0.000
SLPDURC	-0.125	0.016	-7.852	0.000
WORRYNC WITH				
SOLC	0.049	0.005	9.155	0.000
SLPDURC	-0.497	0.022	-22.271	0.000
SOLC WITH				
SLPDURC	-0.067	0.004	-15.090	0.000
Means				
SLPNSSNC	1.101	0.011	101.666	0.000
WORRYNC	-0.580	0.015	-37.798	0.000
SOLC	0.910	0.000	9470.622	0.000
SLPDURC	0.494	0.016	31.282	0.000
Variances				
SLPNSSNC	0.473	0.005	88.730	0.000
WORRYNC	0.988	0.020	49.163	0.000

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   SOLC           0.020      0.001     36.573      0.000
   SLPDURC        1.115      0.022     49.574      0.000

Latent Class 4

 SLPNSSNC WITH
   WORRYNC       -0.145      0.023     -6.286      0.000
   SOLC           0.023      0.003      6.466      0.000
   SLPDURC        0.132      0.021      6.144      0.000

 WORRYNC  WITH
   SOLC          -0.133      0.002    -54.161      0.000
   SLPDURC       -0.828      0.018    -46.563      0.000

 SOLC     WITH
   SLPDURC        0.120      0.003     43.259      0.000

 Means
   SLPNSSNC       0.972      0.010     94.865      0.000
   WORRYNC        0.535      0.007     80.781      0.000
   SOLC          -0.071      0.000   -836.073      0.000
   SLPDURC       -0.373      0.013    -27.768      0.000

 Variances
   SLPNSSNC       0.473      0.005     88.730      0.000
   WORRYNC        0.988      0.020     49.163      0.000
   SOLC           0.020      0.001     36.573      0.000
   SLPDURC        1.115      0.022     49.574      0.000

Latent Class 5

 SLPNSSNC WITH
   WORRYNC        0.014      0.013      1.147      0.251
   SOLC          -0.001      0.001     -2.245      0.025
   SLPDURC       -0.004      0.014     -0.268      0.789

 WORRYNC  WITH
   SOLC          -0.011      0.001    -11.157      0.000
   SLPDURC       -0.407      0.020    -20.611      0.000

 SOLC     WITH
   SLPDURC        0.004      0.001      4.415      0.000

 Means
   SLPNSSNC       1.184      0.012     97.778      0.000
   WORRYNC       -1.338      0.019    -71.482      0.000
   SOLC           2.133      0.008    279.403      0.000
   SLPDURC        0.900      0.020     46.072      0.000

 Variances
   SLPNSSNC       0.473      0.005     88.730      0.000
   WORRYNC        0.988      0.020     49.163      0.000
   SOLC           0.020      0.001     36.573      0.000
   SLPDURC        1.115      0.022     49.574      0.000

Latent Class 6

 SLPNSSNC WITH
   WORRYNC        0.024      0.020      1.194      0.233
   SOLC           0.004      0.004      1.007      0.314
   SLPDURC        0.002      0.017      0.121      0.904

 WORRYNC  WITH
   SOLC           0.082      0.003     25.708      0.000
   SLPDURC       -0.318      0.024    -13.211      0.000

 SOLC     WITH
   SLPDURC       -0.063      0.005    -13.511      0.000

 Means
   SLPNSSNC       0.901      0.013     68.010      0.000
   WORRYNC       -0.509      0.017    -30.758      0.000
   SOLC          -0.072      0.000   -768.888      0.000
   SLPDURC        0.471      0.017     27.896      0.000

 Variances
   SLPNSSNC       0.473      0.005     88.730      0.000
   WORRYNC        0.988      0.020     49.163      0.000
   SOLC           0.020      0.001     36.573      0.000
   SLPDURC        1.115      0.022     49.574      0.000

Categorical Latent Variables

 Means
   C#1            0.227      0.028      8.058      0.000
   C#2           -0.685      0.041    -16.645      0.000
   C#3           -0.275      0.028     -9.843      0.000
   C#4            0.354      0.035     10.135      0.000
   C#5           -0.459      0.029    -15.917      0.000

QUALITY OF NUMERICAL RESULTS

    Condition Number for the Information Matrix
0.573E-10
      (ratio of smallest to largest eigenvalue)

TECHNICAL 11 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          8000
      Number of final stage optimizations            2000

    VUONG-LO-MENDELL-RUBIN LIKELIHOOD RATIO
TEST FOR 5 (H0) VERSUS 6 CLASSES

      H0 Loglikelihood Value                 -107985.460
      2 Times the Loglikelihood Difference      4289.315
      Difference in the Number of Parameters          11
      Mean                                -106396860.944
      Standard Deviation                  150385030.149
      P-Value                                    0.2396

    LO-MENDELL-RUBIN ADJUSTED LRT TEST

      Value                                  4251.544
      P-Value                                    0.2396

TECHNICAL 14 OUTPUT

    Random Starts Specifications for the k-1 Class Analysis
Model
      Number of initial stage random starts          8000
      Number of final stage optimizations            2000

    Random Starts Specification for the k-1 Class Model for
Generated Data
      Number of initial stage random starts            16
      Number of final stage optimizations               8
    Random Starts Specification for the k Class Model for
Generated Data
      Number of initial stage random starts           400
      Number of final stage optimizations              80
    Number of bootstrap draws requested               500

    PARAMETRIC BOOTSTRAPPED LIKELIHOOD RATIO
TEST FOR 5 (H0) VERSUS 6 CLASSES

      H0 Loglikelihood Value                 -107985.460
      2 Times the Loglikelihood Difference      4289.315
```

```
          Difference in the Number of Parameters          11
          Approximate P-Value                        0.0000
          Successful Bootstrap Draws                    493

     WARNING:  OF THE 493 BOOTSTRAP DRAWS, 452
DRAWS HAD BOTH A SMALLER LRT VALUE THAN THE
     OBSERVED LRT VALUE AND NOT A REPLICATED
BEST LOGLIKELIHOOD VALUE FOR THE 6-CLASS
MODEL.
     THIS MEANS THAT THE P-VALUE MAY NOT BE
TRUSTWORTHY DUE TO LOCAL MAXIMA.
     INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

     WARNING:  7 OUT OF 500 BOOTSTRAP DRAWS DID
NOT CONVERGE.
     INCREASE THE NUMBER OF RANDOM STARTS
USING THE LRTSTARTS OPTION.

PLOT INFORMATION

The following plots are available:

  Histograms (sample values)
  Scatterplots (sample values)
  Sample means
  Estimated means, medians, modes, and percentiles
  Sample and estimated means
  Observed individual values
  Estimated means and observed individual values
  Estimated overall and class-specific distributions

SAVEDATA INFORMATION

  Save file
    Step2_LPA6M5.dat

  Order and format of variables

    SLPNSSNC       F10.3
    WORRYNC        F10.3
    SOLC           F10.3
    SLPDURC        F10.3
    CPROB1         F10.3
    CPROB2         F10.3
    CPROB3         F10.3
    CPROB4         F10.3
    CPROB5         F10.3
    CPROB6         F10.3
    C              F10.3
    ID             I6

  Save file format
    11F10.3 I6

  Save file record length    10000

  Save missing symbol        *

DIAGRAM INFORMATION

  Mplus diagrams are currently not available for Mixture
analysis.
  No diagram output was produced.

     Beginning Time:  13:26:45
        Ending Time:  08:20:25
       Elapsed Time:  114:53:40

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```

Secondary Analysis in R

Set graphic theme

```
month_theme <- theme(axis.text.x = element_text(angle = 45, hjust=1, vjust=1, size=7,
      family="Serif"),
                axis.title.x = element_blank(),
                strip.text.x = element_text(size = 10,
      family="Serif"),
                axis.text.y = element_text(size=7,
      family="Serif"),
                axis.title.y = element_text(size=7,
      family="Serif"),
                legend.title = element_blank(),
                legend.text = element_text(size=7,
      family="Serif"),
                legend.position="right",
      panel.grid.major.y = element_blank(),
    panel.grid.minor.y = element_blank())

set_theme(
  geom.outline.color = "white",
  geom.outline.size = 0,
  geom.label.size = 2,
  geom.label.color = "#040540",
  axis.textcolor = "#040540",
  axis.title.color = "#040540",
  legend.color = "#040540",
  legend.title.color = "#040540",
  base = theme_bw()
)
```

Apply classes

```
# Read Mplus data from txt file
classData<-read.table("Step2_LPA5M5.txt", header=FALSE,na.strings=c("", "*"))

## Names of columns - taken from MPlus output
names(classData) <- c("SLPNSSNC", "WORRYNC", "SOLC", "SLPDURC", "CPROB1", "CPROB2", "CPROB3", "CPROB4", "CPR
OB5", "C", "ID")

data$ID <- data$X

## Merge the two
merged <- merge(classData, data, by="ID")

## Probability
probability <- merged[,c("CPROB1", "CPROB2", "CPROB3", "CPROB4", "CPROB5")] # select the probability columns
probability$max<-apply(probability, 1, max) # obtain the max value across the columns

# Add the 'max' column into the data as "weight"
merged$weight <- probability$max

## Create class column to text:
merged$Class <- ifelse(merged$C==1,"Class1",
            ifelse(merged$C==2, "Class2",
            ifelse(merged$C==3, "Class3",
            ifelse(merged$C==4,"Class4", "Class5"))))

merged$Class <- as.factor(merged$Class)

table(is.na(merged$Class))

##
## FALSE
## 27802
```

```
merged[is.na(merged["Class"]),"ID"]
```

Double check missingness & describe classes

```
predictors <- c('Gender_dummy', 'YEARGROUP_cat_dummy', 'SCI_02_binary')

for(x in predictors){
  merged[,x] <- as.character(merged[,x])
}


# get descriptives
table1::table1(~ Gender_dummy + Gender + YEARGROUP_cat_dummy +
               YEARGROUP_cat + SCI_02_binary +
               SCI_02 +
               sleepiness_num +
               worry_stops_sleep_num +
               sol +
               sch_sleep_duration|Class,
             data = merged,
             topclass="Rtable1-zebra")

## Get nicer `table1` .docx output by simply installing the `flextable` package
```

```
##                              Class1          Class2          Class3
## 1                           (N=1037)        (N=4825)        (N=1250)
## 2         Gender_dummy
## 3                   0      681 (65.7%)     2982 (61.8%)     772 (61.8%)
## 4                   1      356 (34.3%)     1843 (38.2%)     478 (38.2%)
## 5              Gender
## 6              Female      681 (65.7%)     2982 (61.8%)     772 (61.8%)
## 7                Male      356 (34.3%)     1843 (38.2%)     478 (38.2%)
## 8   YEARGROUP_cat_dummy
## 9                   0      367 (35.4%)     1426 (29.6%)     181 (14.5%)
## 10                  1      448 (43.2%)     2438 (50.5%)     628 (50.2%)
## 11                  2      222 (21.4%)      961 (19.9%)     441 (35.3%)
## 12       YEARGROUP_cat
## 13         Year 10-13      222 (21.4%)      961 (19.9%)     441 (35.3%)
## 14          Year 5-6       367 (35.4%)     1426 (29.6%)     181 (14.5%)
## 15          Year 7-9       448 (43.2%)     2438 (50.5%)     628 (50.2%)
## 16       SCI_02_binary
## 17         good sleep      316 (30.5%)     4823 (100.0%)    1250 (100%)
## 18   probable insomnia      721 (69.5%)      2 (0.0%)          0 (0%)
## 19             SCI_02
## 20          Mean (SD)      1.97 (0.895)    4.27 (0.762)     5.39 (1.24)
## 21    Median [Min, Max]    2.00 [0, 3.00] 4.00 [2.00, 6.00] 5.00 [4.00, 8.00]
## 22       sleepiness_num
## 23          Mean (SD)      1.96 (0.593)    2.21 (0.655)     4.15 (0.378)
## 24    Median [Min, Max] 2.00 [1.00, 3.00] 2.00 [1.00, 3.00] 4.00 [3.00, 5.00]
## 25             Missing      23 (2.2%)       187 (3.9%)        0 (0%)
## 26 worry_stops_sleep_num
## 27          Mean (SD)       3.38 (1.14)     2.73 (1.03)     2.84 (1.14)
## 28    Median [Min, Max] 4.00 [1.00, 5.00] 3.00 [1.00, 5.00] 3.00 [1.00, 5.00]
## 29             Missing      41 (4.0%)       239 (5.0%)       61 (4.9%)
## 30                sol
## 31          Mean (SD)      1.35 (0.565)    1.01 (0.559)    0.848 (0.589)
## 32    Median [Min, Max]    1.49 [0, 2.00]   0.964 [0, 2.00]   0.688 [0, 2.00]
## 33             Missing      40 (3.9%)       198 (4.1%)       57 (4.6%)
## 34   sch_sleep_duration
## 35          Mean (SD)       7.14 (1.69)     7.58 (1.54)     7.27 (1.56)
## 36    Median [Min, Max] 7.19 [3.00, 11.8] 7.63 [3.04, 12.0] 7.27 [3.00, 12.0]
## 37             Missing      144 (13.9%)     649 (13.5%)     161 (12.9%)
##              Class4          Class5          Overall
## 1           (N=2335)        (N=18355)       (N=27802)
## 2
## 3       1701 (72.8%)     9072 (49.4%)     15208 (54.7%)
## 4        634 (27.2%)     9283 (50.6%)     12594 (45.3%)
## 5
## 6       1701 (72.8%)     9072 (49.4%)     15208 (54.7%)
```

```
## 7       634 (27.2%)      9283 (50.6%)     12594 (45.3%)
## 8
## 9       319 (13.7%)      5242 (28.6%)      7535 (27.1%)
## 10     1244 (53.3%)      9837 (53.6%)     14595 (52.5%)
## 11      772 (33.1%)      3276 (17.8%)      5672 (20.4%)
## 12
## 13      772 (33.1%)      3276 (17.8%)      5672 (20.4%)
## 14      319 (13.7%)      5242 (28.6%)      7535 (27.1%)
## 15     1244 (53.3%)      9837 (53.6%)     14595 (52.5%)
## 16
## 17      473 (20.3%)     18355 (100%)      25217 (90.7%)
## 18     1862 (79.7%)         0 (0%)        2585 (9.3%)
## 19
## 20     1.57 (0.994)     7.22 (0.763)      5.96 (2.11)
## 21    2.00 [0, 3.00] 7.00 [6.00, 8.00]    7.00 [0, 8.00]
## 22
## 23     4.06 (0.656)     1.65 (0.628)      2.07 (1.02)
## 24 4.00 [3.00, 5.00] 2.00 [1.00, 3.00] 2.00 [1.00, 5.00]
## 25       95 (4.1%)        374 (2.0%)        679 (2.4%)
## 26
## 27      3.65 (1.03)      1.95 (0.873)      2.32 (1.10)
## 28 4.00 [1.00, 5.00] 2.00 [1.00, 5.00] 2.00 [1.00, 5.00]
## 29       89 (3.8%)        609 (3.3%)       1039 (3.7%)
## 30
## 31     1.38 (0.590)     0.632 (0.478)     0.795 (0.572)
## 32    1.51 [0, 2.00]   0.492 [0, 2.00]   0.560 [0, 2.00]
## 33       92 (3.9%)        629 (3.4%)       1016 (3.7%)
## 34
## 35      6.61 (1.62)      8.24 (1.40)       7.90 (1.56)
## 36 6.64 [3.00, 11.9] 8.28 [3.00, 12.0] 7.99 [3.00, 12.0]
## 37      320 (13.7%)      2428 (13.2%)      3702 (13.3%)
```

```
# get descriptives
table1::table1(~ Class,
               data = merged,
               topclass="Rtable1-zebra")

## Get nicer `table1` .docx output by simply installing the `flextable` package
```

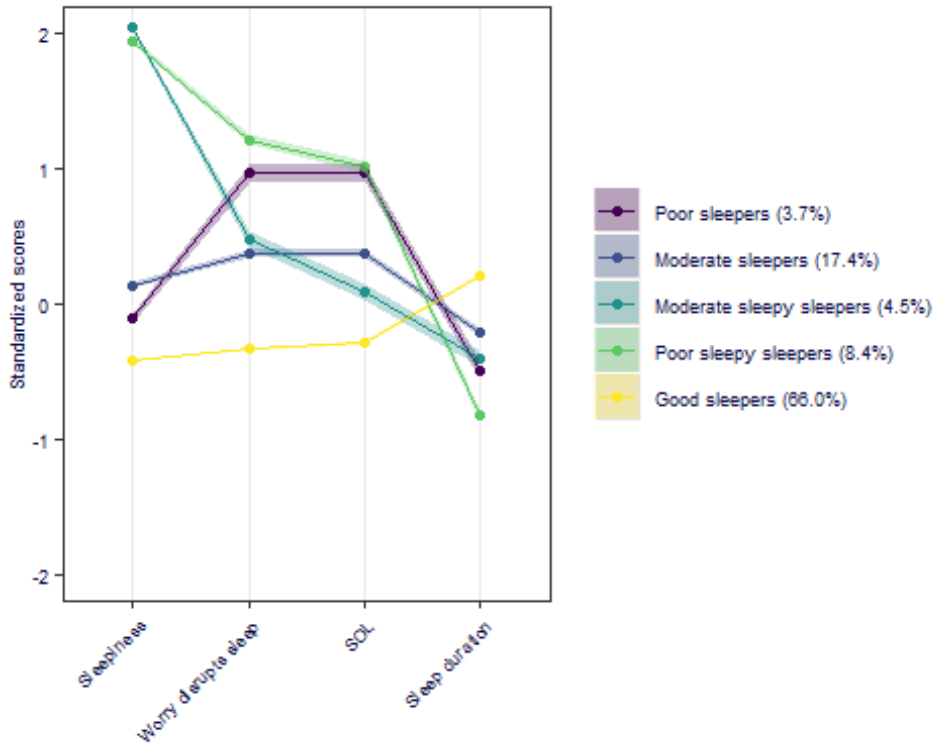
```
##                Overall
## 1             (N=27802)
## 2    Class
## 3   Class1   1037 (3.7%)
## 4   Class2  4825 (17.4%)
## 5   Class3   1250 (4.5%)
## 6   Class4   2335 (8.4%)
## 7   Class5 18355 (66.0%)
```

Graph classes

```
# create a percentage variable
merged$Class2 <- factor(merged$Class, levels = c("Class1", "Class2", "Class3", "Class4", "Class5"),
                        labels = c("Poor sleepers (3.7%)",
                           "Moderate sleepers (17.4%)",
                           "Moderate sleepy sleepers (4.5%)",
                           "Poor sleepy sleepers (8.4%)",
                           "Good sleepers (66.0%)"))

merged$SCI_02_S <- scale(merged$SCI_02, center = TRUE, scale = TRUE)
merged$sleepiness_S <- scale(merged$sleepiness_num, center = TRUE, scale = TRUE)
merged$worry_S <- scale(merged$worry_stops_sleep_num, center = TRUE, scale = TRUE)
merged$sol_S <- scale(merged$sol, center = TRUE, scale = TRUE)
merged$dur_S <- scale(merged$sch_sleep_duration, center = TRUE, scale = TRUE)

# separate graphs for class
# Select only columns that are needed:
data2 <- merged[,c("Class2", "SCI_02_S", "sleepiness_S", "worry_S", "sol_S", "dur_S", "ID")]
```

Scripts & Outputs *"Insomnia symptoms in children and adolescents: Screening for sleep problems with the Two-item Sleep Condition Indicator (SCI-02)"*

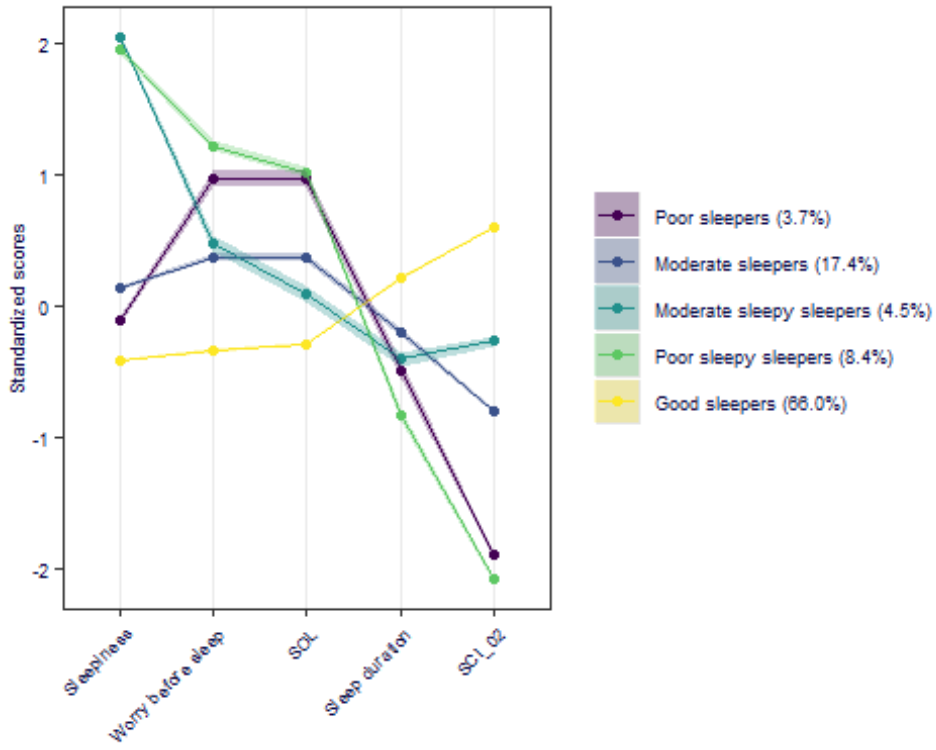
```
# Summary
summary(data2)

##                         Class2          SCI_02_S.V1       sleepiness_S.V1
##  Poor sleepers (3.7%)          : 1037   Min.   :-2.8248292   Min.   :-1.0538
##  Moderate sleepers (17.4%)     : 4825   1st Qu.:-0.4538482   1st Qu.:-1.0538
##  Moderate sleepy sleepers (4.5%): 1250   Median : 0.4945442   Median :-0.0717
##  Poor sleepy sleepers (8.4%)   : 2335   Mean   : 0.0000000   Mean   : 0.0000
##  Good sleepers (66.0%)         :18355   3rd Qu.: 0.9687404   3rd Qu.:-0.0717
##                                         Max.   : 0.9687404   Max.   : 2.8745
##                                                              NA's   :679
##    worry_S.V1         sol_S.V1          dur_S.V1           ID
##  Min.   :-1.2049   Min.   :-1.3912   Min.   :-3.152   Min.   :    1
##  1st Qu.:-1.2049   1st Qu.:-0.7475   1st Qu.:-0.612   1st Qu.: 6951
##  Median :-0.2923   Median :-0.4116   Median : 0.056   Median :13902
##  Mean   : 0.0000   Mean   : 0.0000   Mean   : 0.000   Mean   :13902
##  3rd Qu.: 0.6202   3rd Qu.: 0.6799   3rd Qu.: 0.683   3rd Qu.:20852
##  Max.   : 2.4452   Max.   : 2.1073   Max.   : 2.619   Max.   :27802
##  NA's   :1039      NA's   :1016      NA's   :3702

class(data2)

## [1] "data.frame"

## Long data: just indicators
long_data <- pivot_longer(data = data2,
  cols = sleepiness_S:dur_S,
  names_to ="scale",
  values_to = "measurement")

long_data$scale <- factor(long_data$scale, levels = c("sleepiness_S", "worry_S", "sol_S", "dur_S"),
                          labels = c("Sleepiness", "Worry disrupts sleep", "SOL", "Sleep duration"))

summary(long_data)

##                         Class2          SCI_02_S.V1           ID
##  Poor sleepers (3.7%)          : 4148   Min.   :-2.8248292   Min.   :    1
##  Moderate sleepers (17.4%)     :19300   1st Qu.:-0.4538482   1st Qu.: 6951
##  Moderate sleepy sleepers (4.5%): 5000   Median : 0.4945442   Median :13902
##  Poor sleepy sleepers (8.4%)   : 9340   Mean   : 0.0000000   Mean   :13902
##  Good sleepers (66.0%)         :73420   3rd Qu.: 0.9687404   3rd Qu.:20852
##                                         Max.   : 0.9687404   Max.   :27802
##
##                scale        measurement.V1
##  Sleepiness         :27802   Min.   :-3.152
##  Worry disrupts sleep:27802   1st Qu.:-0.810
##  SOL                :27802   Median :-0.072
##  Sleep duration     :27802   Mean   : 0.000
##                              3rd Qu.: 0.620
##                              Max.   : 2.875
##                              NA's   :6436

lineFig <- ggplot(long_data, aes(x=scale, y=measurement, group=Class2, colour=Class2, fill=Class2)) +
  stat_summary(fun=mean, geom="point") + stat_summary(fun=mean, geom="line") + stat_summary(fun.data = mean_cl_normal
, geom="ribbon", alpha = 0.3, colour=NA) + ylab(label= 'Standardized scores') + scale_colour_viridis_d() + scale_fill_viridis_d()
+ month_theme + coord_cartesian(ylim = c(-2,2))

lineFig
```



Investigate relationship with SCI-02

```
# graph
## Long data: with SCI-02
long_data <- pivot_longer(data = data2,
  cols = SCI_02_S:dur_S,
  names_to ="scale",
  values_to = "measurement")

long_data$scale <- factor(long_data$scale, levels = c("sleepiness_S", "worry_S", "sol_S", "dur_S", "SCI_02_S"),
                          labels = c("Sleepiness", "Worry before sleep", "SOL", "Sleep duration", "SCI_02"))

summary(long_data)

##                          Class2           ID
##  Poor sleepers (3.7%)          : 5185   Min.   :    1
##  Moderate sleepers (17.4%)     :24125   1st Qu.: 6951
##  Moderate sleepy sleepers (4.5%): 6250   Median :13902
##  Poor sleepy sleepers (8.4%)   :11675   Mean   :13902
##  Good sleepers (66.0%)         :91775   3rd Qu.:20852
##                                Max.   :27802
##
##              scale       measurement.V1
##  Sleepiness       :27802   Min.   :-3.152
##  Worry before sleep:27802   1st Qu.:-0.780
##  SOL              :27802   Median :-0.072
##  Sleep duration   :27802   Mean   : 0.000
##  SCI_02           :27802   3rd Qu.: 0.620
##                            Max.   : 2.875
##                            NA's   :6436

ggplot(long_data, aes(x=scale, y=measurement, group=Class2, colour=Class2, fill=Class2)) +
  stat_summary(fun=mean, geom="point")+stat_summary(fun=mean, geom="line")+ stat_summary(fun.data = mean_cl_normal,
geom="ribbon", alpha = 0.3, colour=NA) + ylab(label= 'Standardized scores') + scale_colour_viridis_d() + scale_fill_viridis_d() +
month_theme
```

Scripts & Outputs *"Insomnia symptoms in children and adolescents: Screening for sleep problems with the Two-item Sleep Condition Indicator (SCI-02)"*




```
# anova
SCI_02_comp <- aov(SCI_02 ~ Class2, data = merged)

summary(SCI_02_comp)

##               Df Sum Sq Mean Sq F value Pr(>F)
## Class2         4 105084   26271   39364 <2e-16 ***
## Residuals   27797  18551       1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

pairwise.t.test(merged$SCI_02, merged$Class2,
                p.adjust.method = "bonferroni")

##
##  Pairwise comparisons using t tests with pooled SD
##
## data:  merged$SCI_02 and merged$Class2
##
##                                Poor sleepers (3.7%) Moderate sleepers (17.4%)
## Moderate sleepers (17.4%)      <2e-16               -
## Moderate sleepy sleepers (4.5%) <2e-16              <2e-16
## Poor sleepy sleepers (8.4%)    <2e-16               <2e-16
## Good sleepers (66.0%)          <2e-16               <2e-16
##                                Moderate sleepy sleepers (4.5%)
## Moderate sleepers (17.4%)      -
## Moderate sleepy sleepers (4.5%) -
## Poor sleepy sleepers (8.4%)    <2e-16
## Good sleepers (66.0%)          <2e-16
##                                Poor sleepy sleepers (8.4%)
## Moderate sleepers (17.4%)      -
## Moderate sleepy sleepers (4.5%) -
## Poor sleepy sleepers (8.4%)    -
## Good sleepers (66.0%)          <2e-16
##
## P value adjustment method: bonferroni
```

Logistic regression

```
# Select only columns that are needed:
data3 <- merged[,c("Class", "Gender_dummy", "YEARGROUP_cat_dummy", "weight", "ID")]

predictors <- c('Gender_dummy', 'YEARGROUP_cat_dummy')

for(x in predictors){
  data3[,x] <- as.character(data3[,x])
}

# Summary
summary(data3)

##     Class       Gender_dummy       YEARGROUP_cat_dummy     weight
##  Class1: 1037   Length:27802       Length:27802        Min.   :0.3510
##  Class2: 4825   Class :character   Class :character    1st Qu.:0.8850
##  Class3: 1250   Mode  :character   Mode  :character    Median :0.9950
##  Class4: 2335                                         Mean   :0.9157
##  Class5:18355                                         3rd Qu.:1.0000
##                                                       Max.   :1.0000
##        ID
##  Min.   :    1
##  1st Qu.: 6951
##  Median :13902
##  Mean   :13902
##  3rd Qu.:20852
##  Max.   :27802

## Long data
data4 = mlogit.data(data3, choice = "Class", shape="wide")

# Model:
model_LR <- mlogit(Class ~ 1 | Gender_dummy + YEARGROUP_cat_dummy, data=data4, reflevel =  "Class5")

#summary
summary(model_LR)

##
## Call:
## mlogit(formula = Class ~ 1 | Gender_dummy + YEARGROUP_cat_dummy,
##     data = data4, reflevel = "Class5", method = "nr")
##
## Frequencies of alternatives:choice
##   Class5   Class1   Class2   Class3   Class4
## 0.660204 0.037299 0.173549 0.044961 0.083987
##
## nr method
## 7 iterations, 0h:0m:7s
## g'(-H)^-1g = 1.04E-05
## successive function values within tolerance limits
##
## Coefficients :
##                                Estimate Std. Error  z-value  Pr(>|z|)
## (Intercept):Class1            -2.349727   0.059826 -39.2761 < 2.2e-16 ***
## (Intercept):Class2            -1.061812   0.033331 -31.8564 < 2.2e-16 ***
## (Intercept):Class3            -3.137894   0.079848 -39.2985 < 2.2e-16 ***
## (Intercept):Class4            -2.389418   0.059998 -39.8249 < 2.2e-16 ***
## Gender_dummy1:Class1          -0.684501   0.067160 -10.1921 < 2.2e-16 ***
## Gender_dummy1:Class2          -0.506638   0.033142 -15.2869 < 2.2e-16 ***
## Gender_dummy1:Class3          -0.477822   0.060346  -7.9180 2.442e-15 ***
## Gender_dummy1:Class4          -0.984424   0.049116 -20.0429 < 2.2e-16 ***
## YEARGROUP_cat_dummy1:Class1 -0.458847   0.072667  -6.3144 2.713e-10 ***
## YEARGROUP_cat_dummy1:Class2 -0.114792   0.037669  -3.0474  0.002308 **
## YEARGROUP_cat_dummy1:Class3  0.594139   0.086180   6.8942 5.417e-12 ***
## YEARGROUP_cat_dummy1:Class4  0.691392   0.065404  10.5711 < 2.2e-16 ***
## YEARGROUP_cat_dummy2:Class1 -0.062002   0.088141  -0.7034  0.481785
## YEARGROUP_cat_dummy2:Class2  0.053350   0.047540   1.1222  0.261776
```

```
## YEARGROUP_cat_dummy2:Class3  1.339768   0.091165  14.6961 < 2.2e-16 ***
## YEARGROUP_cat_dummy2:Class4  1.313035   0.070679  18.5775 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Log-Likelihood: -28462
## McFadden R^2:  0.023353
## Likelihood ratio test : chisq = 1361.2 (p.value = < 2.22e-16)

exp(coefficients(model_LR)) ## risk ratio

##         (Intercept):Class1         (Intercept):Class2
##                  0.09539524                 0.34582845
##         (Intercept):Class3         (Intercept):Class4
##                  0.04337404                 0.09168299
##       Gender_dummy1:Class1       Gender_dummy1:Class2
##                  0.50434183                 0.60251763
##       Gender_dummy1:Class3       Gender_dummy1:Class4
##                  0.62013258                 0.37365447
## YEARGROUP_cat_dummy1:Class1 YEARGROUP_cat_dummy1:Class2
##                  0.63201174                 0.89155141
## YEARGROUP_cat_dummy1:Class3 YEARGROUP_cat_dummy1:Class4
##                  1.81147094                 1.99649191
## YEARGROUP_cat_dummy2:Class1 YEARGROUP_cat_dummy2:Class2
##                  0.93988144                 1.05479873
## YEARGROUP_cat_dummy2:Class3 YEARGROUP_cat_dummy2:Class4
##                  3.81815842                 3.71743742

exp(confint.default(model_LR))

##                                2.5 %    97.5 %
## (Intercept):Class1         0.08484043 0.1072632
## (Intercept):Class2         0.32395830 0.3691750
## (Intercept):Class3         0.03709057 0.0507220
## (Intercept):Class4         0.08151139 0.1031239
## Gender_dummy1:Class1       0.44213823 0.5752967
## Gender_dummy1:Class2       0.56462379 0.6429547
## Gender_dummy1:Class3       0.55095677 0.6979938
## Gender_dummy1:Class4       0.33936156 0.4114127
## YEARGROUP_cat_dummy1:Class1 0.54811380 0.7287517
## YEARGROUP_cat_dummy1:Class2 0.82809917 0.9598656
## YEARGROUP_cat_dummy1:Class3 1.52994298 2.1448034
## YEARGROUP_cat_dummy1:Class4 1.75628654 2.2695499
## YEARGROUP_cat_dummy2:Class1 0.79076449 1.1171179
## YEARGROUP_cat_dummy2:Class2 0.96095520 1.1578067
## YEARGROUP_cat_dummy2:Class3 3.19340534 4.5651373
## YEARGROUP_cat_dummy2:Class4 3.23654718 4.2697789
```

Produce a forest graph

```
oddsSleep <- broom::tidy(model_LR) # extract model estimates into a separate DF
oddsSleep$OR <- exp(coefficients(model_LR)) # extract and save ORs
oddsSleep$CI <- exp(confint.default(model_LR)) # extract and save CIs
oddsSleep$Class <- rep(c("C1",
                  "C2",
                  "C3",
                  "C4"), 4) # create a new variable for class

# might want to adjust these but a place holder for now
oddsSleep$Class <- factor(oddsSleep$Class,
                    levels = c("C1",
                  "C2",
                  "C3",
                  "C4",
                  "C5"),
                  labels = c("Poor sleepers",
                             "Moderate sleepers",
                             "Moderate sleepy sleepers",
                             "Poor sleepy sleepers",
```

```
                          "Good sleepers"))

oddsSleep$term <- gsub("\\:.*","", oddsSleep$term) # remove class name from the effects

oddsSleep <- dplyr::filter(oddsSleep, term!="(Intercept)") # remove intercept values

#write.table(oddsSleep, file="oddsNon-gamers.csv", row.names=F, sep=",")


oddsSleep$effect <- rep(c("Gender: Boy (vs. Girl)",
                          "Year: 7-9 (vs. 5-6)",
                          "Year: 10-13 (vs. 5-6)"),
                        each=4) # create a new variable for class

# Relevel effect factor
oddsSleep$effect <- factor(oddsSleep$effect,
                           levels = c("Gender: Boy (vs. Girl)",
                           "Year: 7-9 (vs. 5-6)",
                           "Year: 10-13 (vs. 5-6)"))

forestStr <- ggplot(oddsSleep, aes(y=effect,x=OR,colour=Class))+
  geom_pointrangeh(aes(xmin=CI[,1],
                       xmax=CI[,2]),
    position=position_dodgev(height=0.75)) + scale_y_discrete(limits=rev) + geom_vline(xintercept=1, linetype=2, color = "grey")
+ labs(x = "Odds Ratio", y=element_blank()) + theme_few() +  theme(axis.text.x = element_text(hjust=0.5, vjust=1, size=7, family
="Serif"), axis.title.x = element_text(size=7, family="Serif"), axis.text.y = element_text(size=7, family="Serif"), axis.title.y = element
_text(size=7, family="Serif"), legend.title = element_blank(), legend.text = element_text(size=7, family="Serif"), legend.position="ri
ght") + scale_x_log10() + scale_colour_viridis_d()

print(forestStr)
```