MPLUS Analysis Examples Replication Chapter 9

Mplus includes all input code and output in the *.out file. This document contains selected output from each analysis for Chapter 9. All data preparation and management was done using SAS and then read into Mplus using a text file format produced by SAS. Plots can be produced in MPlus with additional coding but are not included here, see the Mplus documentation for details and examples.

Some options available in Stata or other software presented in Chapter 9 including multi-parameter tests, GOF tests, margins plots prepared via a simple command using model output, and design-adjusted model fit statistics are not available in Mplus. They are, therefore, not included in this document. In addition, in this chapter we omit the test of model parameters and focus on final models instead. See Chapter 8 for examples of full-blown testing of groups of model predictors.

Mplus VERSION 7.4
MUTHEN & MUTHEN
04/09/2025   7:21 AM

INPUT INSTRUCTIONS

```
  TITLE: ASDA3 ANALYSIS EXAMPLE SECTION 9.2.6 MULTINOMIAL LOGISTIC REG MODEL
   DATA:
   FILE IS "P:\asda3\replication mplus\ncsr.txt";

   VARIABLE:
   NAMES ARE
   AGE CASEID DSM_SO ED4CAT MAR3CAT MDE_OND NCSRWTLG NCSRWTSH OBESE6CA
   REGION SECLUSTR SESTRAT SEX
   SO_OND WKSTAT3C ag60 ag1829 ag3044 ag4559 ag4cat ald ed011 ed12 ed16
   ed1315 married mde nevmar
   numsecu prevmar racecat sexf sexm;

   USEVARIABLES ARE
   SESTRAT NUMSECU NCSRWTLG AG3044 AG4559 AG60 SEXM ALD MDE ED12 ED1315 ED16
   PREVMAR NEVMAR WKSTAT3C WKST3CR ;

   missing are . ;
   weight is ncsrwtlg ;
   stratification is sestrat ;
   cluster is numsecu ;
   nominal is wkst3cr ;

   DEFINE:
   if wkstat3c==1 then wkst3cr=3 ;
   if wkstat3c==2 then wkst3cr=2 ;
   if wkstat3c==3 then wkst3cr=1 ;

   ANALYSIS:
   type is complex;
   estimator is mlr ;

   Model:
   WKST3CR on
   AG3044  AG4559 AG60 SEXM ALD MDE ED12 ED1315 ED16 PREVMAR NEVMAR ;

  Output: cinterval ;
```

```
*** WARNING in MODEL command
  Variable is uncorrelated with all other variables:  WKSTAT3C
*** WARNING in MODEL command
  At least one variable is uncorrelated with all other variables in the model.
  Check that this is what is intended.
*** WARNING
```

```
  Data set contains cases with missing on all variables except
  x-variables.  These cases were not included in the analysis.
  Number of cases with missing on all variables except x-variables:  2649
   3 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS



ASDA3 ANALYSIS EXAMPLE SECTION 9.2.6 MULTINOMIAL LOGISTIC REG MODEL

SUMMARY OF ANALYSIS

Number of groups                                                 1
Number of observations                                        6633

Number of dependent variables                                    2
Number of independent variables                                 11
Number of continuous latent variables                            0

Observed dependent variables

  Continuous
   WKSTAT3C

  Unordered categorical (nominal)
   WKST3CR

Observed independent variables
   AG3044      AG4559      AG60        SEXM        ALD         MDE
   ED12        ED1315      ED16        PREVMAR     NEVMAR

Variables with special functions

  Stratification        SESTRAT
  Cluster variable      NUMSECU
  Weight variable       NCSRWTLG

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-02
    Relative loglikelihood change                      0.100D-05
    Derivative                                         0.100D-02
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-02
  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-02
  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
Integration Specifications
  Type                                                 STANDARD
  Number of integration points                               15
  Dimensions of numerical integration                         0
  Adaptive quadrature                                        ON
Cholesky                                                    OFF

Input data file(s)
  P:\asda3\replication mplus\ncsr.txt
Input data format  FREE


SUMMARY OF DATA

     Number of missing data patterns             1
     Number of strata                       42
     Number of clusters                     84


COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100


     PROPORTION OF DATA PRESENT FOR Y


           Covariance Coverage
              WKSTAT3C       AG3044         AG4559         AG60           SEXM
              ________       ________       ________       ________       ________
 WKSTAT3C       1.000
 AG3044         1.000          1.000
 AG4559         1.000          1.000          1.000
 AG60           1.000          1.000          1.000          1.000
 SEXM           1.000          1.000          1.000          1.000          1.000
 ALD            1.000          1.000          1.000          1.000          1.000
 MDE            1.000          1.000          1.000          1.000          1.000
 ED12           1.000          1.000          1.000          1.000          1.000
 ED1315         1.000          1.000          1.000          1.000          1.000
 ED16           1.000          1.000          1.000          1.000          1.000
 PREVMAR        1.000          1.000          1.000          1.000          1.000
 NEVMAR         1.000          1.000          1.000          1.000          1.000


           Covariance Coverage
              ALD            MDE            ED12           ED1315         ED16
              ________       ________       ________       ________       ________
 ALD            1.000
 MDE            1.000          1.000
 ED12           1.000          1.000          1.000
 ED1315         1.000          1.000          1.000          1.000
 ED16           1.000          1.000          1.000          1.000          1.000
 PREVMAR        1.000          1.000          1.000          1.000          1.000
```

NEVMAR	1.000	1.000	1.000	1.000	1.000

Covariance Coverage

	PREVMAR	NEVMAR
PREVMAR	1.000	
NEVMAR	1.000	1.000

UNIVARIATE PROPORTIONS AND COUNTS FOR CATEGORICAL VARIABLES

WKST3CR

Category 1	0.301	1996.620
Category 2	0.051	339.208
Category 3	0.648	4297.172

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 26

Loglikelihood

H0 Value	-13090.539
H0 Scaling Correction Factor for MLR	1.9565

Information Criteria

Akaike (AIC)	26233.079
Bayesian (BIC)	26409.874
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	26327.252

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
WKST3CR#1 ON				
AG3044	-0.316	0.129	-2.457	0.014
AG4559	0.065	0.171	0.380	0.704
AG60	2.381	0.173	13.729	0.000
SEXM	-0.640	0.110	-5.818	0.000
ALD	0.333	0.130	2.559	0.011
MDE	0.099	0.088	1.120	0.263
ED12	-0.651	0.141	-4.619	0.000
ED1315	-0.917	0.146	-6.259	0.000
ED16	-1.230	0.160	-7.704	0.000
PREVMAR	-0.052	0.105	-0.498	0.619
NEVMAR	0.553	0.132	4.176	0.000

WKST3CR#2 ON				
AG3044	-0.852	0.295	-2.894	0.004
AG4559	-0.838	0.258	-3.246	0.001
AG60	1.828	0.295	6.204	0.000
SEXM	-1.393	0.198	-7.049	0.000
ALD	-0.164	0.357	-0.459	0.646
MDE	-0.140	0.157	-0.889	0.374
ED12	-0.847	0.235	-3.598	0.000
ED1315	-1.365	0.258	-5.302	0.000
ED16	-1.731	0.310	-5.575	0.000
PREVMAR	-0.590	0.225	-2.619	0.009
NEVMAR	-2.785	0.380	-7.323	0.000
Means				
WKSTAT3C	1.653	0.019	86.686	0.000
Intercepts				
WKST3CR#1	-0.379	0.173	-2.194	0.028
WKST3CR#2	-0.644	0.296	-2.174	0.030
Variances				
WKSTAT3C	0.829	0.013	62.571	0.000

LOGISTIC REGRESSION ODDS RATIO RESULTS

WKST3CR#1 ON	
AG3044	0.729
AG4559	1.067
AG60	10.811
SEXM	0.527
ALD	1.395
MDE	1.104
ED12	0.521
ED1315	0.400
ED16	0.292
PREVMAR	0.949
NEVMAR	1.738
WKST3CR#2 ON	
AG3044	0.426
AG4559	0.433
AG60	6.224
SEXM	0.248
ALD	0.849
MDE	0.870
ED12	0.429
ED1315	0.255
ED16	0.177
PREVMAR	0.554
NEVMAR	0.062

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix (ratio of smallest to largest eigenvalue)	0.815E-03

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
WKST3CR# ON							
AG3044	-0.648	-0.569	-0.528	-0.316	-0.105	-0.064	0.015
AG4559	-0.375	-0.270	-0.216	0.065	0.346	0.400	0.505
AG60	1.934	2.041	2.095	2.381	2.666	2.720	2.827
SEXM	-0.924	-0.856	-0.821	-0.640	-0.459	-0.425	-0.357
ALD	-0.002	0.078	0.119	0.333	0.547	0.589	0.669
MDE	-0.128	-0.074	-0.046	0.099	0.243	0.271	0.325
ED12	-1.015	-0.928	-0.883	-0.651	-0.419	-0.375	-0.288
ED1315	-1.294	-1.204	-1.158	-0.917	-0.676	-0.630	-0.540
ED16	-1.641	-1.542	-1.492	-1.230	-0.967	-0.917	-0.818
PREVMAR	-0.323	-0.258	-0.225	-0.052	0.120	0.154	0.218
NEVMAR	0.212	0.293	0.335	0.553	0.771	0.812	0.894
WKST3CR# ON							
AG3044	-1.611	-1.430	-1.337	-0.852	-0.368	-0.275	-0.094
AG4559	-1.503	-1.344	-1.262	-0.838	-0.413	-0.332	-0.173
AG60	1.069	1.251	1.344	1.828	2.313	2.406	2.587
SEXM	-1.902	-1.781	-1.718	-1.393	-1.068	-1.006	-0.884
ALD	-1.083	-0.863	-0.751	-0.164	0.423	0.536	0.756
MDE	-0.545	-0.448	-0.398	-0.140	0.119	0.168	0.265
ED12	-1.453	-1.308	-1.234	-0.847	-0.460	-0.386	-0.241
ED1315	-2.029	-1.870	-1.789	-1.365	-0.942	-0.861	-0.702
ED16	-2.531	-2.340	-2.242	-1.731	-1.220	-1.122	-0.931
PREVMAR	-1.170	-1.031	-0.960	-0.590	-0.219	-0.148	-0.010
NEVMAR	-3.764	-3.530	-3.410	-2.785	-2.159	-2.039	-1.805
Means							
WKSTAT3C	1.604	1.616	1.622	1.653	1.685	1.691	1.702
Intercepts							
WKST3CR#1	-0.825	-0.718	-0.664	-0.379	-0.095	-0.041	0.066
WKST3CR#2	-1.406	-1.224	-1.131	-0.644	-0.157	-0.063	0.119
Variances							
WKSTAT3C	0.794	0.803	0.807	0.829	0.850	0.855	0.863

CONFIDENCE INTERVALS FOR THE LOGISTIC REGRESSION ODDS RATIO RESULTS

WKST3CR# ON							
AG3044	0.523	0.566	0.590	0.729	0.901	0.938	1.015
AG4559	0.687	0.763	0.806	1.067	1.414	1.492	1.657
AG60	6.917	7.696	8.128	10.811	14.380	15.187	16.899
SEXM	0.397	0.425	0.440	0.527	0.632	0.654	0.700
ALD	0.998	1.081	1.126	1.395	1.729	1.801	1.952
MDE	0.880	0.929	0.955	1.104	1.275	1.311	1.384
ED12	0.363	0.395	0.413	0.521	0.657	0.687	0.750
ED1315	0.274	0.300	0.314	0.400	0.509	0.533	0.583
ED16	0.194	0.214	0.225	0.292	0.380	0.400	0.441
PREVMAR	0.724	0.773	0.799	0.949	1.128	1.166	1.244
NEVMAR	1.236	1.341	1.398	1.738	2.161	2.253	2.444
WKST3CR# ON							
AG3044	0.200	0.239	0.263	0.426	0.692	0.760	0.911

AG4559	0.223	0.261	0.283	0.433	0.662	0.718	0.841
AG60	2.913	3.493	3.833	6.224	10.106	11.089	13.296
SEXM	0.149	0.169	0.179	0.248	0.344	0.366	0.413
ALD	0.339	0.422	0.472	0.849	1.527	1.709	2.129
MDE	0.580	0.639	0.671	0.870	1.126	1.183	1.304
ED12	0.234	0.270	0.291	0.429	0.631	0.680	0.786
ED1315	0.132	0.154	0.167	0.255	0.390	0.423	0.496
ED16	0.080	0.096	0.106	0.177	0.295	0.325	0.394
PREVMAR	0.310	0.357	0.383	0.554	0.803	0.862	0.990
NEVMAR	0.023	0.029	0.033	0.062	0.115	0.130	0.164

DIAGRAM INFORMATION

  Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
  If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

  Diagram output
    p:\asda3\replication mplus\chapter 9\c9 multinomial logistic regression with ci.dgm

     Beginning Time: 07:21:43
        Ending Time: 07:21:46
       Elapsed Time: 00:00:03

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```
!NOTE: Tests of Variable groups are not included in this example, see Chapters 7 and 8 for how to execute tests
of this type.  Margins plots are not easily done in Mplus, see documentation for more. Alternative Bayesian
Approach is also not available with type=complex.
```

Mplus VERSION 7.4
MUTHEN & MUTHEN
04/09/2025   7:56 AM

INPUT INSTRUCTIONS

```
  TITLE: ASDA3 ANALYSIS EXAMPLE SECTION 9.3.6 ORDINAL REGRESSION FINAL MODEL
   DATA:
   FILE IS "P:\ASDA3\Replication Mplus\russia.txt";

   VARIABLE:
   NAMES ARE
   AGEA DWEIGHT EISCED GNDR PSPWGHT STFECO STFLIFE TRSTPLC TVTOT VOTE ag60
   ag1529 ag3044 ag4559 agecat idno male marcat married nevmar
   numstratify prevmar psu stflife2 stflife2r stratify ;

   USEVARIABLES ARE
   PSPWGHT ag60 ag1529 ag3044 ag4559 male married nevmar prevmar
   psu stflife2 numstratify ;

   missing are . ;
   weight is pspwght ;
   stratification is numstratify ;
   cluster is psu ;
   categorical is stflife2 ;

   ANALYSIS:
   type is complex;
   estimator is mlr ;

   Model:
   stflife2 on
   AG3044 AG4559 AG60 male prevmar nevmar ;

   Output: cinterval ;
```

```
*** WARNING in MODEL command
  Variable is uncorrelated with all other variables:  AG1529
*** WARNING in MODEL command
  Variable is uncorrelated with all other variables:  MARRIED
*** WARNING in MODEL command
  At least one variable is uncorrelated with all other variables in the model.
  Check that this is what is intended.
*** WARNING
  Data set contains cases with missing on x-variables.
  These cases were not included in the analysis.
  Number of cases with missing on x-variables:  45
   4 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS
```

ASDA3 ANALYSIS EXAMPLE SECTION 9.3.6 ORDINAL REGRESSION FINAL MODEL

SUMMARY OF ANALYSIS

Number of groups	1
Number of observations	2439

```
Number of dependent variables                                    3
Number of independent variables                                  6
Number of continuous latent variables                            0

Observed dependent variables

  Continuous
   AG1529      MARRIED

  Binary and ordered categorical (ordinal)
   STFLIFE2

Observed independent variables
   AG60        AG3044      AG4559      MALE        NEVMAR      PREVMAR

Variables with special functions

  Stratification        NUMSTRAT
  Cluster variable      PSU
  Weight variable       PSPWGHT

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-02
    Relative loglikelihood change                         0.100D-05
    Derivative                                            0.100D-02
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-02
  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-02
  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
Integration Specifications
  Type                                                     STANDARD
  Number of integration points                                    15
  Dimensions of numerical integration                              0
  Adaptive quadrature                                             ON
Link                                                           LOGIT
Cholesky                                                         OFF
```

Input data file(s)
  P:\ASDA3\Replication Mplus\russia.txt
Input data format FREE

SUMMARY OF DATA

     Number of missing data patterns   2
     Number of y missing data patterns   1
     Number of u missing data patterns   2
     Number of strata   8
     Number of clusters   184

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value   0.100

     PROPORTION OF DATA PRESENT

           Covariance Coverage
              STFLIFE2   AG1529   MARRIED   AG60   AG3044
              ________   ________   ________   ________   ________
 STFLIFE2   0.990
 AG1529   0.990   1.000
 MARRIED   0.990   1.000   1.000
 AG60   0.990   1.000   1.000   1.000
 AG3044   0.990   1.000   1.000   1.000   1.000
 AG4559   0.990   1.000   1.000   1.000   1.000
 MALE   0.990   1.000   1.000   1.000   1.000
 NEVMAR   0.990   1.000   1.000   1.000   1.000
 PREVMAR   0.990   1.000   1.000   1.000   1.000

           Covariance Coverage
              AG4559   MALE   NEVMAR   PREVMAR
              ________   ________   ________   ________
 AG4559   1.000
 MALE   1.000   1.000
 NEVMAR   1.000   1.000   1.000
 PREVMAR   1.000   1.000   1.000   1.000

     PROPORTION OF DATA PRESENT FOR U

           Covariance Coverage
              STFLIFE2
              ____
 STFLIFE2   0.990

     PROPORTION OF DATA PRESENT FOR Y

           Covariance Coverage
              AG1529   MARRIED   AG60   AG3044   AG4559

AG1529	1.000				
MARRIED	1.000	1.000			
AG60	1.000	1.000	1.000		
AG3044	1.000	1.000	1.000	1.000	
AG4559	1.000	1.000	1.000	1.000	1.000
MALE	1.000	1.000	1.000	1.000	1.000
NEVMAR	1.000	1.000	1.000	1.000	1.000
PREVMAR	1.000	1.000	1.000	1.000	1.000

Covariance Coverage

	MALE	NEVMAR	PREVMAR
MALE	1.000		
NEVMAR	1.000	1.000	
PREVMAR	1.000	1.000	1.000

UNIVARIATE PROPORTIONS AND COUNTS FOR CATEGORICAL VARIABLES

STFLIFE2

Category 1	0.046	110.649
Category 2	0.197	476.064
Category 3	0.208	500.827
Category 4	0.427	1031.110
Category 5	0.122	293.627

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 14

Loglikelihood

H0 Value	-6619.964
H0 Scaling Correction Factor for MLR	1.6860

Information Criteria

Akaike (AIC)	13267.928
Bayesian (BIC)	13349.119
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	13304.638

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
STFLIFE2 ON				
AG3044	-0.529	0.136	-3.888	0.000
AG4559	-0.746	0.143	-5.202	0.000
AG60	-0.808	0.166	-4.879	0.000
MALE	-0.110	0.095	-1.151	0.250
PREVMAR	-0.209	0.105	-1.981	0.048
NEVMAR	-0.137	0.132	-1.039	0.299
Means				
AG1529	0.274	0.015	18.824	0.000
MARRIED	0.505	0.013	39.159	0.000
Thresholds				
STFLIFE2$1	-3.711	0.214	-17.307	0.000
STFLIFE2$2	-1.793	0.167	-10.747	0.000
STFLIFE2$3	-0.835	0.159	-5.243	0.000
STFLIFE2$4	1.384	0.154	9.009	0.000
Variances				
AG1529	0.199	0.007	30.200	0.000
MARRIED	0.250	0.000	2070.283	0.000

LOGISTIC REGRESSION ODDS RATIO RESULTS

STFLIFE2 ON	
AG3044	0.589
AG4559	0.474
AG60	0.446
MALE	0.896
PREVMAR	0.811
NEVMAR	0.872

BRANT WALD TEST FOR PROPORTIONAL ODDS

	Chi-Square	Degrees of Freedom	P-Value
STFLIFE2			
Overall test	27.294	18	0.074
AG60	8.340	3	0.039
AG3044	1.504	3	0.681
AG4559	1.759	3	0.624
MALE	9.157	3	0.027
NEVMAR	6.636	3	0.084
PREVMAR	2.319	3	0.509

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix (ratio of smallest to largest eigenvalue)	0.360E-03

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
STFLIFE2 ON							
AG3044	-0.880	-0.796	-0.753	-0.529	-0.305	-0.262	-0.179
AG4559	-1.115	-1.026	-0.981	-0.746	-0.510	-0.465	-0.376
AG60	-1.235	-1.133	-1.081	-0.808	-0.536	-0.483	-0.381
MALE	-0.355	-0.296	-0.266	-0.110	0.047	0.077	0.136
PREVMAR	-0.480	-0.416	-0.382	-0.209	-0.035	-0.002	0.063
NEVMAR	-0.477	-0.396	-0.354	-0.137	0.080	0.122	0.203
Means							
AG1529	0.236	0.245	0.250	0.274	0.298	0.302	0.311
MARRIED	0.471	0.479	0.483	0.505	0.526	0.530	0.538
Thresholds							
STFLIFE2$1	-4.263	-4.131	-4.064	-3.711	-3.358	-3.291	-3.159
STFLIFE2$2	-2.223	-2.120	-2.067	-1.793	-1.518	-1.466	-1.363
STFLIFE2$3	-1.245	-1.147	-1.097	-0.835	-0.573	-0.523	-0.425
STFLIFE2$4	0.988	1.083	1.131	1.384	1.637	1.685	1.780
Variances							
AG1529	0.182	0.186	0.188	0.199	0.210	0.212	0.216
MARRIED	0.250	0.250	0.250	0.250	0.250	0.250	0.250

CONFIDENCE INTERVALS FOR THE LOGISTIC REGRESSION ODDS RATIO RESULTS

STFLIFE2 ON							
AG3044	0.415	0.451	0.471	0.589	0.737	0.769	0.836
AG4559	0.328	0.358	0.375	0.474	0.601	0.628	0.686
AG60	0.291	0.322	0.339	0.446	0.585	0.617	0.683
MALE	0.701	0.744	0.766	0.896	1.048	1.080	1.145
PREVMAR	0.619	0.660	0.682	0.811	0.965	0.998	1.065
NEVMAR	0.620	0.673	0.702	0.872	1.083	1.129	1.225

DIAGRAM INFORMATION

Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

Diagram output
p:\asda3\replication mplus\chapter 9\c9 ordinal logistic regression with russia data.dgm

Beginning Time: 07:56:47
Ending Time: 07:56:49
Elapsed Time: 00:00:02

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Mplus VERSION 7.4
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04/09/2025   8:30 AM

INPUT INSTRUCTIONS

```
   TITLE: ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 POISSON REGRESSION MODEL
   DATA:
   FILE IS "P:\asda3\replication mplus\hrs2012.txt";
   VARIABLE:
   NAMES ARE
   H11ATOTA H11ITOT R11BMI age65p arthritis bmi_c diabetes edcat gender
   hhid male marcat nage nage_c nfinr numfalls24 numsecu
   nwgthh nwgtr offset24 pn racecat secu stratum;

   USEVARIABLES ARE
   NUMSECU NWGTR STRATUM NUMFALLS24 MALE NAGE_C ARTHRITIS DIABETES BMI_C ;
   missing are . ;
   WEIGHT IS NWGTR ;
   stratification is STRATUM ;
   cluster is NUMSECU ;
   count is NUMFALLS24 ;
   subpopulation =(age65p==1) ;

   ANALYSIS:
   type is complex;
   estimator is mlr ;
  ! Note that Mplus does not offer Odds Ratios, can be done manually (exp)
   Model:
   numfalls24 on male MALE NAGE_C ARTHRITIS DIABETES BMI_C ;

   Output:
   cinterval;
```

```
*** WARNING in VARIABLE command
  Note that only the first 8 characters of variable names are used in the output.
  Shorten variable names to avoid any confusion.
*** WARNING
  Data set contains cases with missing on x-variables.
  These cases were not included in the analysis.
  Number of cases with missing on x-variables:  349
*** WARNING
  Data set contains cases with missing on all variables except
  x-variables.  These cases were not included in the analysis.
  Number of cases with missing on all variables except x-variables:  9749
   3 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS
```

ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 POISSON REGRESSION MODEL

SUMMARY OF ANALYSIS

Number of groups	1
Number of observations	10455
Number of dependent variables	1
Number of independent variables	5
Number of continuous latent variables	0

```
Observed dependent variables

  Count
   NUMFALLS

Observed independent variables
   MALE        NAGE_C      ARTHRITI    DIABETES    BMI_C

Variables with special functions

  Stratification        STRATUM
  Cluster variable      NUMSECU
  Weight variable       NWGTR

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-02
    Relative loglikelihood change                 0.100D-05
    Derivative                                    0.100D-02
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-02
  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-02
  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
Integration Specifications
  Type                                             STANDARD
  Number of integration points                            15
  Dimensions of numerical integration                      0
  Adaptive quadrature                                     ON
Cholesky                                                 OFF

Input data file(s)
  P:\asda3\replication mplus\hrs2012.txt
Input data format  FREE


SUMMARY OF DATA

     Number of strata                        55
```

Number of clusters 108

COUNT PROPORTION OF ZERO, MINIMUM AND MAXIMUM VALUES

NUMFALLS	0.347	0	50

WARNING: THE VARIANCE CONTRIBUTION FROM A STRATUM WITH A SINGLE CLUSTER (PSU) IS BASED ON THE DIFFERENCE BETWEEN THE SINGLE CLUSTER VALUE AND THE OVERALL CLUSTER MEAN.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 6

Loglikelihood

H0 Value	-22848.147
H0 Scaling Correction Factor for MLR	15.3227

Information Criteria

Akaike (AIC)	45708.294
Bayesian (BIC)	45751.823
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	45732.756

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
NUMFALLS24 ON				
MALE	0.257	0.080	3.195	0.001
NAGE_C	0.015	0.004	3.315	0.001
ARTHRITIS	0.736	0.077	9.514	0.000
DIABETES	0.248	0.070	3.526	0.000
BMI_C	0.004	0.008	0.491	0.623
Intercepts				
NUMFALLS24	-0.636	0.074	-8.546	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.110E-02
(ratio of smallest to largest eigenvalue)

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
NUMFALLS ON							
MALE	0.050	0.099	0.125	0.257	0.390	0.415	0.464
NAGE_C	0.003	0.006	0.007	0.015	0.022	0.023	0.026
ARTHRITIS	0.537	0.585	0.609	0.736	0.863	0.888	0.935
DIABETES	0.067	0.110	0.132	0.248	0.363	0.385	0.428
BMI_C	-0.018	-0.012	-0.010	0.004	0.018	0.021	0.026
Intercepts							
NUMFALLS24	-0.827	-0.781	-0.758	-0.636	-0.513	-0.490	-0.444

DIAGRAM INFORMATION

Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

Diagram output
p:\asda3\replication mplus\chapter 9\c9 poisson regression with hrs data .dgm

Beginning Time: 08:30:09
Ending Time: 08:30:12
Elapsed Time: 00:00:03

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Mplus VERSION 7.4
MUTHEN & MUTHEN
04/09/2025 8:34 AM

INPUT INSTRUCTIONS

```
   TITLE: ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 NB REGRESSION MODEL
   DATA:
   FILE IS "P:\asda3\replication mplus\hrs2012.txt";
   VARIABLE:
   NAMES ARE
   H11ATOTA H11ITOT R11BMI age65p arthritis bmi_c diabetes edcat gender
   hhid male marcat nage nage_c nfinr numfalls24 numsecu
   nwgthh nwgtr offset24 pn racecat secu stratum;

   USEVARIABLES ARE
   NUMSECU NWGTR STRATUM NUMFALLS24 MALE NAGE_C ARTHRITIS DIABETES BMI_C ;
   missing are . ;
   WEIGHT IS NWGTR ;
   stratification is STRATUM ;
   cluster is NUMSECU ;
   count is NUMFALLS24 (NB) ;
   subpopulation =(age65p==1) ;

   ANALYSIS:
   type is complex;
   estimator is mlr ;
  ! Note that Mplus does not offer Odds Ratios, can be done manually (exp)
   Model:
   numfalls24 on MALE NAGE_C ARTHRITIS DIABETES BMI_C ;

   Output:
   cinterval;
```

```
*** WARNING in VARIABLE command
  Note that only the first 8 characters of variable names are used in the output.
  Shorten variable names to avoid any confusion.
*** WARNING
  Data set contains cases with missing on x-variables.
  These cases were not included in the analysis.
  Number of cases with missing on x-variables:  349
*** WARNING
  Data set contains cases with missing on all variables except
  x-variables.  These cases were not included in the analysis.
  Number of cases with missing on all variables except x-variables:  9749
   3 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS
```

ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 NB REGRESSION MODEL

SUMMARY OF ANALYSIS

Number of groups 1
Number of observations 10455

Number of dependent variables 1
Number of independent variables 5
Number of continuous latent variables 0

Observed dependent variables

  Count
   NUMFALLS24

Observed independent variables
   MALE NAGE_C ARTHRITI DIABETES BMI_C

Variables with special functions

  Stratification STRATUM
  Cluster variable NUMSECU
  Weight variable NWGTR

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-02
    Relative loglikelihood change 0.100D-05
    Derivative 0.100D-02
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-02
  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-02
  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
Integration Specifications
  Type STANDARD
  Number of integration points 15
  Dimensions of numerical integration 0
  Adaptive quadrature ON

Cholesky OFF

Input data file(s)
  P:\asda3\replication mplus\hrs2012.txt
Input data format FREE

SUMMARY OF DATA

     Number of strata   55
     Number of clusters   108

COUNT PROPORTION OF ZERO, MINIMUM AND MAXIMUM VALUES

      NUMFALLS   0.347   0   50

     WARNING: THE VARIANCE CONTRIBUTION FROM A STRATUM WITH A SINGLE CLUSTER
     (PSU) IS BASED ON THE DIFFERENCE BETWEEN THE SINGLE CLUSTER VALUE AND
     THE OVERALL CLUSTER MEAN.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters   7

Loglikelihood

          H0 Value   -13622.212
          H0 Scaling Correction Factor   2.7709
            for MLR

Information Criteria

          Akaike (AIC)   27258.425
          Bayesian (BIC)   27309.209
          Sample-Size Adjusted BIC   27286.964
            (n* = (n + 2) / 24)

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
NUMFALLS24 ON				
MALE	0.237	0.081	2.906	0.004
NAGE_C	0.016	0.004	3.888	0.000
ARTHRITIS	0.742	0.079	9.406	0.000
DIABETES	0.260	0.069	3.801	0.000
BMI_C	0.001	0.007	0.202	0.840
Intercepts				
NUMFALLS24	-0.634	0.079	-8.071	0.000
Dispersion				
NUMFALLS24	3.824	0.168	22.722	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.777E-03
(ratio of smallest to largest eigenvalue)

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
NUMFALLS ON							
MALE	0.027	0.077	0.103	0.237	0.371	0.396	0.447
NAGE_C	0.005	0.008	0.009	0.016	0.023	0.024	0.027
ARTHRITIS	0.539	0.587	0.612	0.742	0.872	0.896	0.945
DIABETES	0.084	0.126	0.148	0.260	0.373	0.395	0.437
BMI_C	-0.016	-0.012	-0.010	0.001	0.012	0.014	0.018
Intercepts							
NUMFALLS24	-0.837	-0.788	-0.764	-0.634	-0.505	-0.480	-0.432
Dispersion							
NUMFALLS24	3.390	3.494	3.547	3.824	4.101	4.154	4.257

DIAGRAM INFORMATION
Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
If running Mplus from the Mplus Diagrammer, the diagram opens automatically.
Diagram output
p:\asda3\replication mplus\chapter 9\c9 negative binonmial regression with hrs data .dgm

Beginning Time: 08:34:29
Ending Time: 08:34:32
Elapsed Time: 00:00:03

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Mplus VERSION 7.4
MUTHEN & MUTHEN
04/09/2025   8:42 AM

INPUT INSTRUCTIONS

```
   TITLE: ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 ZERO INF NB REGRESSION MODEL
   DATA:
   FILE IS "P:\asda3\replication mplus\hrs2012.txt";
   VARIABLE:
   NAMES ARE
   H11ATOTA H11ITOT R11BMI age65p arthritis bmi_c diabetes edcat gender
   hhid male marcat nage nage_c nfinr numfalls24 numsecu
   nwgthh nwgtr offset24 pn racecat secu stratum;

   USEVARIABLES ARE
   NUMSECU NWGTR STRATUM NUMFALLS24 MALE NAGE_C ARTHRITIS DIABETES BMI_C ;
   missing are . ;
   WEIGHT IS NWGTR ;
   stratification is STRATUM ;
   cluster is NUMSECU ;
   count is NUMFALLS24 (NBI) ;
   subpopulation =(age65p==1) ;

  ANALYSIS:
   type is complex;
   estimator is mlr ;
   Model:
   numfalls24 on MALE NAGE_C ARTHRITIS DIABETES BMI_C ;
   numfalls24#1 on male nage_c arthritis ;

  Output:
   cint ;
```

```
*** WARNING in VARIABLE command
  Note that only the first 8 characters of variable names are used in the output.
  Shorten variable names to avoid any confusion.
*** WARNING
  Data set contains cases with missing on x-variables.
  These cases were not included in the analysis.
  Number of cases with missing on x-variables:  349
*** WARNING
  Data set contains cases with missing on all variables except
  x-variables.  These cases were not included in the analysis.
  Number of cases with missing on all variables except x-variables:  9749
   3 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS
```

ASDA3 ANALYSIS EXAMPLE SECTION 9.4.7 ZERO INF NB REGRESSION MODEL

SUMMARY OF ANALYSIS

Number of groups	1
Number of observations	10455
Number of dependent variables	1
Number of independent variables	5
Number of continuous latent variables	0

```
Observed dependent variables

  Count
   NUMFALLS24

Observed independent variables
   MALE        NAGE_C      ARTHRITI    DIABETES    BMI_C

Variables with special functions

  Stratification        STRATUM
  Cluster variable      NUMSECU
  Weight variable       NWGTR

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-02
    Relative loglikelihood change                 0.100D-05
    Derivative                                    0.100D-02
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-02
  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-02
  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
Integration Specifications
  Type                                             STANDARD
  Number of integration points                            15
  Dimensions of numerical integration                      0
  Adaptive quadrature                                     ON
Cholesky                                                 OFF

Input data file(s)
  P:\asda3\replication mplus\hrs2012.txt
Input data format  FREE
```

SUMMARY OF DATA

Number of strata	55
Number of clusters	108

COUNT PROPORTION OF ZERO, MINIMUM AND MAXIMUM VALUES

NUMFALLS	0.347	0	50

WARNING: THE VARIANCE CONTRIBUTION FROM A STRATUM WITH A SINGLE CLUSTER (PSU) IS BASED ON THE DIFFERENCE BETWEEN THE SINGLE CLUSTER VALUE AND THE OVERALL CLUSTER MEAN.

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters	11

Loglikelihood

H0 Value	-13566.609
H0 Scaling Correction Factor for MLR	2.2525

Information Criteria

Akaike (AIC)	27155.218
Bayesian (BIC)	27235.021
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	27200.065

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
NUMFALLS24 ON				
MALE	0.457	0.095	4.827	0.000
NAGE_C	0.005	0.005	0.939	0.348
ARTHRITIS	0.557	0.106	5.245	0.000
DIABETES	0.270	0.072	3.764	0.000
BMI_C	0.000	0.006	0.055	0.956
NUMFALLS24 ON				
MALE	1.511	0.496	3.043	0.002
NAGE_C	-0.095	0.013	-7.225	0.000
ARTHRITIS	-0.912	0.234	-3.897	0.000
Intercepts				
NUMFALLS24	-2.127	0.617	-3.445	0.001
NUMFALLS24	-0.414	0.128	-3.232	0.001

Dispersion				
NUMFALLS24	2.995	0.201	14.881	0.000

QUALITY OF NUMERICAL RESULTS

Condition Number for the Information Matrix 0.225E-04
(ratio of smallest to largest eigenvalue)

CONFIDENCE INTERVALS OF MODEL RESULTS

	Lower .5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper .5%
NUMFALLS ON							
MALE	0.213	0.271	0.301	0.457	0.613	0.642	0.701
NAGE_C	-0.008	-0.005	-0.003	0.005	0.013	0.014	0.017
ARTHRITIS	0.284	0.349	0.382	0.557	0.732	0.765	0.831
DIABETES	0.085	0.129	0.152	0.270	0.387	0.410	0.454
BMI_C	-0.015	-0.012	-0.010	0.000	0.010	0.012	0.016
NUMFALLS ON							
MALE	0.232	0.538	0.694	1.511	2.328	2.484	2.790
NAGE_C	-0.129	-0.121	-0.117	-0.095	-0.074	-0.070	-0.061
ARTHRITIS	-1.515	-1.371	-1.298	-0.912	-0.527	-0.454	-0.309
Intercepts							
NUMFALLS24	-3.718	-3.337	-3.143	-2.127	-1.111	-0.917	-0.537
NUMFALLS24	-0.744	-0.665	-0.625	-0.414	-0.203	-0.163	-0.084
Dispersion							
NUMFALLS24	2.477	2.601	2.664	2.995	3.326	3.390	3.514

DIAGRAM INFORMATION

Use View Diagram under the Diagram menu in the Mplus Editor to view the diagram.
If running Mplus from the Mplus Diagrammer, the diagram opens automatically.

Diagram output
p:\asda3\replication mplus\chapter 9\c9 zi negative binonmial regression with hrs data .dgm

Beginning Time: 08:42:02
Ending Time: 08:42:05
Elapsed Time: 00:00:03

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