Preliminary look at possible latent variables, YL-YC

We take a look at possible latent variables, working backwards from outcomes

First, we load the data file, and some packages

Load some packages

```
library(pacman) #install this if not already present
p_load(tidyverse, haven, magrittr, psych, car, knitr, lavaan, GPArotation, reshape2)
```

Then we clear the workspace, and load the data file created in the script "import data from YL files script".

```
rm(list=ls(all=TRUE))

load("peru_long_yc.Rdata")
```

1 Overall measurement model

Let's try putting a measurement model together for the whole model

```
temp <- peru_long.dat %>%
          select(childid, round, typesite, indigenous,
                 mother_age_birth, partner, momedu, dadlit, momlit,
                 wi_early_yrs, food_insecurity_r2, totalexp,
                 chore_hours, school_type, hours_study, read_encourage,
                 sdq1, sdq3, sdq4, sdq5,
                 sdq9, sdq8, sdq10, sdq11,
                 sdq13, sdq16, sdq12, sdq14,
                 sdq17, sdq20, sdq15, sdq18,
                 sdq19,
                 drink_to_drunk, drunk_hit, alc_1perwk,
                 stunting_to_r3, probs_vision, probs_resp,
                 care_school_qual2, care_school_qual3,
                 care_school_qual4,
                 school_punish1, school_punish2,
                 lang_instruct_matches,
                 ppvt_raw, maths_perco, yrs_grtr_grade, literate, deprived_grouping) %>%
          melt(id.vars = c("childid","round")) %>%
          dcast(childid ~ round + variable)
```

```
## Warning: attributes are not identical across measure variables; they will
## be dropped
```

```
temp %<>%
  mutate(`1_mother_age_birth` = `1_mother_age_birth`/25,
         `2_totalexp` = `2_totalexp`/750,
         `4_ppvt_raw`= `4_ppvt_raw`/200,
         `4_maths_perco`= `4_maths_perco`/200,
         `3_chore_hours`= `3_chore_hours`/2.2,
         `3_read_encourage` = `3_read_encourage`/3.2,
         `3_stunting_to_r3` = `3_stunting_to_r3`/2)
```

```
temp %<>%
  select(`1_mother_age_birth`, `1_partner`,
                  `1_momedu`, `1_dadlit`, `1_momlit`, `1_typesite`, `1_indigenous`,

                  `2_wi_early_yrs`, `2_food_insecurity_r2`, `2_totalexp`,

                  `3_chore_hours`, `3_school_type`, `3_hours_study`,
                              `3_read_encourage`,

                            `1_sdq1`, `1_sdq3`, `1_sdq4`, `1_sdq5`,
                              `1_sdq9`, `1_sdq8`, `1_sdq10`, `1_sdq11`,
                              `1_sdq13`, `1_sdq14`,
                              `1_sdq17`, `1_sdq20`, `1_sdq15`, `1_sdq18`,
                   `1_sdq19`,
                   `1_drink_to_drunk`, `1_drunk_hit`, `1_alc_1perwk`,

                # Child health
                   `3_stunting_to_r3`, `3_probs_vision`, `3_probs_resp`,

                # School environment
                   `3_care_school_qual2`, `3_care_school_qual3`,
                   `3_care_school_qual4`,
                   `3_school_punish1`, `3_school_punish2`,
                   `3_lang_instruct_matches`,

                # Round`3 outcomes
                   `3_ppvt_raw`, `3_maths_perco`, `3_yrs_grtr_grade`,
                                 `3_literate`,
                # Round`4 outcomes
                  `4_ppvt_raw`, `4_maths_perco`, `4_yrs_grtr_grade`)

# summary(temp)

temp.model <- '
               # Caregiver Status
                   care_status =~ `1_partner` + `1_mother_age_birth`
                   lit_ed =~`1_momedu` +`1_momlit`


               # # Economic well-being
                    eco_well_being_cfa =~`2_wi_early_yrs` +`2_food_insecurity_r2` +`2_totalexp`

               # Education investment
                   ed_invest =~`3_chore_hours` +`3_school_type` +`3_hours_study`+
                               `3_read_encourage`


               # Adverse EC environment
                    mmhealth =~`1_sdq1` +`1_sdq3` +`1_sdq4` +`1_sdq5` +
                               `1_sdq9` +`1_sdq8` +`1_sdq10` +`1_sdq11` +
                               `1_sdq13` +`1_sdq14` +
                               `1_sdq17 ` +`1_sdq20` +`1_sdq15` +`1_sdq18` +
                               `1_sdq19`
```

```
                # Child health
                    child_health =~`3_stunting_to_r3` +`3_probs_vision` +`3_probs_resp`

                # School environment
                   #  school_qual =~`3_care_school_qual2` +`3_care_school_qual3` +
                   # `3_care_school_qual4`
                    # school_punish =~`3_school_punish1` +`3_school_punish2`
                    lang_instruct =~`3_lang_instruct_matches`
                     # school_environ =~ school_qual + lang_instruct
                     # school_environ ~~ 1*school_environ

                # Round`3 outcomes
                    # outcomes_r3 =~`3_ppvt_raw` +`3_maths_perco` +`3_yrs_grtr_grade` +
                                  # `3_literate`
                # Round`4 outcomes
                    outcomes_ =~`4_ppvt_raw` +`4_maths_perco` +`4_yrs_grtr_grade`

               '
temp.model.fit <- cfa(temp.model, data = temp)
```

```
## Warning in lav_object_post_check(lavobject): lavaan WARNING: some estimated
## ov variances are negative
```

```
summary(temp.model.fit, fit.measures = T)
```

```
## lavaan (0.5-22) converged normally after 293 iterations
##
##                                                   Used       Total
##   Number of observations                          1625        2052
##
##   Estimator                                         ML
##   Minimum Function Test Statistic             1469.535
##   Degrees of freedom                               468
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic           11347.877
##   Degrees of freedom                              528
##   P-value                                       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.907
##   Tucker-Lewis Index (TLI)                       0.896
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -22591.893
##   Loglikelihood unrestricted model (H1)     -21857.125
##
##   Number of free parameters                         93
##   Akaike (AIC)                               45369.785
##   Bayesian (BIC)                             45871.358
```

```
##   Sample-size adjusted Bayesian (BIC)        45575.914
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.036
##   90 Percent Confidence Interval          0.034  0.038
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.035
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   care_status =~
##     1_partner             1.000
##     1_mothr_g_brth        9.358    9.745    0.960    0.337
##   lit_ed =~
##     1_momedu              1.000
##     1_momlit              0.419    0.014   30.316    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs        1.000
##     2_fd_nscrty_r2       -0.528    0.090   -5.848    0.000
##     2_totalexp            2.437    0.114   21.398    0.000
##   ed_invest =~
##     3_chore_hours         1.000
##     3_school_type         0.673    0.049   13.673    0.000
##     3_hours_study        -1.077    0.092  -11.673    0.000
##     3_read_encourg       -1.185    0.080  -14.812    0.000
##   mmhealth =~
##     1_sdq1                1.000
##     1_sdq3                0.655    0.050   13.192    0.000
##     1_sdq4                0.823    0.064   12.835    0.000
##     1_sdq5                0.538    0.045   12.021    0.000
##     1_sdq9                1.214    0.074   16.417    0.000
##     1_sdq8                0.618    0.054   11.343    0.000
##     1_sdq10               0.929    0.061   15.217    0.000
##     1_sdq11               0.871    0.060   14.446    0.000
##     1_sdq13               0.676    0.052   13.053    0.000
##     1_sdq14               0.588    0.047   12.459    0.000
##     1_sdq17               0.248    0.024   10.244    0.000
##     1_sdq20               0.991    0.066   14.936    0.000
##     1_sdq15               0.551    0.045   12.279    0.000
##     1_sdq18               1.005    0.063   15.896    0.000
##     1_sdq19               0.782    0.059   13.286    0.000
##   child_health =~
##     3_stuntng_t_r3        1.000
##     3_probs_vision       -0.127    0.020   -6.278    0.000
##     3_probs_resp         -0.062    0.018   -3.483    0.000
```

```
##   lang_instruct =~
##     3_lng_nstrct_m         1.000
##   outcomes_ =~
##     4_ppvt_raw             1.000
##     4_maths_perco          0.905    0.034   26.277    0.000
##     4_yrs_grtr_grd        -6.162    0.305  -20.173    0.000
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   care_status ~~
##     lit_ed                -0.003    0.004   -0.941    0.347
##     eco_wll_bng_cf         0.000    0.000    0.604    0.546
##     ed_invest             -0.001    0.001   -0.924    0.355
##     mmhealth              -0.001    0.001   -0.938    0.348
##     child_health           0.001    0.001    0.860    0.390
##     lang_instruct         -0.000    0.000   -0.739    0.460
##     outcomes_             -0.000    0.000   -0.611    0.541
##   lit_ed ~~
##     eco_wll_bng_cf         0.119    0.006   20.654    0.000
##     ed_invest             -0.175    0.013  -13.555    0.000
##     mmhealth               0.043    0.006    6.798    0.000
##     child_health          -0.252    0.017  -15.129    0.000
##     lang_instruct          0.169    0.009   19.043    0.000
##     outcomes_              0.039    0.002   18.692    0.000
##   eco_well_being_cfa ~~
##     ed_invest             -0.052    0.004  -14.392    0.000
##     mmhealth               0.008    0.002    4.747    0.000
##     child_health          -0.068    0.004  -15.649    0.000
##     lang_instruct          0.031    0.002   14.473    0.000
##     outcomes_              0.010    0.001   19.325    0.000
##   ed_invest ~~
##     mmhealth              -0.008    0.003   -3.053    0.002
##     child_health           0.090    0.009   10.638    0.000
##     lang_instruct         -0.051    0.004  -11.434    0.000
##     outcomes_             -0.017    0.001  -13.550    0.000
##   mmhealth ~~
##     child_health          -0.023    0.005   -4.631    0.000
##     lang_instruct          0.009    0.003    3.634    0.000
##     outcomes_              0.002    0.001    3.190    0.001
##   child_health ~~
##     lang_instruct         -0.082    0.007  -12.303    0.000
##     outcomes_             -0.023    0.002  -14.147    0.000
##   lang_instruct ~~
##     outcomes_              0.011    0.001   13.876    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.109    0.004   26.595    0.000
##    .1_mothr_g_brth   -0.057    0.129   -0.440    0.660
##    .1_momedu          0.292    0.016   18.365    0.000
##    .1_momlit          0.078    0.003   22.509    0.000
##    .2_wi_early_yrs    0.007    0.001    5.467    0.000
##    .2_fd_nscrty_r2    0.491    0.017   28.415    0.000
##    .2_totalexp        0.533    0.020   26.146    0.000
```

```
##    .3_chore_hours     0.354    0.013   27.080    0.000
##    .3_school_type     0.113    0.004   26.234    0.000
##    .3_hours_study     0.552    0.020   27.520    0.000
##    .3_read_encourg    0.222    0.009   24.254    0.000
##    .1_sdq1            0.184    0.007   26.202    0.000
##    .1_sdq3            0.119    0.004   26.970    0.000
##    .1_sdq4            0.205    0.008   27.106    0.000
##    .1_sdq5            0.108    0.004   27.370    0.000
##    .1_sdq9            0.158    0.006   24.533    0.000
##    .1_sdq8            0.169    0.006   27.550    0.000
##    .1_sdq10           0.136    0.005   25.817    0.000
##    .1_sdq11           0.150    0.006   26.354    0.000
##    .1_sdq13           0.131    0.005   27.025    0.000
##    .1_sdq14           0.115    0.004   27.235    0.000
##    .1_sdq17           0.036    0.001   27.785    0.000
##    .1_sdq20           0.168    0.006   26.031    0.000
##    .1_sdq15           0.106    0.004   27.292    0.000
##    .1_sdq18           0.129    0.005   25.181    0.000
##    .1_sdq19           0.165    0.006   26.932    0.000
##    .3_stuntng_t_r3    0.359    0.034   10.614    0.000
##    .3_probs_vision    0.077    0.003   27.955    0.000
##    .3_probs_resp      0.065    0.002   28.393    0.000
##    .3_lng_nstrct_m    0.000
##    .4_ppvt_raw        0.002    0.000   14.256    0.000
##    .4_maths_perco     0.005    0.000   22.499    0.000
##    .4_yrs_grtr_grd    0.505    0.019   26.090    0.000
##     care_status       0.001    0.002    0.912    0.362
##     lit_ed            0.534    0.030   17.974    0.000
##     eco_wll_bng_cf    0.043    0.002   19.408    0.000
##     ed_invest         0.081    0.010    8.306    0.000
##     mmhealth          0.063    0.006    9.800    0.000
##     child_health      0.172    0.034    5.021    0.000
##     lang_instruct     0.128    0.005   28.504    0.000
##     outcomes_         0.005    0.000   18.160    0.000
```

```
x <- modindices(temp.model.fit)
```

2 Now we look at structural + measurement model for R4 outcome

```
temp <- peru_long.dat %>%
          select(childid, round, typesite, indigenous,
                 mother_age_birth, partner, momedu, dadlit, momlit,
                 wi_early_yrs, food_insecurity_r2, totalexp,
                 chore_hours, school_type, hours_study, read_encourage,
                 sdq1, sdq3, sdq4, sdq5,
                 sdq9, sdq8, sdq10, sdq11,
                 sdq13, sdq16, sdq12, sdq14,
                 sdq17, sdq20, sdq15, sdq18,
                 sdq19,
                 drink_to_drunk, drunk_hit, alc_1perwk,
                 stunting_to_r3, probs_vision, probs_resp,
                 care_school_qual2, care_school_qual3,
```

```
                care_school_qual4,
                school_punish1, school_punish2,
                lang_instruct_matches,
                ppvt_raw, maths_perco, yrs_grtr_grade, literate, deprived_grouping) %>%
          melt(id.vars = c("childid","round")) %>%
          dcast(childid ~ round + variable)
```

```
## Warning: attributes are not identical across measure variables; they will
## be dropped
```

```
temp %<>%
  mutate(`1_mother_age_birth` = `1_mother_age_birth`/25,
         `2_totalexp` = `2_totalexp`/750,
         `4_ppvt_raw`= `4_ppvt_raw`/200,
         `4_maths_perco`= `4_maths_perco`/200,
         `3_chore_hours`= `3_chore_hours`/2.2,
         `3_read_encourage` = `3_read_encourage`/3.2,
         `3_stunting_to_r3` = `3_stunting_to_r3`/2)

temp.model <- '
               # Caregiver Status
                   older_with_partner =~ `1_partner`
                  # `1_mother_age_birth`
                   lit_ed =~`1_momedu` +`1_momlit`

               # # Economic well-being
                    eco_well_being_cfa =~`2_wi_early_yrs` +`2_food_insecurity_r2` +`3_school_type`
                    # +`2_totalexp`

               # Education investment
                   ed_invest =~`3_chore_hours` +`3_hours_study`+
                               `3_read_encourage`


               # Adverse EC environment
                    mmhealth =~`1_sdq1` +`1_sdq3` +`1_sdq4` +`1_sdq5` +
                               `1_sdq8` +`1_sdq10` +
                               `1_sdq13` +`1_sdq14` +
                               `1_sdq17 `  +`1_sdq15` +`1_sdq18` +
                               `1_sdq19`

                # Child health
                    child_health =~`3_stunting_to_r3` +`3_probs_vision` +`3_probs_resp`

                # School environment
                   #  school_qual =~`3_care_school_qual2` +`3_care_school_qual3` +
                   # `3_care_school_qual4`
                    # school_punish =~`3_school_punish1` +`3_school_punish2`
                     # lang_instruct =~`3_lang_instruct_matches`
                     # school_environ =~ school_qual + lang_instruct
                     # school_environ ~~ 1*school_environ

                # Round`3 outcomes
                    # outcomes_r3 =~`3_ppvt_raw` +`3_maths_perco` +`3_yrs_grtr_grade` +
```

```
                                # `3_literate`
                # Round`4 outcomes
                    outcomes_r4 =~`4_ppvt_raw` +`4_maths_perco` +`4_yrs_grtr_grade`

                # REG COMPONENT

                     eco_well_being_cfa ~ lit_ed
                     mmhealth ~ lit_ed
                     child_health ~ eco_well_being_cfa
                     ed_invest ~ eco_well_being_cfa  + lit_ed
                     # lang_instruct ~ eco_well_being_cfa
                     outcomes_r4 ~ ed_invest
                      # + child_health + mmhealth + lang_instruct

              '

temp.model.fit <- sem(temp.model, data = temp)
summary(temp.model.fit, fit.measures = T)
```

```
## lavaan (0.5-22) converged normally after 124 iterations
##
##                                                   Used       Total
##   Number of observations                          1643        2052
##
##   Estimator                                         ML
##   Minimum Function Test Statistic              733.776
##   Degrees of freedom                               315
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             8230.777
##   Degrees of freedom                               351
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.947
##   Tucker-Lewis Index (TLI)                       0.941
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -17998.628
##   Loglikelihood unrestricted model (H1)     -17631.741
##
##   Number of free parameters                         63
##   Akaike (AIC)                               36123.257
##   Bayesian (BIC)                             36463.726
##   Sample-size adjusted Bayesian (BIC)        36263.586
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.028
##   90 Percent Confidence Interval          0.026  0.031
```

```
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.031
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner =~
##     1_partner              1.000
##   lit_ed =~
##     1_momedu               1.000
##     1_momlit               0.341    0.013   26.221    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000
##     2_fd_nscrty_r2        -0.560    0.096   -5.817    0.000
##     3_school_type         -0.995    0.052  -19.208    0.000
##   ed_invest =~
##     3_chore_hours          1.000
##     3_hours_study         -1.118    0.094  -11.913    0.000
##     3_read_encourg        -1.154    0.079  -14.538    0.000
##   mmhealth =~
##     1_sdq1                 1.000
##     1_sdq3                 0.665    0.050   13.345    0.000
##     1_sdq4                 0.764    0.063   12.185    0.000
##     1_sdq5                 0.535    0.045   11.993    0.000
##     1_sdq8                 0.604    0.054   11.165    0.000
##     1_sdq10                0.861    0.060   14.461    0.000
##     1_sdq13                0.643    0.051   12.604    0.000
##     1_sdq14                0.567    0.047   12.168    0.000
##     1_sdq17                0.262    0.025   10.615    0.000
##     1_sdq15                0.513    0.044   11.660    0.000
##     1_sdq18                0.923    0.061   15.045    0.000
##     1_sdq19                0.757    0.058   12.997    0.000
##   child_health =~
##     3_stuntng_t_r3         1.000
##     3_probs_vision        -0.138    0.021   -6.706    0.000
##     3_probs_resp          -0.068    0.018   -3.786    0.000
##   outcomes_r4 =~
##     4_ppvt_raw             1.000
##     4_maths_perco          0.920    0.034   26.697    0.000
##     4_yrs_grtr_grd        -6.401    0.309  -20.745    0.000
##
## Regressions:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   eco_well_being_cfa ~
##     lit_ed                 0.197    0.007   26.796    0.000
##   mmhealth ~
##     lit_ed                 0.071    0.010    6.853    0.000
```

```
##   child_health ~
##     eco_wll_bng_cf       -1.869    0.098  -19.006    0.000
##   ed_invest ~
##     eco_wll_bng_cf       -0.908    0.117   -7.734    0.000
##     lit_ed               -0.121    0.025   -4.844    0.000
##   outcomes_r4 ~
##     ed_invest            -0.211    0.013  -15.616    0.000
##
## Covariances:
##                          Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner ~~
##     lit_ed                -0.006    0.007   -0.804    0.421
##  .mmhealth ~~
##    .child_health          -0.008    0.005   -1.670    0.095
##    .outcomes_r4           -0.001    0.000   -1.357    0.175
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -3.109    0.002
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.000
##    .1_momedu          0.166    0.019    8.812    0.000
##    .1_momlit          0.096    0.004   24.260    0.000
##    .2_wi_early_yrs    0.012    0.001   10.376    0.000
##    .2_fd_nscrty_r2    0.488    0.017   28.541    0.000
##    .3_school_type     0.114    0.004   26.975    0.000
##    .3_chore_hours     0.370    0.014   27.188    0.000
##    .3_hours_study     0.549    0.020   27.428    0.000
##    .3_read_encourg    0.223    0.009   25.271    0.000
##    .1_sdq1            0.179    0.007   24.911    0.000
##    .1_sdq3            0.116    0.004   26.102    0.000
##    .1_sdq4            0.208    0.008   26.785    0.000
##    .1_sdq5            0.107    0.004   26.877    0.000
##    .1_sdq8            0.169    0.006   27.224    0.000
##    .1_sdq10           0.141    0.006   25.140    0.000
##    .1_sdq13           0.132    0.005   26.565    0.000
##    .1_sdq14           0.115    0.004   26.793    0.000
##    .1_sdq17           0.037    0.001   27.417    0.000
##    .1_sdq15           0.107    0.004   27.026    0.000
##    .1_sdq18           0.135    0.006   24.438    0.000
##    .1_sdq19           0.164    0.006   26.333    0.000
##    .3_stuntng_t_r3    0.377    0.032   11.914    0.000
##    .3_probs_vision    0.077    0.003   28.011    0.000
##    .3_probs_resp      0.064    0.002   28.534    0.000
##    .4_ppvt_raw        0.002    0.000   15.028    0.000
##    .4_maths_perco     0.005    0.000   22.469    0.000
##    .4_yrs_grtr_grd    0.510    0.020   26.089    0.000
##     oldr_wth_prtnr    0.110    0.004   28.662    0.000
##     lit_ed            0.665    0.034   19.809    0.000
##    .eco_wll_bng_cf    0.012    0.001    8.977    0.000
##    .ed_invest         0.016    0.003    5.257    0.000
##    .mmhealth          0.065    0.007    9.819    0.000
##    .child_health      0.029    0.029    0.996    0.319
##    .outcomes_r4       0.001    0.000    8.331    0.000
```

```
inspect(temp.model.fit, "rsquare")
```

```
##            1_partner             1_momedu             1_momlit
##                1.000                0.800                0.446
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                0.758                0.024                0.248
##        3_chore_hours        3_hours_study     3_read_encourage
##                0.189                0.164                0.340
##               1_sdq1               1_sdq3               1_sdq4
##                0.277                0.207                0.161
##               1_sdq5               1_sdq8              1_sdq10
##                0.154                0.128                0.264
##              1_sdq13              1_sdq14              1_sdq17
##                0.176                0.160                0.113
##              1_sdq15              1_sdq18              1_sdq19
##                0.143                0.301                0.192
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                0.301                0.039                0.012
##           4_ppvt_raw        4_maths_perco     4_yrs_grtr_grade
##                0.683                0.494                0.299
##   eco_well_being_cfa            ed_invest             mmhealth
##                0.675                0.810                0.049
##         child_health          outcomes_r4
##                0.822                0.722
```

```
x <- modindices(temp.model.fit)
resid(temp.model.fit, type = "standardized")
```

```
## $type
## [1] "standardized"
##
## $cov
##                      1_prtn 1_momd 1_mmlt 2_w_r_ 2_f__2 3_sch_ 3_chr_
## 1_partner             0.000
## 1_momedu             -1.751     NA
## 1_momlit             -0.452     NA     NA
## 2_wi_early_yrs        1.388  0.636 -1.712  0.000
## 2_food_insecurity_r2 -2.008 -0.755  1.226 -0.134  0.000
## 3_school_type        -0.113  0.616  4.938 -2.870 -0.844     NA
## 3_chore_hours         0.068  0.407 -3.731 -0.508 -0.588  0.177     NA
## 3_hours_study        -0.261 -1.848  0.094  1.515  1.725 -1.865 -2.046
## 3_read_encourage      2.201 -1.496 -0.041 -1.389 -0.894  0.388  0.569
## 1_sdq1               -0.517  1.874  0.169 -0.197 -0.646  0.341  0.789
## 1_sdq3                0.349 -0.244  0.483 -1.521 -1.472  3.217 -2.154
## 1_sdq4               -0.858 -2.142 -0.713 -4.701 -1.862  2.399  0.758
## 1_sdq5                1.179  2.140  2.625  0.953 -1.107 -0.091 -1.698
## 1_sdq8                0.292  0.317 -0.766 -0.776 -2.192  1.333 -1.341
## 1_sdq10               1.032  1.028  0.288 -1.731 -2.655  1.307  0.576
## 1_sdq13              -0.377 -1.276 -1.621  0.992 -0.596  0.043  1.314
## 1_sdq14               1.712  2.038  0.569  1.666 -0.042  0.762 -0.583
## 1_sdq17               0.818 -0.763 -0.516 -3.557 -2.828  2.767 -0.355
## 1_sdq15               3.361 -2.652 -3.429 -2.255 -2.503  1.973  2.800
## 1_sdq18               1.247  2.472  1.527  2.296 -1.264  0.826  0.609
## 1_sdq19               0.608 -0.508 -0.099 -1.292 -0.655 -0.552  0.188
```

```
## 3_stunting_to_r3     -0.889 -2.276 -5.303  4.470 -0.008 -2.681  1.262
## 3_probs_vision       -0.597 -0.873 -0.716  2.587  0.328 -0.475  0.299
## 3_probs_resp         -0.080 -1.040  0.624  1.417  1.113 -0.742 -0.852
## 4_ppvt_raw            0.736  2.428  1.866  2.359 -0.743 -1.624  0.249
## 4_maths_perco         1.490 -0.937  0.209 -4.925 -0.277  2.074  2.005
## 4_yrs_grtr_grade     -0.551  1.050 -1.441  0.176 -0.351 -2.204 -2.751
##                      3_hrs_ 3_rd_n 1_sdq1 1_sdq3 1_sdq4 1_sdq5 1_sdq8
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study            NA
## 3_read_encourage      1.207  0.000
## 1_sdq1               -1.149 -0.995  0.214
## 1_sdq3                0.037 -1.439  3.049  0.186
## 1_sdq4               -2.070 -3.143  0.867  1.373  0.161
## 1_sdq5                1.195 -0.414  0.492  1.656  2.508  0.000
## 1_sdq8                0.435  1.069 -0.457 -1.723  0.104 -0.723  0.146
## 1_sdq10               1.408  0.867  1.673 -1.913  1.717 -0.625  0.063
## 1_sdq13               0.488 -0.466 -1.765 -1.167 -1.188 -2.142  2.873
## 1_sdq14               0.146  0.300 -4.045  0.011 -2.043 -3.877  3.063
## 1_sdq17               2.329  0.076 -2.029 -1.272  0.480  1.150 -0.161
## 1_sdq15              -1.434 -2.774 -3.203 -2.919 -0.975 -0.378  1.082
## 1_sdq18               0.165 -0.207 -0.454 -0.051 -0.211  0.144 -3.074
## 1_sdq19               0.216 -1.886  3.243  1.925 -1.937  0.458  0.216
## 3_stunting_to_r3     -1.746  1.523 -0.968 -0.086  0.772 -1.455 -0.975
## 3_probs_vision        0.836 -2.662 -0.574 -2.357 -1.076 -0.625 -0.829
## 3_probs_resp          1.739  0.886 -0.128 -2.179 -1.443 -1.488 -0.292
## 4_ppvt_raw           -1.548  0.806 -0.644 -0.798 -2.761  1.420 -0.293
## 4_maths_perco        -4.441  2.021  1.307  0.612 -0.264  1.444  1.853
## 4_yrs_grtr_grade     -1.559 -2.264 -0.422  0.448  0.297 -0.672  1.092
##                      1_sd10 1_sd13 1_sd14 1_sd17 1_sd15 1_sd18 1_sd19
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10               0.209
## 1_sdq13              -2.335  0.171
## 1_sdq14              -2.736  3.854  0.000
## 1_sdq17               3.454 -0.037 -0.513  0.000
## 1_sdq15               3.296  1.277  3.258  2.688  0.000
```

```
## 1_sdq18              -0.367  1.890  1.711 -0.680  0.159  0.223
## 1_sdq19              -1.660 -0.021  1.243 -1.851 -1.830 -0.554  0.179
## 3_stunting_to_r3      0.472 -0.820 -2.105  1.460  0.302 -1.014  0.717
## 3_probs_vision       -1.720  0.749 -1.793 -3.557 -3.654 -0.044 -1.990
## 3_probs_resp         -0.375  0.542  0.590 -0.846  0.669 -0.767 -2.046
## 4_ppvt_raw            0.469 -0.146 -0.990 -0.899 -1.801  0.948 -0.911
## 4_maths_perco         0.131  0.443  0.700  1.190 -2.306  0.558 -1.278
## 4_yrs_grtr_grade     -0.642  0.904  1.071 -0.453  1.820  0.199  1.178
##                      3_s__3 3_prbs_v 3_prbs_r 4_ppv_ 4_mth_ 4_yr__
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10
## 1_sdq13
## 1_sdq14
## 1_sdq17
## 1_sdq15
## 1_sdq18
## 1_sdq19
## 3_stunting_to_r3         NA
## 3_probs_vision       -0.255     NA
## 3_probs_resp         -0.046 -0.948       NA
## 4_ppvt_raw           -1.920 -0.937   -0.191    0.000
## 4_maths_perco         0.887 -0.374   -1.495    0.365  0.000
## 4_yrs_grtr_grade      1.189  0.527    0.907    6.714 -5.235  0.454
##
## $mean
##            1_partner             1_momedu             1_momlit
##                    0                    0                    0
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                    0                    0                    0
##        3_chore_hours        3_hours_study     3_read_encourage
##                    0                    0                    0
##               1_sdq1               1_sdq3               1_sdq4
##                    0                    0                    0
##               1_sdq5               1_sdq8              1_sdq10
##                    0                    0                    0
##              1_sdq13              1_sdq14              1_sdq17
##                    0                    0                    0
##              1_sdq15              1_sdq18              1_sdq19
##                    0                    0                    0
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                    0                    0                    0
```

```
##           4_ppvt_raw        4_maths_perco     4_yrs_grtr_grade
##                    0                    0                    0
```

```
summary(temp.model.fit, fit.measures = T, standardized = TRUE)
```

```
## lavaan (0.5-22) converged normally after 124 iterations
##
##                                                   Used       Total
##   Number of observations                          1643        2052
##
##   Estimator                                         ML
##   Minimum Function Test Statistic              733.776
##   Degrees of freedom                               315
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             8230.777
##   Degrees of freedom                               351
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.947
##   Tucker-Lewis Index (TLI)                       0.941
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -17998.628
##   Loglikelihood unrestricted model (H1)     -17631.741
##
##   Number of free parameters                         63
##   Akaike (AIC)                               36123.257
##   Bayesian (BIC)                             36463.726
##   Sample-size adjusted Bayesian (BIC)        36263.586
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.028
##   90 Percent Confidence Interval          0.026  0.031
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.031
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner =~
##     1_partner             1.000                               0.332
```

```
##   lit_ed =~
##     1_momedu              1.000                           0.815
##     1_momlit              0.341    0.013   26.221    0.000    0.278
##   eco_well_being_cfa =~
##     2_wi_early_yrs        1.000                           0.195
##     2_fd_nscrty_r2       -0.560    0.096   -5.817    0.000   -0.109
##     3_school_type        -0.995    0.052  -19.208    0.000   -0.194
##   ed_invest =~
##     3_chore_hours         1.000                           0.294
##     3_hours_study        -1.118    0.094  -11.913    0.000   -0.328
##     3_read_encourg       -1.154    0.079  -14.538    0.000   -0.339
##   mmhealth =~
##     1_sdq1                1.000                           0.261
##     1_sdq3                0.665    0.050   13.345    0.000    0.174
##     1_sdq4                0.764    0.063   12.185    0.000    0.200
##     1_sdq5                0.535    0.045   11.993    0.000    0.140
##     1_sdq8                0.604    0.054   11.165    0.000    0.158
##     1_sdq10               0.861    0.060   14.461    0.000    0.225
##     1_sdq13               0.643    0.051   12.604    0.000    0.168
##     1_sdq14               0.567    0.047   12.168    0.000    0.148
##     1_sdq17               0.262    0.025   10.615    0.000    0.068
##     1_sdq15               0.513    0.044   11.660    0.000    0.134
##     1_sdq18               0.923    0.061   15.045    0.000    0.241
##     1_sdq19               0.757    0.058   12.997    0.000    0.198
##   child_health =~
##     3_stuntng_t_r3        1.000                           0.403
##     3_probs_vision       -0.138    0.021   -6.706    0.000   -0.056
##     3_probs_resp         -0.068    0.018   -3.786    0.000   -0.028
##   outcomes_r4 =~
##     4_ppvt_raw            1.000                           0.073
##     4_maths_perco         0.920    0.034   26.697    0.000    0.067
##     4_yrs_grtr_grd       -6.401    0.309  -20.745    0.000   -0.466
##   Std.all
##
##     1.000
##
##     0.895
##     0.668
##
##     0.871
##    -0.155
##    -0.498
##
##     0.435
##    -0.405
##    -0.583
##
##     0.526
##     0.455
##     0.401
##     0.393
##     0.358
##     0.514
##     0.420
```

```
##     0.400
##     0.336
##     0.379
##     0.548
##     0.438
##
##     0.549
##    -0.196
##    -0.108
##
##     0.827
##     0.703
##    -0.546
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   eco_well_being_cfa ~
##     lit_ed                0.197    0.007   26.796    0.000    0.821
##   mmhealth ~
##     lit_ed                0.071    0.010    6.853    0.000    0.221
##   child_health ~
##     eco_wll_bng_cf       -1.869    0.098  -19.006    0.000   -0.907
##   ed_invest ~
##     eco_wll_bng_cf       -0.908    0.117   -7.734    0.000   -0.604
##     lit_ed               -0.121    0.025   -4.844    0.000   -0.335
##   outcomes_r4 ~
##     ed_invest            -0.211    0.013  -15.616    0.000   -0.850
##   Std.all
##
##     0.821
##
##     0.221
##
##    -0.907
##
##    -0.604
##    -0.335
##
##    -0.850
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner ~~
##     lit_ed                -0.006    0.007   -0.804    0.421   -0.021
##  .mmhealth ~~
##    .child_health          -0.008    0.005   -1.670    0.095   -0.178
##    .outcomes_r4           -0.001    0.000   -1.357    0.175   -0.064
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -3.109    0.002   -0.477
##   Std.all
##
##    -0.021
##
##    -0.178
```

```
##    -0.064
##
##    -0.477
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.000                               0.000    0.000
##    .1_momedu          0.166    0.019    8.812    0.000    0.166    0.200
##    .1_momlit          0.096    0.004   24.260    0.000    0.096    0.554
##    .2_wi_early_yrs    0.012    0.001   10.376    0.000    0.012    0.242
##    .2_fd_nscrty_r2    0.488    0.017   28.541    0.000    0.488    0.976
##    .3_school_type     0.114    0.004   26.975    0.000    0.114    0.752
##    .3_chore_hours     0.370    0.014   27.188    0.000    0.370    0.811
##    .3_hours_study     0.549    0.020   27.428    0.000    0.549    0.836
##    .3_read_encourg    0.223    0.009   25.271    0.000    0.223    0.660
##    .1_sdq1            0.179    0.007   24.911    0.000    0.179    0.723
##    .1_sdq3            0.116    0.004   26.102    0.000    0.116    0.793
##    .1_sdq4            0.208    0.008   26.785    0.000    0.208    0.839
##    .1_sdq5            0.107    0.004   26.877    0.000    0.107    0.846
##    .1_sdq8            0.169    0.006   27.224    0.000    0.169    0.872
##    .1_sdq10           0.141    0.006   25.140    0.000    0.141    0.736
##    .1_sdq13           0.132    0.005   26.565    0.000    0.132    0.824
##    .1_sdq14           0.115    0.004   26.793    0.000    0.115    0.840
##    .1_sdq17           0.037    0.001   27.417    0.000    0.037    0.887
##    .1_sdq15           0.107    0.004   27.026    0.000    0.107    0.857
##    .1_sdq18           0.135    0.006   24.438    0.000    0.135    0.699
##    .1_sdq19           0.164    0.006   26.333    0.000    0.164    0.808
##    .3_stuntng_t_r3    0.377    0.032   11.914    0.000    0.377    0.699
##    .3_probs_vision    0.077    0.003   28.011    0.000    0.077    0.961
##    .3_probs_resp      0.064    0.002   28.534    0.000    0.064    0.988
##    .4_ppvt_raw        0.002    0.000   15.028    0.000    0.002    0.317
##    .4_maths_perco     0.005    0.000   22.469    0.000    0.005    0.506
##    .4_yrs_grtr_grd    0.510    0.020   26.089    0.000    0.510    0.701
##     oldr_wth_prtnr    0.110    0.004   28.662    0.000    1.000    1.000
##     lit_ed            0.665    0.034   19.809    0.000    1.000    1.000
##    .eco_wll_bng_cf    0.012    0.001    8.977    0.000    0.325    0.325
##    .ed_invest         0.016    0.003    5.257    0.000    0.190    0.190
##    .mmhealth          0.065    0.007    9.819    0.000    0.951    0.951
##    .child_health      0.029    0.029    0.996    0.319    0.178    0.178
##    .outcomes_r4       0.001    0.000    8.331    0.000    0.278    0.278
```

3 Now we look at structural + measurement model for R3

```
# Let's repeat this for Round 3 outcomes
# But note that one has to load the original data again

temp <- peru_long.dat %>%
          select(childid, round, typesite, indigenous,
                 mother_age_birth, partner, momedu, dadlit, momlit,
                 wi_early_yrs, food_insecurity_r2, totalexp,
                 chore_hours, school_type, hours_study, read_encourage,
                 sdq1, sdq3, sdq4, sdq5,
```

```
                sdq9, sdq8, sdq10, sdq11,
                sdq13, sdq16, sdq12, sdq14,
                sdq17, sdq20, sdq15, sdq18,
                sdq19,
                drink_to_drunk, drunk_hit, alc_1perwk,
                stunting_to_r3, probs_vision, probs_resp,
                care_school_qual2, care_school_qual3,
                care_school_qual4,
                school_punish1, school_punish2,
                lang_instruct_matches,
                ppvt_raw, maths_perco, yrs_grtr_grade, literate, deprived_grouping) %>%
        melt(id.vars = c("childid","round")) %>%
        dcast(childid ~ round + variable)
```

```
## Warning: attributes are not identical across measure variables; they will
## be dropped
```

```
temp %<>%
  mutate(`1_mother_age_birth` = `1_mother_age_birth`/25,
         `2_totalexp` = `2_totalexp`/750,
         `3_ppvt_raw`= `3_ppvt_raw`/200,
         `3_maths_perco`= `3_maths_perco`/200,
         `3_chore_hours`= `3_chore_hours`/2.2,
         `3_read_encourage` = `3_read_encourage`/3.2,
         `3_stunting_to_r3` = `3_stunting_to_r3`/2)

temp.model <- '
              # Caregiver Status
                  older_with_partner =~ `1_partner`
                 # `1_mother_age_birth`
                  lit_ed =~`1_momedu` +`1_momlit`

              # # Economic well-being
                   eco_well_being_cfa =~`2_wi_early_yrs` +`2_food_insecurity_r2` +`3_school_type`
                   # +`2_totalexp`

              # Education investment
                  ed_invest =~`3_chore_hours` +`3_hours_study`+
                              `3_read_encourage`


              # Adverse EC environment
                   mmhealth =~`1_sdq1` +`1_sdq3` +`1_sdq4` +`1_sdq5` +
                              `1_sdq8` +`1_sdq10` +
                              `1_sdq13` +`1_sdq14` +
                              `1_sdq17 `  +`1_sdq15` +`1_sdq18` +
                              `1_sdq19`

               # Child health
                   child_health =~`3_stunting_to_r3` +`3_probs_vision` +`3_probs_resp`

               # School environment
                  #  school_qual =~`3_care_school_qual2` +`3_care_school_qual3` +
                  # `3_care_school_qual4`
```

```
                    # school_punish =~`3_school_punish1` +`3_school_punish2`
                     # lang_instruct =~`3_lang_instruct_matches`
                     # school_environ =~ school_qual + lang_instruct
                     # school_environ ~~ 1*school_environ

                # Round`3 outcomes
                   outcomes_r3 =~`3_ppvt_raw` +`3_maths_perco` +`3_yrs_grtr_grade`
                                 # `3_literate`
                # Round`4 outcomes
                    # outcomes_r4 =~`4_ppvt_raw` +`4_maths_perco`

                # REG COMPONENT

                     eco_well_being_cfa ~ lit_ed
                     mmhealth ~ lit_ed
                     child_health ~ eco_well_being_cfa
                     ed_invest ~ eco_well_being_cfa  + lit_ed
                     # lang_instruct ~ eco_well_being_cfa
                     outcomes_r3 ~ ed_invest
                      # + child_health + mmhealth + lang_instruct

              '

temp.model.fit <- sem(temp.model, data = temp)
summary(temp.model.fit, fit.measures = T)
```

```
## lavaan (0.5-22) converged normally after 125 iterations
##
##                                                   Used       Total
##   Number of observations                          1640        2052
##
##   Estimator                                         ML
##   Minimum Function Test Statistic              749.869
##   Degrees of freedom                               315
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             8271.226
##   Degrees of freedom                               351
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.945
##   Tucker-Lewis Index (TLI)                       0.939
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -17196.359
##   Loglikelihood unrestricted model (H1)     -16821.425
##
##   Number of free parameters                         63
##   Akaike (AIC)                               34518.718
```

```
##   Bayesian (BIC)                              34859.073
##   Sample-size adjusted Bayesian (BIC)         34658.932
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.029
##   90 Percent Confidence Interval          0.026  0.032
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.032
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner =~
##     1_partner             1.000
##   lit_ed =~
##     1_momedu              1.000
##     1_momlit              0.350    0.013   26.456    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs        1.000
##     2_fd_nscrty_r2       -0.609    0.099   -6.148    0.000
##     3_school_type        -1.034    0.051  -20.412    0.000
##   ed_invest =~
##     3_chore_hours         1.000
##     3_hours_study        -1.167    0.099  -11.783    0.000
##     3_read_encourg       -1.208    0.085  -14.270    0.000
##   mmhealth =~
##     1_sdq1                1.000
##     1_sdq3                0.655    0.050   13.221    0.000
##     1_sdq4                0.776    0.063   12.389    0.000
##     1_sdq5                0.535    0.044   12.104    0.000
##     1_sdq8                0.608    0.054   11.268    0.000
##     1_sdq10               0.862    0.059   14.551    0.000
##     1_sdq13               0.638    0.051   12.556    0.000
##     1_sdq14               0.578    0.047   12.362    0.000
##     1_sdq17               0.250    0.024   10.448    0.000
##     1_sdq15               0.515    0.044   11.759    0.000
##     1_sdq18               0.929    0.061   15.172    0.000
##     1_sdq19               0.756    0.058   13.065    0.000
##   child_health =~
##     3_stuntng_t_r3        1.000
##     3_probs_vision       -0.132    0.021   -6.393    0.000
##     3_probs_resp         -0.057    0.017   -3.296    0.001
##   outcomes_r3 =~
##     3_ppvt_raw            1.000
##     3_maths_perco         0.984    0.034   28.834    0.000
##     3_yrs_grtr_grd       -2.709    0.187  -14.518    0.000
```

```
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   eco_well_being_cfa ~
##     lit_ed                0.201    0.007   27.026    0.000
##   mmhealth ~
##     lit_ed                0.063    0.010    6.096    0.000
##   child_health ~
##     eco_wll_bng_cf       -1.868    0.099  -18.889    0.000
##   ed_invest ~
##     eco_wll_bng_cf       -0.995    0.125   -7.948    0.000
##     lit_ed               -0.091    0.026   -3.555    0.000
##   outcomes_r3 ~
##     ed_invest            -0.224    0.015  -15.376    0.000
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner ~~
##     lit_ed                -0.007    0.007   -0.961    0.336
##  .mmhealth ~~
##    .child_health          -0.006    0.005   -1.176    0.240
##    .outcomes_r3           -0.001    0.000   -1.870    0.062
##  .child_health ~~
##    .outcomes_r3           -0.003    0.001   -2.431    0.015
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.000
##    .1_momedu          0.176    0.019    9.449    0.000
##    .1_momlit          0.097    0.004   24.058    0.000
##    .2_wi_early_yrs    0.013    0.001   11.234    0.000
##    .2_fd_nscrty_r2    0.512    0.018   28.505    0.000
##    .3_school_type     0.108    0.004   26.790    0.000
##    .3_chore_hours     0.364    0.013   27.323    0.000
##    .3_hours_study     0.550    0.020   27.455    0.000
##    .3_read_encourg    0.225    0.009   25.376    0.000
##    .1_sdq1            0.178    0.007   24.881    0.000
##    .1_sdq3            0.118    0.004   26.200    0.000
##    .1_sdq4            0.206    0.008   26.683    0.000
##    .1_sdq5            0.105    0.004   26.824    0.000
##    .1_sdq8            0.169    0.006   27.177    0.000
##    .1_sdq10           0.140    0.006   25.088    0.000
##    .1_sdq13           0.133    0.005   26.596    0.000
##    .1_sdq14           0.115    0.004   26.697    0.000
##    .1_sdq17           0.035    0.001   27.458    0.000
##    .1_sdq15           0.107    0.004   26.979    0.000
##    .1_sdq18           0.134    0.006   24.330    0.000
##    .1_sdq19           0.164    0.006   26.300    0.000
##    .3_stuntng_t_r3    0.383    0.034   11.287    0.000
##    .3_probs_vision    0.076    0.003   27.994    0.000
##    .3_probs_resp      0.059    0.002   28.531    0.000
##    .3_ppvt_raw        0.002    0.000   12.843    0.000
##    .3_maths_perco     0.004    0.000   21.049    0.000
##    .3_yrs_grtr_grd    0.245    0.009   27.717    0.000
```

```
##     oldr_wth_prtnr    0.110    0.004   28.636    0.000
##     lit_ed            0.655    0.033   19.631    0.000
##    .eco_wll_bng_cf    0.011    0.001    8.561    0.000
##    .ed_invest         0.013    0.003    4.516    0.000
##    .mmhealth          0.066    0.007    9.868    0.000
##    .child_health      0.033    0.031    1.050    0.294
##    .outcomes_r3       0.002    0.000    9.225    0.000
```

```
inspect(temp.model.fit, "rsquare")
```

```
##            1_partner             1_momedu             1_momlit
##                1.000                0.788                0.454
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                0.749                0.027                0.273
##        3_chore_hours        3_hours_study     3_read_encourage
##                0.179                0.164                0.340
##               1_sdq1               1_sdq3               1_sdq4
##                0.278                0.200                0.168
##               1_sdq5               1_sdq8              1_sdq10
##                0.157                0.131                0.267
##              1_sdq13              1_sdq14              1_sdq17
##                0.174                0.167                0.108
##              1_sdq15              1_sdq18              1_sdq19
##                0.146                0.307                0.194
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                0.301                0.036                0.009
##           3_ppvt_raw        3_maths_perco     3_yrs_grtr_grade
##                0.733                0.553                0.146
##   eco_well_being_cfa            ed_invest             mmhealth
##                0.697                0.841                0.038
##         child_health          outcomes_r3
##                0.801                0.699
```

```
x <- modindices(temp.model.fit)
resid(temp.model.fit, type = "standardized")
```

```
## $type
## [1] "standardized"
##
## $cov
##                      1_prtn 1_momd 1_mmlt 2_w_r_ 2_f__2 3_sch_ 3_chr_
## 1_partner                NA
## 1_momedu             -1.612  0.000
## 1_momlit             -0.621     NA  0.000
## 2_wi_early_yrs        1.671  1.130 -2.264     NA
## 2_food_insecurity_r2 -1.940 -0.374  0.783 -0.351  0.000
## 3_school_type         0.298  0.442  4.980 -2.433 -0.790  0.000
## 3_chore_hours        -0.431 -1.175 -4.557 -1.060 -0.284  0.337  0.000
## 3_hours_study         0.216 -1.871 -0.572  0.360  1.645 -2.634 -2.124
## 3_read_encourage      2.007 -1.277 -0.485 -2.164 -0.962  0.643  0.400
## 1_sdq1               -0.318  2.187  0.690  0.130 -0.810  0.641  0.351
## 1_sdq3                0.300 -0.294  0.140 -1.586 -1.489  3.124 -1.859
## 1_sdq4               -0.886 -2.743 -0.976 -5.310 -1.858  2.751  0.914
## 1_sdq5                1.318  2.266  2.857  0.994 -1.004  0.014 -1.662
## 1_sdq8                0.156  0.403 -0.317 -0.517 -1.996  0.892 -1.519
```

```
## 1_sdq10               0.939  0.927  0.792 -1.346 -3.133  1.164  0.162
## 1_sdq13              -0.023 -0.943 -1.468  0.920 -0.289  0.008  0.816
## 1_sdq14               1.684  1.487 -0.008  1.141  0.053  0.904 -0.418
## 1_sdq17               0.988 -1.205 -0.492 -3.842 -3.398  3.029 -0.579
## 1_sdq15               3.210 -2.299 -3.099 -1.793 -2.370  2.389  2.573
## 1_sdq18               1.112  2.241  1.192  1.701 -1.175  0.778  0.795
## 1_sdq19               0.375  0.345  0.334 -1.091 -1.390 -0.793  0.576
## 3_stunting_to_r3     -0.812 -1.986 -5.000  3.551  0.382 -2.346  1.749
## 3_probs_vision       -0.699 -0.896 -0.790  2.780  0.302 -0.408  0.110
## 3_probs_resp          0.437 -1.280  0.606  1.176  1.501 -0.347 -0.621
## 3_ppvt_raw            0.442  0.903  3.442  2.993  1.144  0.189  2.141
## 3_maths_perco         0.478 -1.143  0.501 -3.688 -1.088 -1.308  4.733
## 3_yrs_grtr_grade     -1.488  2.269  1.892  2.449  1.013 -1.058 -4.305
##                     3_hrs_ 3_rd_n 1_sdq1 1_sdq3 1_sdq4 1_sdq5 1_sdq8
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study         0.000
## 3_read_encourage      0.998     NA
## 1_sdq1               -1.237 -0.889  0.162
## 1_sdq3               -0.333 -1.960  3.236  0.000
## 1_sdq4               -2.750 -3.039  1.496  1.330  0.000
## 1_sdq5                0.935 -0.759 -0.057  1.791  2.405  0.000
## 1_sdq8                0.062  0.971 -0.009 -2.051 -0.287 -0.831  0.000
## 1_sdq10               1.608  0.828  1.490 -1.671  1.402 -0.206 -0.018
## 1_sdq13               0.349 -0.462 -1.744 -0.531 -1.693 -1.797  2.548
## 1_sdq14              -0.280 -0.008 -3.385 -0.528 -1.788 -3.315  2.914
## 1_sdq17               2.231  0.340 -1.923 -1.520  1.093  0.409 -0.055
## 1_sdq15              -1.043 -2.365 -3.078 -2.681 -1.220 -0.292  1.005
## 1_sdq18              -0.153 -0.371 -0.768  0.021 -0.133 -0.028 -2.982
## 1_sdq19               0.317 -1.867  2.563  1.549 -1.846  0.713  0.850
## 3_stunting_to_r3     -1.043  2.207 -1.125  0.168  1.343 -1.448 -1.255
## 3_probs_vision        1.303 -2.524 -0.956 -2.225 -1.043 -0.923 -0.846
## 3_probs_resp          1.805  1.536 -0.037 -1.982 -1.719 -1.635 -0.556
## 3_ppvt_raw           -1.862  2.815  0.518  0.868 -3.056  1.526  0.758
## 3_maths_perco        -0.164  2.146  1.974  0.100 -2.068  1.477  1.216
## 3_yrs_grtr_grade      1.207 -1.264 -0.829 -0.075 -0.294  0.209  1.222
##                     1_sd10 1_sd13 1_sd14 1_sd17 1_sd15 1_sd18 1_sd19
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
```

```
## 1_sdq5
## 1_sdq8
## 1_sdq10               0.159
## 1_sdq13              -2.363  0.000
## 1_sdq14              -2.695  4.151  0.000
## 1_sdq17               3.802 -0.279 -1.052  0.000
## 1_sdq15               2.437  1.005  2.778  2.730  0.000
## 1_sdq18              -0.557  1.705  1.838 -0.444  1.153  0.169
## 1_sdq19              -1.165 -0.009  1.178 -1.957 -2.008 -0.819  0.000
## 3_stunting_to_r3     -0.075 -0.575 -1.656  1.505  0.115 -0.869  0.328
## 3_probs_vision       -1.918  0.391 -2.203 -2.781 -3.163 -0.394 -2.438
## 3_probs_resp         -0.613  0.235  0.877 -1.597  0.387 -1.219 -1.984
## 3_ppvt_raw           -0.599 -0.041 -0.445 -1.836 -1.908 -0.323 -1.677
## 3_maths_perco        -0.084  1.382 -0.175 -0.613 -2.164  0.914 -1.121
## 3_yrs_grtr_grade     -0.218  1.217  0.357 -0.697  1.649  0.598  1.230
##                      3_s__3 3_prbs_v 3_prbs_r 3_ppv_ 3_mth_ 3_yr__
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10
## 1_sdq13
## 1_sdq14
## 1_sdq17
## 1_sdq15
## 1_sdq18
## 1_sdq19
## 3_stunting_to_r3         NA
## 3_probs_vision        0.129     NA
## 3_probs_resp         -0.388 -0.795       NA
## 3_ppvt_raw           -1.849 -0.420   -0.662    0.000
## 3_maths_perco         0.000 -1.551   -0.656   -4.735  0.000
## 3_yrs_grtr_grade     -0.548 -0.629    1.574    4.903 -7.326  0.305
##
## $mean
##            1_partner             1_momedu             1_momlit
##                    0                    0                    0
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                    0                    0                    0
##        3_chore_hours        3_hours_study     3_read_encourage
##                    0                    0                    0
##               1_sdq1               1_sdq3               1_sdq4
##                    0                    0                    0
##               1_sdq5               1_sdq8              1_sdq10
```

```
##                   0                   0                   0
##              1_sdq13             1_sdq14             1_sdq17
##                   0                   0                   0
##              1_sdq15             1_sdq18             1_sdq19
##                   0                   0                   0
##     3_stunting_to_r3      3_probs_vision        3_probs_resp
##                   0                   0                   0
##           3_ppvt_raw       3_maths_perco     3_yrs_grtr_grade
##                   0                   0                   0
```

```
summary(temp.model.fit, fit.measures = T, standardized = TRUE)
```

```
## lavaan (0.5-22) converged normally after 125 iterations
##
##                                                   Used       Total
##   Number of observations                          1640        2052
##
##   Estimator                                         ML
##   Minimum Function Test Statistic              749.869
##   Degrees of freedom                               315
##   P-value (Chi-square)                           0.000
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             8271.226
##   Degrees of freedom                               351
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.945
##   Tucker-Lewis Index (TLI)                       0.939
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -17196.359
##   Loglikelihood unrestricted model (H1)     -16821.425
##
##   Number of free parameters                         63
##   Akaike (AIC)                               34518.718
##   Bayesian (BIC)                             34859.073
##   Sample-size adjusted Bayesian (BIC)        34658.932
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.029
##   90 Percent Confidence Interval          0.026  0.032
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.032
##
## Parameter Estimates:
##
```

```
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner =~
##     1_partner             1.000                              0.331
##   lit_ed =~
##     1_momedu              1.000                              0.809
##     1_momlit              0.350    0.013   26.456    0.000    0.284
##   eco_well_being_cfa =~
##     2_wi_early_yrs        1.000                              0.195
##     2_fd_nscrty_r2       -0.609    0.099   -6.148    0.000   -0.118
##     3_school_type        -1.034    0.051  -20.412    0.000   -0.201
##   ed_invest =~
##     3_chore_hours         1.000                              0.282
##     3_hours_study        -1.167    0.099  -11.783    0.000   -0.329
##     3_read_encourg       -1.208    0.085  -14.270    0.000   -0.340
##   mmhealth =~
##     1_sdq1                1.000                              0.262
##     1_sdq3                0.655    0.050   13.221    0.000    0.172
##     1_sdq4                0.776    0.063   12.389    0.000    0.204
##     1_sdq5                0.535    0.044   12.104    0.000    0.140
##     1_sdq8                0.608    0.054   11.268    0.000    0.160
##     1_sdq10               0.862    0.059   14.551    0.000    0.226
##     1_sdq13               0.638    0.051   12.556    0.000    0.167
##     1_sdq14               0.578    0.047   12.362    0.000    0.152
##     1_sdq17               0.250    0.024   10.448    0.000    0.066
##     1_sdq15               0.515    0.044   11.759    0.000    0.135
##     1_sdq18               0.929    0.061   15.172    0.000    0.244
##     1_sdq19               0.756    0.058   13.065    0.000    0.198
##   child_health =~
##     3_stuntng_t_r3        1.000                              0.406
##     3_probs_vision       -0.132    0.021   -6.393    0.000   -0.054
##     3_probs_resp         -0.057    0.017   -3.296    0.001   -0.023
##   outcomes_r3 =~
##     3_ppvt_raw            1.000                              0.076
##     3_maths_perco         0.984    0.034   28.834    0.000    0.074
##     3_yrs_grtr_grd       -2.709    0.187  -14.518    0.000   -0.205
##   Std.all
##
##     1.000
##
##     0.888
##     0.674
##
##     0.866
##    -0.163
##    -0.522
##
##     0.423
##    -0.405
##    -0.583
##
```

```
##     0.528
##     0.448
##     0.409
##     0.397
##     0.362
##     0.517
##     0.417
##     0.408
##     0.329
##     0.382
##     0.554
##     0.440
##
##     0.549
##    -0.191
##    -0.095
##
##     0.856
##     0.744
##    -0.382
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   eco_well_being_cfa ~
##     lit_ed                0.201    0.007   27.026    0.000    0.835
##   mmhealth ~
##     lit_ed                0.063    0.010    6.096    0.000    0.195
##   child_health ~
##     eco_wll_bng_cf       -1.868    0.099  -18.889    0.000   -0.895
##   ed_invest ~
##     eco_wll_bng_cf       -0.995    0.125   -7.948    0.000   -0.687
##     lit_ed               -0.091    0.026   -3.555    0.000   -0.262
##   outcomes_r3 ~
##     ed_invest            -0.224    0.015  -15.376    0.000   -0.836
##   Std.all
##
##     0.835
##
##     0.195
##
##    -0.895
##
##    -0.687
##    -0.262
##
##    -0.836
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner ~~
##     lit_ed                -0.007    0.007   -0.961    0.336   -0.026
##  .mmhealth ~~
##    .child_health          -0.006    0.005   -1.176    0.240   -0.118
##    .outcomes_r3           -0.001    0.000   -1.870    0.062   -0.083
```

```
##  .child_health ~~
##    .outcomes_r3           -0.003    0.001   -2.431    0.015   -0.335
##   Std.all
##
##    -0.026
##
##    -0.118
##    -0.083
##
##    -0.335
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.000                               0.000    0.000
##    .1_momedu          0.176    0.019    9.449    0.000    0.176    0.212
##    .1_momlit          0.097    0.004   24.058    0.000    0.097    0.546
##    .2_wi_early_yrs    0.013    0.001   11.234    0.000    0.013    0.251
##    .2_fd_nscrty_r2    0.512    0.018   28.505    0.000    0.512    0.973
##    .3_school_type     0.108    0.004   26.790    0.000    0.108    0.727
##    .3_chore_hours     0.364    0.013   27.323    0.000    0.364    0.821
##    .3_hours_study     0.550    0.020   27.455    0.000    0.550    0.836
##    .3_read_encourg    0.225    0.009   25.376    0.000    0.225    0.660
##    .1_sdq1            0.178    0.007   24.881    0.000    0.178    0.722
##    .1_sdq3            0.118    0.004   26.200    0.000    0.118    0.800
##    .1_sdq4            0.206    0.008   26.683    0.000    0.206    0.832
##    .1_sdq5            0.105    0.004   26.824    0.000    0.105    0.843
##    .1_sdq8            0.169    0.006   27.177    0.000    0.169    0.869
##    .1_sdq10           0.140    0.006   25.088    0.000    0.140    0.733
##    .1_sdq13           0.133    0.005   26.596    0.000    0.133    0.826
##    .1_sdq14           0.115    0.004   26.697    0.000    0.115    0.833
##    .1_sdq17           0.035    0.001   27.458    0.000    0.035    0.892
##    .1_sdq15           0.107    0.004   26.979    0.000    0.107    0.854
##    .1_sdq18           0.134    0.006   24.330    0.000    0.134    0.693
##    .1_sdq19           0.164    0.006   26.300    0.000    0.164    0.806
##    .3_stuntng_t_r3    0.383    0.034   11.287    0.000    0.383    0.699
##    .3_probs_vision    0.076    0.003   27.994    0.000    0.076    0.964
##    .3_probs_resp      0.059    0.002   28.531    0.000    0.059    0.991
##    .3_ppvt_raw        0.002    0.000   12.843    0.000    0.002    0.267
##    .3_maths_perco     0.004    0.000   21.049    0.000    0.004    0.447
##    .3_yrs_grtr_grd    0.245    0.009   27.717    0.000    0.245    0.854
##     oldr_wth_prtnr    0.110    0.004   28.636    0.000    1.000    1.000
##     lit_ed            0.655    0.033   19.631    0.000    1.000    1.000
##    .eco_wll_bng_cf    0.011    0.001    8.561    0.000    0.303    0.303
##    .ed_invest         0.013    0.003    4.516    0.000    0.159    0.159
##    .mmhealth          0.066    0.007    9.868    0.000    0.962    0.962
##    .child_health      0.033    0.031    1.050    0.294    0.199    0.199
##    .outcomes_r3       0.002    0.000    9.225    0.000    0.301    0.301
```

4 Model by group : rural and indigenous vs urban and SPanish

```
# Try to repeat model for disad group split
```

```
temp <- peru_long.dat %>%
          select(childid, round,
                 mother_age_birth, partner, momedu, dadlit, momlit,
                 wi_early_yrs, food_insecurity_r2, totalexp,
                 chore_hours, school_type, hours_study, read_encourage,
                 sdq1, sdq3, sdq4, sdq5,
                 sdq9, sdq8, sdq10, sdq11,
                 sdq13, sdq16, sdq12, sdq14,
                 sdq17, sdq20, sdq15, sdq18,
                 sdq19,
                 drink_to_drunk, drunk_hit, alc_1perwk,
                 stunting_to_r3, probs_vision, probs_resp,
                 care_school_qual2, care_school_qual3,
                 care_school_qual4,
                 school_punish1, school_punish2,
                 lang_instruct_matches,
                 ppvt_raw, maths_perco, yrs_grtr_grade, literate, deprived_grouping) %>%
          melt(id.vars = c("childid","round")) %>%
          dcast(childid ~ round + variable)
```

```
## Warning: attributes are not identical across measure variables; they will
## be dropped
```

```
temp %<>%
  mutate(`1_mother_age_birth` = `1_mother_age_birth`/25,
         `2_totalexp` = `2_totalexp`/750,
         `4_ppvt_raw`= `3_ppvt_raw`/200,
         `4_maths_perco`= `3_maths_perco`/200,
         `3_chore_hours`= `3_chore_hours`/2.2,
         `3_read_encourage` = `3_read_encourage`/3.2,
         `3_stunting_to_r3` = `3_stunting_to_r3`/2)

temp.model <- '
               # Caregiver Status
                   # older_with_partner =~ `1_partner`
                        # + `1_mother_age_birth`
                   lit_ed =~`1_momedu` +`1_momlit`

               # # Economic well-being
                    eco_well_being_cfa =~`2_wi_early_yrs` +`2_food_insecurity_r2`
                    # +`2_totalexp`

               # Education investment
                   ed_invest =~`3_chore_hours` +`3_hours_study`+
                               `3_read_encourage`


               # Adverse EC environment
                    mmhealth =~`1_sdq1` +`1_sdq3` +`1_sdq4` +`1_sdq5` +
                               `1_sdq8` +`1_sdq10` +
                               `1_sdq13` +`1_sdq14` +
                               `1_sdq17 `  +`1_sdq15`
```

```
                # Child health
                    child_health =~`3_stunting_to_r3`
                                   # +`3_probs_vision`
                                   # +`3_probs_resp`

                # School environment
                   #  school_qual =~`3_care_school_qual2` +`3_care_school_qual3` +
                   # `3_care_school_qual4`
                    # school_punish =~`3_school_punish1` +`3_school_punish2`
                     # lang_instruct =~`3_lang_instruct_matches`
                     # school_environ =~ school_qual + lang_instruct
                     # school_environ ~~ 1*school_environ

                # Round`3 outcomes
                    # outcomes_r3 =~`3_ppvt_raw` +`3_maths_perco` +`3_yrs_grtr_grade` +
                                  # `3_literate`
                # Round`4 outcomes
                    outcomes_r4 =~`4_ppvt_raw` +`4_maths_perco`

                # REG COMPONENT

                     eco_well_being_cfa ~ lit_ed
                     mmhealth ~ lit_ed
                     child_health ~ eco_well_being_cfa
                     ed_invest ~  mmhealth + eco_well_being_cfa
                     # lang_instruct ~ eco_well_being_cfa
                     outcomes_r4 ~ ed_invest + eco_well_being_cfa
                      # + child_health + lang_instruct

               '

temp$depriv_group = temp$`1_deprived_grouping`
temp %<>%
  filter(depriv_group == 1)

temp.model.fit <- sem(temp.model, data = temp)
summary(temp.model.fit, fit.measures = T)
```

```
## lavaan (0.5-22) converged normally after 183 iterations
##
##                                                   Used       Total
##   Number of observations                            344         399
##
##   Estimator                                          ML
##   Minimum Function Test Statistic               224.514
##   Degrees of freedom                                163
##   P-value (Chi-square)                            0.001
##
## Model test baseline model:
##
##   Minimum Function Test Statistic               909.071
##   Degrees of freedom                                190
##   P-value                                         0.000
##
```

```
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.914
##   Tucker-Lewis Index (TLI)                       0.900
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -2692.860
##   Loglikelihood unrestricted model (H1)      -2580.602
##
##   Number of free parameters                         47
##   Akaike (AIC)                                5479.719
##   Bayesian (BIC)                              5660.229
##   Sample-size adjusted Bayesian (BIC)         5511.133
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.033
##   90 Percent Confidence Interval          0.022  0.043
##   P-value RMSEA <= 0.05                          0.998
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.050
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   lit_ed =~
##     1_momedu               1.000
##     1_momlit               0.527    0.107    4.916    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000
##     2_fd_nscrty_r2        -2.721    1.353   -2.011    0.044
##   ed_invest =~
##     3_chore_hours          1.000
##     3_hours_study         -1.584    0.723   -2.190    0.028
##     3_read_encourg        -2.536    1.100   -2.306    0.021
##   mmhealth =~
##     1_sdq1                 1.000
##     1_sdq3                 0.637    0.121    5.270    0.000
##     1_sdq4                 1.053    0.166    6.335    0.000
##     1_sdq5                 0.875    0.135    6.496    0.000
##     1_sdq8                 0.655    0.136    4.816    0.000
##     1_sdq10                0.871    0.147    5.936    0.000
##     1_sdq13                0.647    0.120    5.389    0.000
##     1_sdq14                0.460    0.107    4.298    0.000
##     1_sdq17                0.189    0.052    3.655    0.000
##     1_sdq15                0.532    0.101    5.282    0.000
##   child_health =~
```

```
##     3_stuntng_t_r3         1.000
##   outcomes_r4 =~
##     4_ppvt_raw             1.000
##     4_maths_perco          0.984    0.122    8.074    0.000
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   eco_well_being_cfa ~
##     lit_ed                0.051    0.015    3.456    0.001
##   mmhealth ~
##     lit_ed                0.092    0.042    2.197    0.028
##   child_health ~
##     eco_wll_bng_cf       -4.381    1.795   -2.441    0.015
##   ed_invest ~
##     mmhealth              0.147    0.078    1.884    0.060
##     eco_wll_bng_cf       -1.665    0.845   -1.970    0.049
##   outcomes_r4 ~
##     ed_invest            -0.154    0.097   -1.583    0.113
##     eco_wll_bng_cf        0.823    0.285    2.891    0.004
##
## Covariances:
##                     Estimate  Std.Err  z-value  P(>|z|)
##  .child_health ~~
##    .outcomes_r4       0.003    0.004    0.702    0.482
##
## Variances:
##                     Estimate  Std.Err  z-value  P(>|z|)
##    .1_momedu           0.106    0.047    2.274    0.023
##    .1_momlit           0.130    0.016    8.030    0.000
##    .2_wi_early_yrs     0.009    0.001   10.556    0.000
##    .2_fd_nscrty_r2     0.681    0.053   12.890    0.000
##    .3_chore_hours      0.501    0.039   12.801    0.000
##    .3_hours_study      0.361    0.030   11.981    0.000
##    .3_read_encourg     0.149    0.029    5.094    0.000
##    .1_sdq1             0.185    0.016   11.245    0.000
##    .1_sdq3             0.138    0.011   12.099    0.000
##    .1_sdq4             0.179    0.016   10.964    0.000
##    .1_sdq5             0.108    0.010   10.647    0.000
##    .1_sdq8             0.194    0.016   12.352    0.000
##    .1_sdq10            0.166    0.014   11.528    0.000
##    .1_sdq13            0.132    0.011   12.018    0.000
##    .1_sdq14            0.132    0.011   12.564    0.000
##    .1_sdq17            0.034    0.003   12.753    0.000
##    .1_sdq15            0.096    0.008   12.091    0.000
##    .3_stuntng_t_r3     0.000
##    .4_ppvt_raw         0.003    0.001    4.665    0.000
##    .4_maths_perco      0.004    0.001    7.167    0.000
##     lit_ed             0.239    0.052    4.574    0.000
##    .eco_wll_bng_cf     0.002    0.001    2.804    0.005
##    .ed_invest          0.009    0.008    1.168    0.243
##    .mmhealth           0.062    0.015    4.174    0.000
##    .child_health       0.760    0.062   12.200    0.000
##    .outcomes_r4        0.002    0.001    3.066    0.002
```

```r
inspect(temp.model.fit, "rsquare")
```

```
##             1_momedu             1_momlit       2_wi_early_yrs
##                0.693                0.339                0.186
## 2_food_insecurity_r2        3_chore_hours        3_hours_study
##                0.023                0.031                0.101
##     3_read_encourage               1_sdq1               1_sdq3
##                0.411                0.257                0.159
##               1_sdq4               1_sdq5               1_sdq8
##                0.284                0.313                0.124
##              1_sdq10              1_sdq13              1_sdq14
##                0.227                0.169                0.093
##              1_sdq17              1_sdq15     3_stunting_to_r3
##                0.063                0.160                1.000
##           4_ppvt_raw        4_maths_perco   eco_well_being_cfa
##                0.642                0.511                0.295
##            ed_invest             mmhealth         child_health
##                0.418                0.032                0.051
##          outcomes_r4
##                0.581
```

```r
x <- modindices(temp.model.fit)
summary(temp.model.fit, fit.measures = T, standardized = TRUE)
```

```
## lavaan (0.5-22) converged normally after 183 iterations
##
##                                                   Used       Total
##   Number of observations                          344         399
##
##   Estimator                                        ML
##   Minimum Function Test Statistic             224.514
##   Degrees of freedom                              163
##   P-value (Chi-square)                          0.001
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             909.071
##   Degrees of freedom                              190
##   P-value                                       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                   0.914
##   Tucker-Lewis Index (TLI)                      0.900
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -2692.860
##   Loglikelihood unrestricted model (H1)     -2580.602
##
##   Number of free parameters                        47
##   Akaike (AIC)                              5479.719
##   Bayesian (BIC)                            5660.229
##   Sample-size adjusted Bayesian (BIC)       5511.133
```

```
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.033
##   90 Percent Confidence Interval          0.022  0.043
##   P-value RMSEA <= 0.05                          0.998
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.050
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
## Latent Variables:
##                         Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   lit_ed =~
##     1_momedu               1.000                              0.489
##     1_momlit               0.527    0.107    4.916    0.000    0.258
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000                              0.046
##     2_fd_nscrty_r2        -2.721    1.353   -2.011    0.044   -0.126
##   ed_invest =~
##     3_chore_hours          1.000                              0.127
##     3_hours_study         -1.584    0.723   -2.190    0.028   -0.201
##     3_read_encourg        -2.536    1.100   -2.306    0.021   -0.322
##   mmhealth =~
##     1_sdq1                 1.000                              0.253
##     1_sdq3                 0.637    0.121    5.270    0.000    0.161
##     1_sdq4                 1.053    0.166    6.335    0.000    0.267
##     1_sdq5                 0.875    0.135    6.496    0.000    0.222
##     1_sdq8                 0.655    0.136    4.816    0.000    0.166
##     1_sdq10                0.871    0.147    5.936    0.000    0.221
##     1_sdq13                0.647    0.120    5.389    0.000    0.164
##     1_sdq14                0.460    0.107    4.298    0.000    0.116
##     1_sdq17                0.189    0.052    3.655    0.000    0.048
##     1_sdq15                0.532    0.101    5.282    0.000    0.135
##   child_health =~
##     3_stuntng_t_r3         1.000                              0.895
##   outcomes_r4 =~
##     4_ppvt_raw             1.000                              0.068
##     4_maths_perco          0.984    0.122    8.074    0.000    0.067
##   Std.all
##
##     0.832
##     0.582
##
##     0.431
##    -0.150
##
##     0.177
##    -0.318
```

```
##    -0.641
##
##     0.507
##     0.398
##     0.533
##     0.560
##     0.353
##     0.477
##     0.411
##     0.305
##     0.251
##     0.400
##
##     1.000
##
##     0.801
##     0.715
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   eco_well_being_cfa ~
##     lit_ed                0.051    0.015    3.456    0.001    0.543
##   mmhealth ~
##     lit_ed                0.092    0.042    2.197    0.028    0.178
##   child_health ~
##     eco_wll_bng_cf       -4.381    1.795   -2.441    0.015   -0.226
##   ed_invest ~
##     mmhealth              0.147    0.078    1.884    0.060    0.293
##     eco_wll_bng_cf       -1.665    0.845   -1.970    0.049   -0.605
##   outcomes_r4 ~
##     ed_invest            -0.154    0.097   -1.583    0.113   -0.287
##     eco_wll_bng_cf        0.823    0.285    2.891    0.004    0.559
##   Std.all
##
##     0.543
##
##     0.178
##
##    -0.226
##
##     0.293
##    -0.605
##
##    -0.287
##     0.559
##
## Covariances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##  .child_health ~~
##    .outcomes_r4       0.003    0.004    0.702    0.482    0.075    0.075
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_momedu          0.106    0.047    2.274    0.023    0.106    0.307
```

```
##    .1_momlit          0.130    0.016    8.030    0.000    0.130    0.661
##    .2_wi_early_yrs    0.009    0.001   10.556    0.000    0.009    0.814
##    .2_fd_nscrty_r2    0.681    0.053   12.890    0.000    0.681    0.977
##    .3_chore_hours     0.501    0.039   12.801    0.000    0.501    0.969
##    .3_hours_study     0.361    0.030   11.981    0.000    0.361    0.899
##    .3_read_encourg    0.149    0.029    5.094    0.000    0.149    0.589
##    .1_sdq1            0.185    0.016   11.245    0.000    0.185    0.743
##    .1_sdq3            0.138    0.011   12.099    0.000    0.138    0.841
##    .1_sdq4            0.179    0.016   10.964    0.000    0.179    0.716
##    .1_sdq5            0.108    0.010   10.647    0.000    0.108    0.687
##    .1_sdq8            0.194    0.016   12.352    0.000    0.194    0.876
##    .1_sdq10           0.166    0.014   11.528    0.000    0.166    0.773
##    .1_sdq13           0.132    0.011   12.018    0.000    0.132    0.831
##    .1_sdq14           0.132    0.011   12.564    0.000    0.132    0.907
##    .1_sdq17           0.034    0.003   12.753    0.000    0.034    0.937
##    .1_sdq15           0.096    0.008   12.091    0.000    0.096    0.840
##    .3_stuntng_t_r3    0.000                                0.000    0.000
##    .4_ppvt_raw        0.003    0.001    4.665    0.000    0.003    0.358
##    .4_maths_perco     0.004    0.001    7.167    0.000    0.004    0.489
##     lit_ed            0.239    0.052    4.574    0.000    1.000    1.000
##    .eco_wll_bng_cf    0.002    0.001    2.804    0.005    0.705    0.705
##    .ed_invest         0.009    0.008    1.168    0.243    0.582    0.582
##    .mmhealth          0.062    0.015    4.174    0.000    0.968    0.968
##    .child_health      0.760    0.062   12.200    0.000    0.949    0.949
##    .outcomes_r4       0.002    0.001    3.066    0.002    0.419    0.419
```

5 Model by group : boys vs girls

```
# Try to repeat model for disad group split

temp <- peru_long.dat %>%
          select(childid, round, typesite, indigenous, sex,
                 mother_age_birth, partner, momedu, dadlit, momlit,
                 wi_early_yrs, food_insecurity_r2, totalexp,
                 chore_hours, school_type, hours_study, read_encourage,
                 sdq1, sdq3, sdq4, sdq5,
                 sdq9, sdq8, sdq10, sdq11,
                 sdq13, sdq16, sdq12, sdq14,
                 sdq17, sdq20, sdq15, sdq18,
                 sdq19,
                 drink_to_drunk, drunk_hit, alc_1perwk,
                 stunting_to_r3, probs_vision, probs_resp,
                 care_school_qual2, care_school_qual3,
                 care_school_qual4,
                 school_punish1, school_punish2,
                 lang_instruct_matches,
                 ppvt_raw, maths_perco, yrs_grtr_grade, literate, deprived_grouping) %>%
          melt(id.vars = c("childid","round")) %>%
          dcast(childid ~ round + variable)
```

```
## Warning: attributes are not identical across measure variables; they will
## be dropped
```

```
temp %<>%
  mutate(`1_mother_age_birth` = `1_mother_age_birth`/25,
         `2_totalexp` = `2_totalexp`/750,
         `4_ppvt_raw`= `4_ppvt_raw`/200,
         `4_maths_perco`= `4_maths_perco`/200,
         `3_chore_hours`= `3_chore_hours`/2.2,
         `3_read_encourage` = `3_read_encourage`/3.2,
         `3_stunting_to_r3` = `3_stunting_to_r3`/2)

temp.model <- '
               # Caregiver Status
                   older_with_partner =~ `1_partner`
                  # `1_mother_age_birth`
                   lit_ed =~`1_momedu` +`1_momlit`

               # # Economic well-being
                    eco_well_being_cfa =~`2_wi_early_yrs` +`2_food_insecurity_r2` +`3_school_type`
                    # +`2_totalexp`

               # Education investment
                   ed_invest =~`3_chore_hours` +`3_hours_study`+
                               `3_read_encourage`


               # Adverse EC environment
                    mmhealth =~`1_sdq1` +`1_sdq3` +`1_sdq4` +`1_sdq5` +
                               `1_sdq8` +`1_sdq10` +
                               `1_sdq13` +`1_sdq14` +
                               `1_sdq17 `  +`1_sdq15` +`1_sdq18` +
                               `1_sdq19`

                # Child health
                    child_health =~`3_stunting_to_r3` +`3_probs_vision` +`3_probs_resp`

                # School environment
                   #  school_qual =~`3_care_school_qual2` +`3_care_school_qual3` +
                   # `3_care_school_qual4`
                    # school_punish =~`3_school_punish1` +`3_school_punish2`
                     # lang_instruct =~`3_lang_instruct_matches`
                     # school_environ =~ school_qual + lang_instruct
                     # school_environ ~~ 1*school_environ

                # Round`3 outcomes
                    # outcomes_r3 =~`3_ppvt_raw` +`3_maths_perco` +`3_yrs_grtr_grade` +
                                  # `3_literate`
                # Round`4 outcomes
                    outcomes_r4 =~`4_ppvt_raw` +`4_maths_perco` + `4_yrs_grtr_grade`

                # REG COMPONENT

                     eco_well_being_cfa ~ lit_ed
                     mmhealth ~ lit_ed
                     child_health ~ eco_well_being_cfa
```

```
                    ed_invest ~ eco_well_being_cfa  + lit_ed
                    # lang_instruct ~ eco_well_being_cfa
                    outcomes_r4 ~ ed_invest
                     # + child_health + mmhealth + lang_instruct

            '
temp$sex <- temp$`1_sex`

temp.model.fit <- sem(temp.model, data = temp, group = "sex")
summary(temp.model.fit, fit.measures = T)
```

```
## lavaan (0.5-22) converged normally after 206 iterations
##
##                                                   Used       Total
##   Number of observations per group
##   2                                               808        1025
##   1                                               835        1027
##
##   Estimator                                        ML
##   Minimum Function Test Statistic            1093.753
##   Degrees of freedom                              630
##   P-value (Chi-square)                          0.000
##
## Chi-square for each group:
##
##   2                                           526.955
##   1                                           566.798
##
## Model test baseline model:
##
##   Minimum Function Test Statistic            8653.136
##   Degrees of freedom                              702
##   P-value                                       0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                   0.942
##   Tucker-Lewis Index (TLI)                      0.935
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)            -17897.717
##   Loglikelihood unrestricted model (H1)    -17350.841
##
##   Number of free parameters                       180
##   Akaike (AIC)                             36155.434
##   Bayesian (BIC)                           37128.205
##   Sample-size adjusted Bayesian (BIC)      36556.374
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                         0.030
##   90 Percent Confidence Interval          0.027  0.033
##   P-value RMSEA <= 0.05                         1.000
```

```
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                            0.036
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
##
## Group 1 [2]:
##
## Latent Variables:
##                          Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner =~
##     1_partner              1.000
##   lit_ed =~
##     1_momedu               1.000
##     1_momlit               0.343    0.018   18.855    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000
##     2_fd_nscrty_r2        -0.532    0.142   -3.753    0.000
##     3_school_type         -0.970    0.073  -13.269    0.000
##   ed_invest =~
##     3_chore_hours          1.000
##     3_hours_study         -1.141    0.124   -9.175    0.000
##     3_read_encourg        -1.080    0.101  -10.702    0.000
##   mmhealth =~
##     1_sdq1                 1.000
##     1_sdq3                 0.651    0.068    9.543    0.000
##     1_sdq4                 0.732    0.084    8.665    0.000
##     1_sdq5                 0.515    0.060    8.590    0.000
##     1_sdq8                 0.576    0.073    7.847    0.000
##     1_sdq10                0.824    0.079   10.454    0.000
##     1_sdq13                0.665    0.070    9.521    0.000
##     1_sdq14                0.503    0.060    8.341    0.000
##     1_sdq17                0.194    0.029    6.614    0.000
##     1_sdq15                0.494    0.058    8.449    0.000
##     1_sdq18                0.867    0.082   10.639    0.000
##     1_sdq19                0.699    0.076    9.185    0.000
##   child_health =~
##     3_stuntng_t_r3         1.000
##     3_probs_vision        -0.181    0.032   -5.684    0.000
##     3_probs_resp          -0.050    0.024   -2.100    0.036
##   outcomes_r4 =~
##     4_ppvt_raw             1.000
##     4_maths_perco          0.889    0.045   19.890    0.000
##     4_yrs_grtr_grd        -6.330    0.404  -15.671    0.000
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   eco_well_being_cfa ~
##     lit_ed                0.209    0.011   19.860    0.000
```

```
##   mmhealth ~
##     lit_ed                0.074    0.015    4.807    0.000
##   child_health ~
##     eco_wll_bng_cf       -1.804    0.130  -13.892    0.000
##   ed_invest ~
##     eco_wll_bng_cf       -1.050    0.200   -5.264    0.000
##     lit_ed               -0.098    0.043   -2.285    0.022
##   outcomes_r4 ~
##     ed_invest            -0.212    0.018  -11.938    0.000
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner ~~
##     lit_ed                -0.011    0.010   -1.098    0.272
##  .mmhealth ~~
##    .child_health          -0.007    0.006   -1.065    0.287
##    .outcomes_r4           -0.000    0.001   -0.719    0.472
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -2.460    0.014
##
## Intercepts:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.869    0.012   73.151    0.000
##    .1_momedu          1.594    0.032   49.877    0.000
##    .1_momlit          0.780    0.015   53.477    0.000
##    .2_wi_early_yrs    0.443    0.008   55.511    0.000
##    .2_fd_nscrty_r2    0.323    0.026   12.349    0.000
##    .3_school_type     0.803    0.014   57.429    0.000
##    .3_chore_hours     0.732    0.024   30.680    0.000
##    .3_hours_study     1.933    0.028   68.211    0.000
##    .3_read_encourg    1.749    0.021   85.186    0.000
##    .1_sdq1            1.566    0.017   89.786    0.000
##    .1_sdq3            1.814    0.014  132.647    0.000
##    .1_sdq4            1.551    0.017   88.621    0.000
##    .1_sdq5            1.853    0.012  148.613    0.000
##    .1_sdq8            1.731    0.016  111.048    0.000
##    .1_sdq10           1.752    0.015  115.432    0.000
##    .1_sdq13           1.802    0.014  128.540    0.000
##    .1_sdq14           1.848    0.013  146.211    0.000
##    .1_sdq17           1.965    0.006  305.448    0.000
##    .1_sdq15           1.860    0.012  152.456    0.000
##    .1_sdq18           1.734    0.016  111.538    0.000
##    .1_sdq19           1.738    0.015  112.279    0.000
##    .3_stuntng_t_r3    0.454    0.025   18.394    0.000
##    .3_probs_vision    0.099    0.011    9.422    0.000
##    .3_probs_resp      0.058    0.008    7.064    0.000
##    .4_ppvt_raw        0.421    0.003  137.461    0.000
##    .4_maths_perco     0.276    0.003   82.234    0.000
##    .4_yrs_grtr_grd    0.036    0.030    1.211    0.226
##     oldr_wth_prtnr    0.000
##     lit_ed            0.000
##    .eco_wll_bng_cf    0.000
##    .ed_invest         0.000
##    .mmhealth          0.000
```

```
##    .child_health      0.000
##    .outcomes_r4       0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.000
##    .1_momedu          0.171    0.025    6.698    0.000
##    .1_momlit          0.095    0.006   17.155    0.000
##    .2_wi_early_yrs    0.012    0.002    7.597    0.000
##    .2_fd_nscrty_r2    0.542    0.027   20.035    0.000
##    .3_school_type     0.121    0.006   19.107    0.000
##    .3_chore_hours     0.362    0.019   18.993    0.000
##    .3_hours_study     0.522    0.027   19.103    0.000
##    .3_read_encourg    0.227    0.013   17.994    0.000
##    .1_sdq1            0.172    0.010   17.145    0.000
##    .1_sdq3            0.120    0.007   18.312    0.000
##    .1_sdq4            0.208    0.011   18.797    0.000
##    .1_sdq5            0.106    0.006   18.831    0.000
##    .1_sdq8            0.172    0.009   19.126    0.000
##    .1_sdq10           0.136    0.008   17.567    0.000
##    .1_sdq13           0.126    0.007   18.327    0.000
##    .1_sdq14           0.110    0.006   18.939    0.000
##    .1_sdq17           0.031    0.002   19.479    0.000
##    .1_sdq15           0.102    0.005   18.893    0.000
##    .1_sdq18           0.140    0.008   17.369    0.000
##    .1_sdq19           0.158    0.008   18.531    0.000
##    .3_stuntng_t_r3    0.346    0.037    9.266    0.000
##    .3_probs_vision    0.084    0.004   19.438    0.000
##    .3_probs_resp      0.054    0.003   20.063    0.000
##    .4_ppvt_raw        0.002    0.000    9.493    0.000
##    .4_maths_perco     0.005    0.000   16.517    0.000
##    .4_yrs_grtr_grd    0.485    0.026   18.438    0.000
##     oldr_wth_prtnr    0.114    0.006   20.100    0.000
##     lit_ed            0.655    0.047   13.986    0.000
##    .eco_wll_bng_cf    0.011    0.002    5.512    0.000
##    .ed_invest         0.020    0.005    4.127    0.000
##    .mmhealth          0.070    0.010    7.214    0.000
##    .child_health      0.019    0.033    0.574    0.566
##    .outcomes_r4       0.001    0.000    5.158    0.000
##
##
## Group 2 [1]:
##
## Latent Variables:
##                       Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner =~
##     1_partner            1.000
##   lit_ed =~
##     1_momedu             1.000
##     1_momlit             0.335    0.018   18.185    0.000
##   eco_well_being_cfa =~
##     2_wi_early_yrs       1.000
##     2_fd_nscrty_r2      -0.598    0.130   -4.598    0.000
##     3_school_type       -1.018    0.073  -13.930    0.000
```

```
##   ed_invest =~
##     3_chore_hours          1.000
##     3_hours_study         -1.107    0.143   -7.714    0.000
##     3_read_encourg        -1.271    0.129   -9.839    0.000
##   mmhealth =~
##     1_sdq1                 1.000
##     1_sdq3                 0.679    0.072    9.400    0.000
##     1_sdq4                 0.794    0.092    8.606    0.000
##     1_sdq5                 0.553    0.066    8.426    0.000
##     1_sdq8                 0.634    0.079    7.996    0.000
##     1_sdq10                0.889    0.089   10.023    0.000
##     1_sdq13                0.622    0.074    8.418    0.000
##     1_sdq14                0.625    0.071    8.793    0.000
##     1_sdq17                0.326    0.040    8.121    0.000
##     1_sdq15                0.527    0.065    8.062    0.000
##     1_sdq18                0.974    0.091   10.650    0.000
##     1_sdq19                0.808    0.088    9.198    0.000
##   child_health =~
##     3_stuntng_t_r3         1.000
##     3_probs_vision        -0.097    0.026   -3.689    0.000
##     3_probs_resp          -0.085    0.027   -3.168    0.002
##   outcomes_r4 =~
##     4_ppvt_raw             1.000
##     4_maths_perco          0.952    0.053   18.015    0.000
##     4_yrs_grtr_grd        -6.512    0.469  -13.889    0.000
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)
##   eco_well_being_cfa ~
##     lit_ed                0.184    0.010   18.084    0.000
##   mmhealth ~
##     lit_ed                0.068    0.014    4.871    0.000
##   child_health ~
##     eco_wll_bng_cf       -1.935    0.147  -13.163    0.000
##   ed_invest ~
##     eco_wll_bng_cf       -0.795    0.140   -5.682    0.000
##     lit_ed               -0.130    0.030   -4.421    0.000
##   outcomes_r4 ~
##     ed_invest            -0.212    0.021  -10.161    0.000
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)
##   older_with_partner ~~
##     lit_ed                -0.001    0.010   -0.051    0.959
##  .mmhealth ~~
##    .child_health          -0.008    0.007   -1.152    0.249
##    .outcomes_r4           -0.001    0.001   -1.157    0.247
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -2.334    0.020
##
## Intercepts:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.879    0.011   77.899    0.000
##    .1_momedu          1.619    0.032   51.215    0.000
```

```
##    .1_momlit          0.776    0.014   53.791    0.000
##    .2_wi_early_yrs    0.455    0.008   59.424    0.000
##    .2_fd_nscrty_r2    0.278    0.023   12.004    0.000
##    .3_school_type     0.823    0.013   62.257    0.000
##    .3_chore_hours     0.733    0.023   31.462    0.000
##    .3_hours_study     1.819    0.028   64.789    0.000
##    .3_read_encourg    1.690    0.020   84.507    0.000
##    .1_sdq1            1.545    0.017   89.650    0.000
##    .1_sdq3            1.831    0.013  141.246    0.000
##    .1_sdq4            1.549    0.017   89.919    0.000
##    .1_sdq5            1.850    0.012  149.864    0.000
##    .1_sdq8            1.740    0.015  114.655    0.000
##    .1_sdq10           1.731    0.015  112.712    0.000
##    .1_sdq13           1.798    0.014  129.287    0.000
##    .1_sdq14           1.825    0.013  138.853    0.000
##    .1_sdq17           1.949    0.008  254.767    0.000
##    .1_sdq15           1.847    0.012  148.123    0.000
##    .1_sdq18           1.741    0.015  114.910    0.000
##    .1_sdq19           1.695    0.016  106.323    0.000
##    .3_stuntng_t_r3    0.526    0.026   19.962    0.000
##    .3_probs_vision    0.078    0.009    8.395    0.000
##    .3_probs_resp      0.081    0.009    8.604    0.000
##    .4_ppvt_raw        0.438    0.003  143.502    0.000
##    .4_maths_perco     0.282    0.003   85.646    0.000
##    .4_yrs_grtr_grd    0.061    0.030    2.046    0.041
##     oldr_wth_prtnr    0.000
##     lit_ed            0.000
##    .eco_wll_bng_cf    0.000
##    .ed_invest         0.000
##    .mmhealth          0.000
##    .child_health      0.000
##    .outcomes_r4       0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .1_partner         0.000
##    .1_momedu          0.154    0.028    5.549    0.000
##    .1_momlit          0.097    0.006   17.228    0.000
##    .2_wi_early_yrs    0.012    0.002    7.085    0.000
##    .2_fd_nscrty_r2    0.434    0.021   20.319    0.000
##    .3_school_type     0.107    0.006   19.019    0.000
##    .3_chore_hours     0.379    0.019   19.529    0.000
##    .3_hours_study     0.568    0.029   19.699    0.000
##    .3_read_encourg    0.214    0.012   17.624    0.000
##    .1_sdq1            0.184    0.010   18.016    0.000
##    .1_sdq3            0.111    0.006   18.587    0.000
##    .1_sdq4            0.207    0.011   19.083    0.000
##    .1_sdq5            0.108    0.006   19.173    0.000
##    .1_sdq8            0.167    0.009   19.363    0.000
##    .1_sdq10           0.146    0.008   18.031    0.000
##    .1_sdq13           0.137    0.007   19.177    0.000
##    .1_sdq14           0.119    0.006   18.982    0.000
##    .1_sdq17           0.042    0.002   19.311    0.000
##    .1_sdq15           0.112    0.006   19.336    0.000
```

```
##    .1_sdq18           0.131    0.008   17.210    0.000
##    .1_sdq19           0.170    0.009   18.731    0.000
##    .3_stuntng_t_r3    0.405    0.053    7.582    0.000
##    .3_probs_vision    0.070    0.003   20.178    0.000
##    .3_probs_resp      0.074    0.004   20.267    0.000
##    .4_ppvt_raw        0.003    0.000   11.480    0.000
##    .4_maths_perco     0.005    0.000   15.379    0.000
##    .4_yrs_grtr_grd    0.534    0.029   18.515    0.000
##     oldr_wth_prtnr    0.106    0.005   20.433    0.000
##     lit_ed            0.680    0.048   14.097    0.000
##    .eco_wll_bng_cf    0.014    0.002    7.210    0.000
##    .ed_invest         0.013    0.004    3.332    0.001
##    .mmhealth          0.061    0.009    6.742    0.000
##    .child_health      0.036    0.050    0.729    0.466
##    .outcomes_r4       0.002    0.000    6.466    0.000
```

```
inspect(temp.model.fit, "rsquare")
```

```
## $`2`
##            1_partner             1_momedu             1_momlit
##                1.000                0.793                0.450
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                0.760                0.020                0.233
##        3_chore_hours        3_hours_study     3_read_encourage
##                0.212                0.195                0.334
##               1_sdq1               1_sdq3               1_sdq4
##                0.300                0.207                0.160
##               1_sdq5               1_sdq8              1_sdq10
##                0.156                0.124                0.269
##              1_sdq13              1_sdq14              1_sdq17
##                0.205                0.145                0.083
##              1_sdq15              1_sdq18              1_sdq19
##                0.150                0.284                0.186
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                0.297                0.054                0.007
##           4_ppvt_raw        4_maths_perco     4_yrs_grtr_grade
##                0.739                0.488                0.317
##   eco_well_being_cfa            ed_invest             mmhealth
##                0.730                0.797                0.048
##         child_health          outcomes_r4
##                0.869                0.778
##
## $`1`
##            1_partner             1_momedu             1_momlit
##                1.000                0.815                0.439
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                0.760                0.030                0.265
##        3_chore_hours        3_hours_study     3_read_encourage
##                0.164                0.138                0.358
##               1_sdq1               1_sdq3               1_sdq4
##                0.258                0.210                0.163
##               1_sdq5               1_sdq8              1_sdq10
##                0.154                0.134                0.257
##              1_sdq13              1_sdq14              1_sdq17
##                0.153                0.173                0.139
```

```
##              1_sdq15              1_sdq18              1_sdq19
##                0.137                0.317                0.197
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                0.303                0.023                0.017
##           4_ppvt_raw       4_maths_perco     4_yrs_grtr_grade
##                0.637                0.497                0.282
##   eco_well_being_cfa           ed_invest             mmhealth
##                0.617                0.824                0.049
##         child_health          outcomes_r4
##                0.793                0.672
```

```
x <- modindices(temp.model.fit)
resid(temp.model.fit, type = "standardized")
```

```
## $`2`
## $`2`$type
## [1] "standardized"
##
## $`2`$cov
##                       1_prtn 1_momd 1_mmlt 2_w_r_ 2_f__2 3_sch_ 3_chr_
## 1_partner              0.000
## 1_momedu              -0.731     NA
## 1_momlit              -0.798     NA  0.000
## 2_wi_early_yrs         0.759  1.293 -1.462     NA
## 2_food_insecurity_r2 -2.086 -1.932  0.839  0.793     NA
## 3_school_type        -0.210  1.784  4.751 -2.724 -0.703  0.000
## 3_chore_hours         0.556 -0.506 -3.719 -1.279 -0.029  0.679  0.000
## 3_hours_study         0.736 -1.646  1.389  1.795  1.256 -0.122 -1.521
## 3_read_encourage      0.985 -2.005 -0.099 -2.661  0.173  0.969  1.569
## 1_sdq1               -0.927  1.762  0.839 -0.688 -0.028  0.533 -0.031
## 1_sdq3                1.283  0.208 -0.421 -0.912 -1.068  2.273 -1.793
## 1_sdq4               -0.658 -2.500 -1.247 -4.399 -0.342  2.080 -0.370
## 1_sdq5                0.513  2.425  1.766  0.815 -1.651  0.683 -1.114
## 1_sdq8               -0.726  0.242 -0.512 -1.795 -1.115  0.992 -0.648
## 1_sdq10               1.051  0.304  0.645 -2.144 -1.746  1.325  0.538
## 1_sdq13              -0.931 -1.494 -1.442 -0.125 -0.291 -0.054  0.410
## 1_sdq14               1.224  0.422  0.042  0.674  0.650  0.449 -1.157
## 1_sdq17               1.971 -1.134  0.113 -1.981 -2.099  1.981  0.179
## 1_sdq15               3.153 -1.546 -1.977 -1.932 -1.827  0.175  1.559
## 1_sdq18               1.752  3.174  3.231  2.497 -1.595  0.746 -0.124
## 1_sdq19               0.157 -1.065  0.199 -0.979 -1.565 -0.249 -1.081
## 3_stunting_to_r3     -1.480 -1.779 -3.506  4.978  0.211 -1.568  0.909
## 3_probs_vision       -0.669 -1.262 -0.646  1.428 -0.058 -2.181 -1.177
## 3_probs_resp         -0.295  0.820  2.203  1.008  2.727  0.453 -0.877
## 4_ppvt_raw            0.141  2.072  0.429  1.522 -0.558 -2.136  1.434
## 4_maths_perco         0.759 -2.225  1.079 -3.527 -0.719  1.289  1.599
## 4_yrs_grtr_grade     -0.289  0.752 -1.167  0.911 -0.630 -2.280 -1.859
##                       3_hrs_ 3_rd_n 1_sdq1 1_sdq3 1_sdq4 1_sdq5 1_sdq8
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
```

```
## 3_hours_study         0.000
## 3_read_encourage      1.370  0.000
## 1_sdq1                0.499 -0.848  0.154
## 1_sdq3                1.131 -1.197  1.137  0.128
## 1_sdq4               -1.131 -2.213 -0.924  1.262  0.113
## 1_sdq5                0.476 -0.066  1.047 -0.371  0.774  0.000
## 1_sdq8                0.740 -0.194  0.094 -1.233  1.063 -1.581  0.000
## 1_sdq10               1.153  0.316  1.080 -1.639  2.550 -0.590  0.254
## 1_sdq13               1.118  0.883  0.516 -0.153 -0.446 -0.330  2.580
## 1_sdq14               0.953 -0.288 -2.200  0.214 -1.056 -2.322  0.726
## 1_sdq17               1.303 -0.066 -0.397  0.169 -0.021 -0.058 -0.599
## 1_sdq15              -1.226 -1.739 -1.078 -1.096  0.178 -0.663  0.478
## 1_sdq18               1.983  1.175 -1.731 -0.488 -1.281  1.503 -2.192
## 1_sdq19               0.303 -1.553  1.510  2.087 -0.790  0.385  0.705
## 3_stunting_to_r3     -0.910  1.005  0.206 -0.411  0.981 -0.957 -0.473
## 3_probs_vision        1.626 -2.343 -0.720 -1.413  0.793 -0.715 -0.709
## 3_probs_resp          3.156  0.874 -0.184 -0.365 -1.105 -0.257  0.354
## 4_ppvt_raw           -1.664  1.970 -0.017 -1.108 -2.477  1.091  0.021
## 4_maths_perco        -3.981  2.284  1.936  0.170 -0.220  1.045  1.987
## 4_yrs_grtr_grade     -0.603 -2.341 -0.205 -0.387  0.650 -1.404  0.679
##                      1_sd10 1_sd13 1_sd14 1_sd17 1_sd15 1_sd18 1_sd19
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10               0.146
## 1_sdq13              -1.968  0.128
## 1_sdq14              -1.686  0.870  0.000
## 1_sdq17               2.067 -1.360  1.206  0.000
## 1_sdq15               1.881 -0.321  2.422  0.899  0.000
## 1_sdq18               0.948  0.626  1.023  0.303  0.131  0.150
## 1_sdq19              -2.463  0.640  1.640 -1.860 -1.279 -0.692  0.122
## 3_stunting_to_r3      0.783  0.526 -0.073  1.063  0.290 -3.106 -0.275
## 3_probs_vision       -2.046  0.431 -0.556 -2.563 -2.983  0.034 -1.256
## 3_probs_resp          0.281  0.241 -0.993  1.180 -0.405 -0.474 -2.877
## 4_ppvt_raw           -1.141 -0.113 -1.276 -1.250 -0.574  1.774 -0.258
## 4_maths_perco         0.316  0.852  0.033  0.193 -0.827  1.012 -0.656
## 4_yrs_grtr_grade      0.403  1.352  0.915  0.645  1.013 -0.614  0.852
##                      3_s__3 3_prbs_v 3_prbs_r 4_ppv_ 4_mth_ 4_yr__
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
```

```
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10
## 1_sdq13
## 1_sdq14
## 1_sdq17
## 1_sdq15
## 1_sdq18
## 1_sdq19
## 3_stunting_to_r3         NA
## 3_probs_vision        0.686     NA
## 3_probs_resp         -0.822 -0.384       NA
## 4_ppvt_raw           -1.102 -1.178   -1.396    0.000
## 4_maths_perco         0.015  0.609   -2.085    0.000  0.000
## 4_yrs_grtr_grade      1.192  0.062    0.315    5.400 -3.949  0.303
##
## $`2`$mean
##            1_partner             1_momedu             1_momlit
##                    0                   NA                    0
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                   NA                   NA                    0
##        3_chore_hours        3_hours_study     3_read_encourage
##                    0                    0                    0
##               1_sdq1               1_sdq3               1_sdq4
##                    0                    0                    0
##               1_sdq5               1_sdq8              1_sdq10
##                    0                    0                    0
##              1_sdq13              1_sdq14              1_sdq17
##                    0                    0                    0
##              1_sdq15              1_sdq18              1_sdq19
##                    0                    0                    0
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                   NA                   NA                   NA
##           4_ppvt_raw        4_maths_perco     4_yrs_grtr_grade
##                    0                    0                    0
##
##
## $`1`
## $`1`$type
## [1] "standardized"
##
## $`1`$cov
##                      1_prtn 1_momd 1_mmlt 2_w_r_ 2_f__2 3_sch_ 3_chr_
## 1_partner             0.000
## 1_momedu             -1.877  0.000
## 1_momlit              0.190     NA  0.000
## 2_wi_early_yrs        1.246 -1.069 -0.682  0.000
```

```
## 2_food_insecurity_r2 -0.639  0.987  0.902 -0.766  0.000
## 3_school_type         0.006 -0.851  2.152 -1.183 -0.467  0.000
## 3_chore_hours        -0.496  0.851 -1.710  0.312 -0.823 -0.336     NA
## 3_hours_study        -0.989 -0.826 -1.168  0.577  1.061 -2.408 -1.403
## 3_read_encourage      2.222 -0.606 -0.131  0.287 -1.567 -0.206 -0.728
## 1_sdq1                0.229  0.927 -0.565  0.420 -0.962 -0.027  1.115
## 1_sdq3               -0.865 -0.592  1.131 -1.275 -0.966  2.234 -1.265
## 1_sdq4               -0.552 -0.545  0.236 -2.228 -2.383  1.296  1.408
## 1_sdq5                1.163  0.617  1.954  0.553  0.156 -0.826 -1.303
## 1_sdq8                1.158  0.188 -0.562  0.699 -2.012  0.871 -1.264
## 1_sdq10               0.436  1.177 -0.182 -0.266 -2.077  0.540  0.247
## 1_sdq13               0.418 -0.361 -0.863  1.493 -0.571  0.123  1.426
## 1_sdq14               1.223  2.448  0.764  1.755 -0.793  0.647  0.252
## 1_sdq17              -0.574  0.011 -0.740 -2.862 -2.034  1.990 -0.650
## 1_sdq15               1.634 -2.153 -2.822 -1.220 -1.757  2.605  2.356
## 1_sdq18              -0.024  0.253 -1.084  0.755 -0.103  0.380  0.945
## 1_sdq19               0.736  0.366 -0.304 -0.733  0.596 -0.482  1.250
## 3_stunting_to_r3      0.078 -1.562 -4.023  1.477 -0.171 -2.375  0.987
## 3_probs_vision       -0.049  0.017 -0.388  2.417  0.485  1.830  1.721
## 3_probs_resp          0.093 -1.934 -0.916  0.911 -0.939 -1.482 -0.443
## 4_ppvt_raw            0.841  1.272  2.239  1.397 -0.245 -0.493 -0.774
## 4_maths_perco         1.342  0.729 -0.643 -3.478  0.470  1.531  1.112
## 4_yrs_grtr_grade     -0.534  0.800 -0.899 -0.501  0.147 -0.908 -2.005
##                      3_hrs_ 3_rd_n 1_sdq1 1_sdq3 1_sdq4 1_sdq5 1_sdq8
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study         0.000
## 3_read_encourage     -0.063  0.000
## 1_sdq1               -2.158 -0.649  0.122
## 1_sdq3               -0.991 -0.784  3.059  0.000
## 1_sdq4               -1.793 -2.259  1.936  0.628  0.102
## 1_sdq5                1.199 -0.543 -0.398  2.640  2.699  0.000
## 1_sdq8               -0.071  1.726 -0.801 -1.296 -0.979  0.487  0.000
## 1_sdq10               0.773  0.825  1.232 -1.015 -0.070 -0.295 -0.145
## 1_sdq13              -0.421 -1.553 -3.028 -1.588 -1.273 -2.696  1.453
## 1_sdq14              -0.776  0.595 -3.465 -0.105 -1.792 -3.125  3.545
## 1_sdq17               1.833  0.037 -2.219 -1.727  0.688  1.587  0.339
## 1_sdq15              -0.885 -2.242 -3.388 -2.996 -1.505  0.092  1.040
## 1_sdq18              -1.668 -1.484  0.963  0.398  0.986 -1.399 -2.213
## 1_sdq19              -0.156 -1.280  2.934  0.728 -1.923  0.261 -0.368
## 3_stunting_to_r3     -1.328  1.531 -1.487  0.116  0.087 -1.155 -0.978
## 3_probs_vision       -0.725 -1.520 -0.098 -1.874 -2.416 -0.128 -0.401
## 3_probs_resp         -0.110  0.549  0.064 -2.621 -0.938 -1.704 -0.700
## 4_ppvt_raw           -0.241 -0.404 -0.760 -0.180 -1.454  0.945 -0.493
## 4_maths_perco        -2.247  0.481 -0.031  0.657 -0.143  1.007  0.611
## 4_yrs_grtr_grade     -1.403 -0.641 -0.350  1.008 -0.206  0.419  0.859
##                      1_sd10 1_sd13 1_sd14 1_sd17 1_sd15 1_sd18 1_sd19
## 1_partner
## 1_momedu
```

```
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10              0.127
## 1_sdq13             -1.405  0.000
## 1_sdq14             -2.103  4.390  0.000
## 1_sdq17              2.809  1.187 -1.808  0.000
## 1_sdq15              2.760  1.938  2.222  2.746  0.000
## 1_sdq18             -1.379  1.993  1.478 -1.130  0.155  0.141
## 1_sdq19             -0.025 -0.614  0.116 -0.989 -1.320 -0.008  0.111
## 3_stunting_to_r3    -0.095 -1.586 -2.709  1.065  0.129  1.433  1.248
## 3_probs_vision      -0.363  0.632 -2.017 -2.529 -2.195 -0.026 -1.631
## 3_probs_resp        -0.634  0.543  1.625 -1.762  1.250 -0.609 -0.168
## 4_ppvt_raw           1.842 -0.097  0.039  0.154 -1.813 -0.463 -0.703
## 4_maths_perco       -0.053 -0.211  1.024  1.522 -2.343 -0.238 -1.026
## 4_yrs_grtr_grade    -1.228  0.000  0.622 -1.104  1.555  0.864  0.849
##                     3_s__3 3_prbs_v 3_prbs_r 4_ppv_ 4_mth_ 4_yr__
## 1_partner
## 1_momedu
## 1_momlit
## 2_wi_early_yrs
## 2_food_insecurity_r2
## 3_school_type
## 3_chore_hours
## 3_hours_study
## 3_read_encourage
## 1_sdq1
## 1_sdq3
## 1_sdq4
## 1_sdq5
## 1_sdq8
## 1_sdq10
## 1_sdq13
## 1_sdq14
## 1_sdq17
## 1_sdq15
## 1_sdq18
## 1_sdq19
## 3_stunting_to_r3        NA
## 3_probs_vision      -0.816     NA
## 3_probs_resp         0.607 -0.735       NA
## 4_ppvt_raw          -1.771 -0.169    0.479    0.000
## 4_maths_perco        1.352 -1.167   -0.326    0.000  0.000
## 4_yrs_grtr_grade     0.284  0.835    0.861    4.093 -3.521  0.325
##
```

```
## $`1`$mean
##            1_partner              1_momedu             1_momlit
##                    0                     0                    0
##       2_wi_early_yrs 2_food_insecurity_r2        3_school_type
##                    0                     0                    0
##        3_chore_hours        3_hours_study     3_read_encourage
##                   NA                     0                    0
##               1_sdq1               1_sdq3               1_sdq4
##                    0                     0                    0
##               1_sdq5               1_sdq8              1_sdq10
##                    0                     0                    0
##              1_sdq13              1_sdq14              1_sdq17
##                    0                     0                    0
##              1_sdq15              1_sdq18              1_sdq19
##                    0                     0                    0
##     3_stunting_to_r3       3_probs_vision         3_probs_resp
##                   NA                    NA                   NA
##           4_ppvt_raw        4_maths_perco     4_yrs_grtr_grade
##                    0                     0                    0
```

```
summary(temp.model.fit, fit.measures = T, standardized = TRUE)
```

```
## lavaan (0.5-22) converged normally after 206 iterations
##
##                                                   Used       Total
##   Number of observations per group
##   2                                                808        1025
##   1                                                835        1027
##
##   Estimator                                         ML
##   Minimum Function Test Statistic             1093.753
##   Degrees of freedom                               630
##   P-value (Chi-square)                           0.000
##
## Chi-square for each group:
##
##   2                                             526.955
##   1                                             566.798
##
## Model test baseline model:
##
##   Minimum Function Test Statistic             8653.136
##   Degrees of freedom                               702
##   P-value                                        0.000
##
## User model versus baseline model:
##
##   Comparative Fit Index (CFI)                    0.942
##   Tucker-Lewis Index (TLI)                       0.935
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)             -17897.717
##   Loglikelihood unrestricted model (H1)     -17350.841
##
```

```
##   Number of free parameters                        180
##   Akaike (AIC)                               36155.434
##   Bayesian (BIC)                             37128.205
##   Sample-size adjusted Bayesian (BIC)        36556.374
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.030
##   90 Percent Confidence Interval          0.027  0.033
##   P-value RMSEA <= 0.05                          1.000
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.036
##
## Parameter Estimates:
##
##   Information                                 Expected
##   Standard Errors                             Standard
##
##
## Group 1 [2]:
##
## Latent Variables:
##                         Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner =~
##     1_partner              1.000                               0.338
##   lit_ed =~
##     1_momedu               1.000                               0.809
##     1_momlit               0.343    0.018   18.855    0.000    0.278
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000                               0.198
##     2_fd_nscrty_r2        -0.532    0.142   -3.753    0.000   -0.105
##     3_school_type         -0.970    0.073  -13.269    0.000   -0.192
##   ed_invest =~
##     3_chore_hours          1.000                               0.312
##     3_hours_study         -1.141    0.124   -9.175    0.000   -0.356
##     3_read_encourg        -1.080    0.101  -10.702    0.000   -0.337
##   mmhealth =~
##     1_sdq1                 1.000                               0.272
##     1_sdq3                 0.651    0.068    9.543    0.000    0.177
##     1_sdq4                 0.732    0.084    8.665    0.000    0.199
##     1_sdq5                 0.515    0.060    8.590    0.000    0.140
##     1_sdq8                 0.576    0.073    7.847    0.000    0.156
##     1_sdq10                0.824    0.079   10.454    0.000    0.224
##     1_sdq13                0.665    0.070    9.521    0.000    0.181
##     1_sdq14                0.503    0.060    8.341    0.000    0.137
##     1_sdq17                0.194    0.029    6.614    0.000    0.053
##     1_sdq15                0.494    0.058    8.449    0.000    0.134
##     1_sdq18                0.867    0.082   10.639    0.000    0.236
##     1_sdq19                0.699    0.076    9.185    0.000    0.190
##   child_health =~
##     3_stuntng_t_r3         1.000                               0.383
##     3_probs_vision        -0.181    0.032   -5.684    0.000   -0.069
```

```
##     3_probs_resp          -0.050    0.024   -2.100    0.036   -0.019
##   outcomes_r4 =~
##     4_ppvt_raw             1.000                              0.075
##     4_maths_perco          0.889    0.045   19.890    0.000    0.067
##     4_yrs_grtr_grd        -6.330    0.404  -15.671    0.000   -0.474
##   Std.all
##
##     1.000
##
##     0.891
##     0.671
##
##     0.872
##    -0.142
##    -0.483
##
##     0.460
##    -0.442
##    -0.578
##
##     0.548
##     0.455
##     0.400
##     0.395
##     0.353
##     0.519
##     0.453
##     0.381
##     0.288
##     0.387
##     0.533
##     0.431
##
##     0.545
##    -0.232
##    -0.082
##
##     0.860
##     0.699
##    -0.563
##
## Regressions:
##                       Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   eco_well_being_cfa ~
##     lit_ed                0.209    0.011   19.860    0.000    0.854
##   mmhealth ~
##     lit_ed                0.074    0.015    4.807    0.000    0.219
##   child_health ~
##     eco_wll_bng_cf       -1.804    0.130  -13.892    0.000   -0.932
##   ed_invest ~
##     eco_wll_bng_cf       -1.050    0.200   -5.264    0.000   -0.666
##     lit_ed               -0.098    0.043   -2.285    0.022   -0.254
##   outcomes_r4 ~
##     ed_invest            -0.212    0.018  -11.938    0.000   -0.882
```

```
##   Std.all
##
##     0.854
##
##     0.219
##
##    -0.932
##
##    -0.666
##    -0.254
##
##    -0.882
##
## Covariances:
##                          Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner ~~
##     lit_ed                -0.011    0.010   -1.098    0.272   -0.042
##  .mmhealth ~~
##    .child_health          -0.007    0.006   -1.065    0.287   -0.185
##    .outcomes_r4           -0.000    0.001   -0.719    0.472   -0.051
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -2.460    0.014   -0.658
##   Std.all
##
##    -0.042
##
##    -0.185
##    -0.051
##
##    -0.658
##
## Intercepts:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.869    0.012   73.151    0.000    0.869    2.573
##    .1_momedu          1.594    0.032   49.877    0.000    1.594    1.755
##    .1_momlit          0.780    0.015   53.477    0.000    0.780    1.881
##    .2_wi_early_yrs    0.443    0.008   55.511    0.000    0.443    1.953
##    .2_fd_nscrty_r2    0.323    0.026   12.349    0.000    0.323    0.434
##    .3_school_type     0.803    0.014   57.429    0.000    0.803    2.020
##    .3_chore_hours     0.732    0.024   30.680    0.000    0.732    1.079
##    .3_hours_study     1.933    0.028   68.211    0.000    1.933    2.400
##    .3_read_encourg    1.749    0.021   85.186    0.000    1.749    2.997
##    .1_sdq1            1.566    0.017   89.786    0.000    1.566    3.159
##    .1_sdq3            1.814    0.014  132.647    0.000    1.814    4.667
##    .1_sdq4            1.551    0.017   88.621    0.000    1.551    3.118
##    .1_sdq5            1.853    0.012  148.613    0.000    1.853    5.228
##    .1_sdq8            1.731    0.016  111.048    0.000    1.731    3.907
##    .1_sdq10           1.752    0.015  115.432    0.000    1.752    4.061
##    .1_sdq13           1.802    0.014  128.540    0.000    1.802    4.522
##    .1_sdq14           1.848    0.013  146.211    0.000    1.848    5.144
##    .1_sdq17           1.965    0.006  305.448    0.000    1.965   10.746
##    .1_sdq15           1.860    0.012  152.456    0.000    1.860    5.363
##    .1_sdq18           1.734    0.016  111.538    0.000    1.734    3.924
##    .1_sdq19           1.738    0.015  112.279    0.000    1.738    3.950
```

```
##    .3_stuntng_t_r3    0.454    0.025   18.394    0.000    0.454    0.647
##    .3_probs_vision    0.099    0.011    9.422    0.000    0.099    0.331
##    .3_probs_resp      0.058    0.008    7.064    0.000    0.058    0.249
##    .4_ppvt_raw        0.421    0.003  137.461    0.000    0.421    4.836
##    .4_maths_perco     0.276    0.003   82.234    0.000    0.276    2.893
##    .4_yrs_grtr_grd    0.036    0.030    1.211    0.226    0.036    0.043
##     oldr_wth_prtnr    0.000                              0.000    0.000
##     lit_ed            0.000                              0.000    0.000
##    .eco_wll_bng_cf    0.000                              0.000    0.000
##    .ed_invest         0.000                              0.000    0.000
##    .mmhealth          0.000                              0.000    0.000
##    .child_health      0.000                              0.000    0.000
##    .outcomes_r4       0.000                              0.000    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.000                              0.000    0.000
##    .1_momedu          0.171    0.025    6.698    0.000    0.171    0.207
##    .1_momlit          0.095    0.006   17.155    0.000    0.095    0.550
##    .2_wi_early_yrs    0.012    0.002    7.597    0.000    0.012    0.240
##    .2_fd_nscrty_r2    0.542    0.027   20.035    0.000    0.542    0.980
##    .3_school_type     0.121    0.006   19.107    0.000    0.121    0.767
##    .3_chore_hours     0.362    0.019   18.993    0.000    0.362    0.788
##    .3_hours_study     0.522    0.027   19.103    0.000    0.522    0.805
##    .3_read_encourg    0.227    0.013   17.994    0.000    0.227    0.666
##    .1_sdq1            0.172    0.010   17.145    0.000    0.172    0.700
##    .1_sdq3            0.120    0.007   18.312    0.000    0.120    0.793
##    .1_sdq4            0.208    0.011   18.797    0.000    0.208    0.840
##    .1_sdq5            0.106    0.006   18.831    0.000    0.106    0.844
##    .1_sdq8            0.172    0.009   19.126    0.000    0.172    0.876
##    .1_sdq10           0.136    0.008   17.567    0.000    0.136    0.731
##    .1_sdq13           0.126    0.007   18.327    0.000    0.126    0.795
##    .1_sdq14           0.110    0.006   18.939    0.000    0.110    0.855
##    .1_sdq17           0.031    0.002   19.479    0.000    0.031    0.917
##    .1_sdq15           0.102    0.005   18.893    0.000    0.102    0.850
##    .1_sdq18           0.140    0.008   17.369    0.000    0.140    0.716
##    .1_sdq19           0.158    0.008   18.531    0.000    0.158    0.814
##    .3_stuntng_t_r3    0.346    0.037    9.266    0.000    0.346    0.703
##    .3_probs_vision    0.084    0.004   19.438    0.000    0.084    0.946
##    .3_probs_resp      0.054    0.003   20.063    0.000    0.054    0.993
##    .4_ppvt_raw        0.002    0.000    9.493    0.000    0.002    0.261
##    .4_maths_perco     0.005    0.000   16.517    0.000    0.005    0.512
##    .4_yrs_grtr_grd    0.485    0.026   18.438    0.000    0.485    0.683
##     oldr_wth_prtnr    0.114    0.006   20.100    0.000    1.000    1.000
##     lit_ed            0.655    0.047   13.986    0.000    1.000    1.000
##    .eco_wll_bng_cf    0.011    0.002    5.512    0.000    0.270    0.270
##    .ed_invest         0.020    0.005    4.127    0.000    0.203    0.203
##    .mmhealth          0.070    0.010    7.214    0.000    0.952    0.952
##    .child_health      0.019    0.033    0.574    0.566    0.131    0.131
##    .outcomes_r4       0.001    0.000    5.158    0.000    0.222    0.222
##
##
## Group 2 [1]:
##
```

```
## Latent Variables:
##                          Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner =~
##     1_partner              1.000                               0.326
##   lit_ed =~
##     1_momedu               1.000                               0.825
##     1_momlit               0.335    0.018   18.185    0.000    0.276
##   eco_well_being_cfa =~
##     2_wi_early_yrs         1.000                               0.193
##     2_fd_nscrty_r2        -0.598    0.130   -4.598    0.000   -0.115
##     3_school_type         -1.018    0.073  -13.930    0.000   -0.196
##   ed_invest =~
##     3_chore_hours          1.000                               0.272
##     3_hours_study         -1.107    0.143   -7.714    0.000   -0.301
##     3_read_encourg        -1.271    0.129   -9.839    0.000   -0.346
##   mmhealth =~
##     1_sdq1                 1.000                               0.253
##     1_sdq3                 0.679    0.072    9.400    0.000    0.172
##     1_sdq4                 0.794    0.092    8.606    0.000    0.201
##     1_sdq5                 0.553    0.066    8.426    0.000    0.140
##     1_sdq8                 0.634    0.079    7.996    0.000    0.160
##     1_sdq10                0.889    0.089   10.023    0.000    0.225
##     1_sdq13                0.622    0.074    8.418    0.000    0.157
##     1_sdq14                0.625    0.071    8.793    0.000    0.158
##     1_sdq17                0.326    0.040    8.121    0.000    0.083
##     1_sdq15                0.527    0.065    8.062    0.000    0.133
##     1_sdq18                0.974    0.091   10.650    0.000    0.246
##     1_sdq19                0.808    0.088    9.198    0.000    0.204
##   child_health =~
##     3_stuntng_t_r3         1.000                               0.419
##     3_probs_vision        -0.097    0.026   -3.689    0.000   -0.041
##     3_probs_resp          -0.085    0.027   -3.168    0.002   -0.036
##   outcomes_r4 =~
##     4_ppvt_raw             1.000                               0.070
##     4_maths_perco          0.952    0.053   18.015    0.000    0.067
##     4_yrs_grtr_grd        -6.512    0.469  -13.889    0.000   -0.459
##   Std.all
##
##     1.000
##
##     0.903
##     0.663
##
##     0.872
##    -0.172
##    -0.514
##
##     0.405
##    -0.371
##    -0.599
##
##     0.508
##     0.458
##     0.404
```

```
##     0.392
##     0.366
##     0.507
##     0.392
##     0.416
##     0.373
##     0.370
##     0.563
##     0.444
##
##     0.550
##    -0.152
##    -0.130
##
##     0.798
##     0.705
##    -0.531
##
## Regressions:
##                        Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   eco_well_being_cfa ~
##     lit_ed                0.184    0.010   18.084    0.000    0.786
##   mmhealth ~
##     lit_ed                0.068    0.014    4.871    0.000    0.221
##   child_health ~
##     eco_wll_bng_cf       -1.935    0.147  -13.163    0.000   -0.891
##   ed_invest ~
##     eco_wll_bng_cf       -0.795    0.140   -5.682    0.000   -0.563
##     lit_ed               -0.130    0.030   -4.421    0.000   -0.395
##   outcomes_r4 ~
##     ed_invest            -0.212    0.021  -10.161    0.000   -0.820
##   Std.all
##
##     0.786
##
##     0.221
##
##    -0.891
##
##    -0.563
##    -0.395
##
##    -0.820
##
## Covariances:
##                         Estimate  Std.Err  z-value  P(>|z|)   Std.lv
##   older_with_partner ~~
##     lit_ed                -0.001    0.010   -0.051    0.959   -0.002
##  .mmhealth ~~
##    .child_health          -0.008    0.007   -1.152    0.249   -0.161
##    .outcomes_r4           -0.001    0.001   -1.157    0.247   -0.073
##  .child_health ~~
##    .outcomes_r4           -0.003    0.001   -2.334    0.020   -0.452
##   Std.all
```

```
##
##    -0.002
##
##    -0.161
##    -0.073
##
##    -0.452
##
## Intercepts:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.879    0.011   77.899    0.000    0.879    2.696
##    .1_momedu          1.619    0.032   51.215    0.000    1.619    1.772
##    .1_momlit          0.776    0.014   53.791    0.000    0.776    1.862
##    .2_wi_early_yrs    0.455    0.008   59.424    0.000    0.455    2.056
##    .2_fd_nscrty_r2    0.278    0.023   12.004    0.000    0.278    0.415
##    .3_school_type     0.823    0.013   62.257    0.000    0.823    2.155
##    .3_chore_hours     0.733    0.023   31.462    0.000    0.733    1.089
##    .3_hours_study     1.819    0.028   64.789    0.000    1.819    2.242
##    .3_read_encourg    1.690    0.020   84.507    0.000    1.690    2.925
##    .1_sdq1            1.545    0.017   89.650    0.000    1.545    3.102
##    .1_sdq3            1.831    0.013  141.246    0.000    1.831    4.888
##    .1_sdq4            1.549    0.017   89.919    0.000    1.549    3.112
##    .1_sdq5            1.850    0.012  149.864    0.000    1.850    5.186
##    .1_sdq8            1.740    0.015  114.655    0.000    1.740    3.968
##    .1_sdq10           1.731    0.015  112.712    0.000    1.731    3.901
##    .1_sdq13           1.798    0.014  129.287    0.000    1.798    4.474
##    .1_sdq14           1.825    0.013  138.853    0.000    1.825    4.805
##    .1_sdq17           1.949    0.008  254.767    0.000    1.949    8.817
##    .1_sdq15           1.847    0.012  148.123    0.000    1.847    5.126
##    .1_sdq18           1.741    0.015  114.910    0.000    1.741    3.977
##    .1_sdq19           1.695    0.016  106.323    0.000    1.695    3.679
##    .3_stuntng_t_r3    0.526    0.026   19.962    0.000    0.526    0.691
##    .3_probs_vision    0.078    0.009    8.395    0.000    0.078    0.291
##    .3_probs_resp      0.081    0.009    8.604    0.000    0.081    0.298
##    .4_ppvt_raw        0.438    0.003  143.502    0.000    0.438    4.966
##    .4_maths_perco     0.282    0.003   85.646    0.000    0.282    2.964
##    .4_yrs_grtr_grd    0.061    0.030    2.046    0.041    0.061    0.071
##     oldr_wth_prtnr    0.000                              0.000    0.000
##     lit_ed            0.000                              0.000    0.000
##    .eco_wll_bng_cf    0.000                              0.000    0.000
##    .ed_invest         0.000                              0.000    0.000
##    .mmhealth          0.000                              0.000    0.000
##    .child_health      0.000                              0.000    0.000
##    .outcomes_r4       0.000                              0.000    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .1_partner         0.000                              0.000    0.000
##    .1_momedu          0.154    0.028    5.549    0.000    0.154    0.185
##    .1_momlit          0.097    0.006   17.228    0.000    0.097    0.561
##    .2_wi_early_yrs    0.012    0.002    7.085    0.000    0.012    0.240
##    .2_fd_nscrty_r2    0.434    0.021   20.319    0.000    0.434    0.970
##    .3_school_type     0.107    0.006   19.019    0.000    0.107    0.735
##    .3_chore_hours     0.379    0.019   19.529    0.000    0.379    0.836
```

```
##    .3_hours_study     0.568    0.029   19.699    0.000    0.568    0.862
##    .3_read_encourg    0.214    0.012   17.624    0.000    0.214    0.642
##    .1_sdq1            0.184    0.010   18.016    0.000    0.184    0.742
##    .1_sdq3            0.111    0.006   18.587    0.000    0.111    0.790
##    .1_sdq4            0.207    0.011   19.083    0.000    0.207    0.837
##    .1_sdq5            0.108    0.006   19.173    0.000    0.108    0.846
##    .1_sdq8            0.167    0.009   19.363    0.000    0.167    0.866
##    .1_sdq10           0.146    0.008   18.031    0.000    0.146    0.743
##    .1_sdq13           0.137    0.007   19.177    0.000    0.137    0.847
##    .1_sdq14           0.119    0.006   18.982    0.000    0.119    0.827
##    .1_sdq17           0.042    0.002   19.311    0.000    0.042    0.861
##    .1_sdq15           0.112    0.006   19.336    0.000    0.112    0.863
##    .1_sdq18           0.131    0.008   17.210    0.000    0.131    0.683
##    .1_sdq19           0.170    0.009   18.731    0.000    0.170    0.803
##    .3_stuntng_t_r3    0.405    0.053    7.582    0.000    0.405    0.697
##    .3_probs_vision    0.070    0.003   20.178    0.000    0.070    0.977
##    .3_probs_resp      0.074    0.004   20.267    0.000    0.074    0.983
##    .4_ppvt_raw        0.003    0.000   11.480    0.000    0.003    0.363
##    .4_maths_perco     0.005    0.000   15.379    0.000    0.005    0.503
##    .4_yrs_grtr_grd    0.534    0.029   18.515    0.000    0.534    0.718
##     oldr_wth_prtnr    0.106    0.005   20.433    0.000    1.000    1.000
##     lit_ed            0.680    0.048   14.097    0.000    1.000    1.000
##    .eco_wll_bng_cf    0.014    0.002    7.210    0.000    0.383    0.383
##    .ed_invest         0.013    0.004    3.332    0.001    0.176    0.176
##    .mmhealth          0.061    0.009    6.742    0.000    0.951    0.951
##    .child_health      0.036    0.050    0.729    0.466    0.207    0.207
##    .outcomes_r4       0.002    0.000    6.466    0.000    0.328    0.328
```