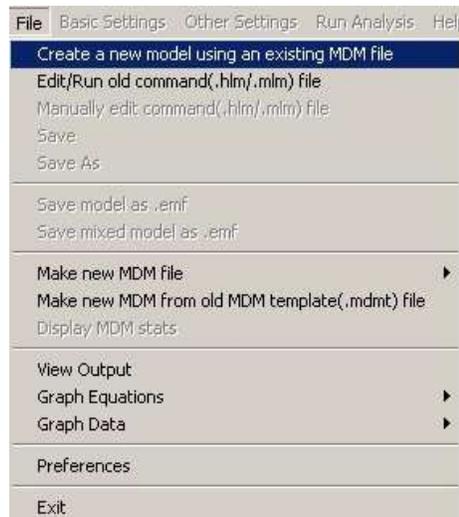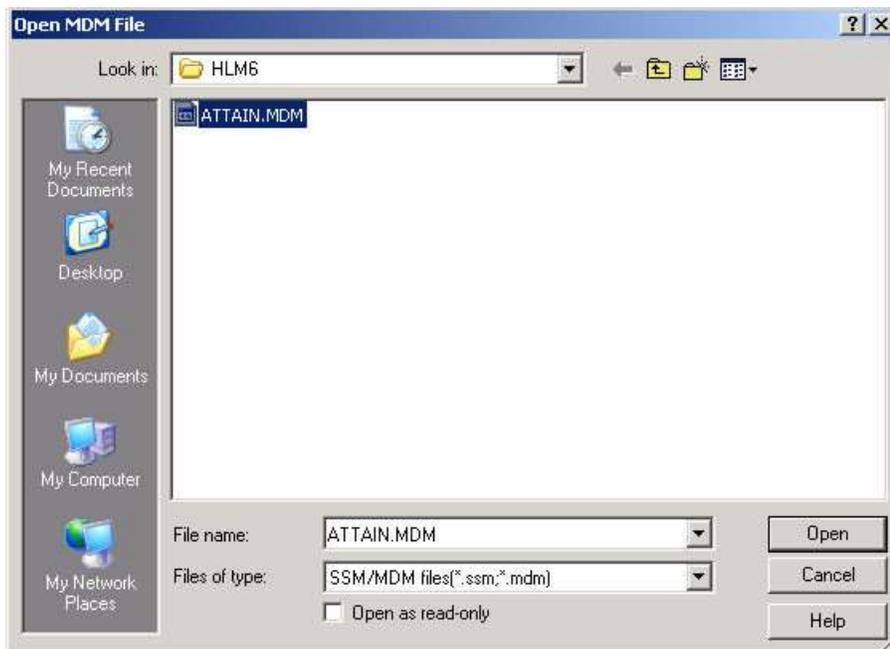## Example of an HCM2 analysis

From the WHLM window, open the **File** menu and choose **Create a new model using an existing MDM file** to open an **Open MDM File** dialog box.
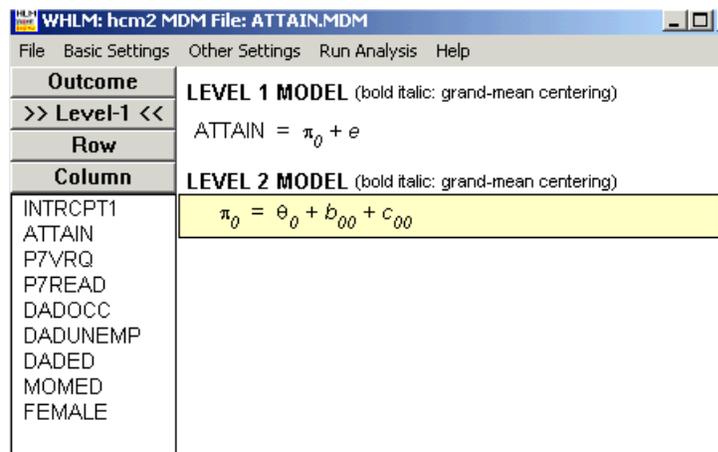

Open the existing MDM file (**attain.mdm** in our example).

After selection of the MDM, file, the list of level-1 variables is displayed on the left side of the main WHLM window. Click on the name of the outcome variable (ATTAIN in our example) and select **Outcome variable** from the pop-up menu.
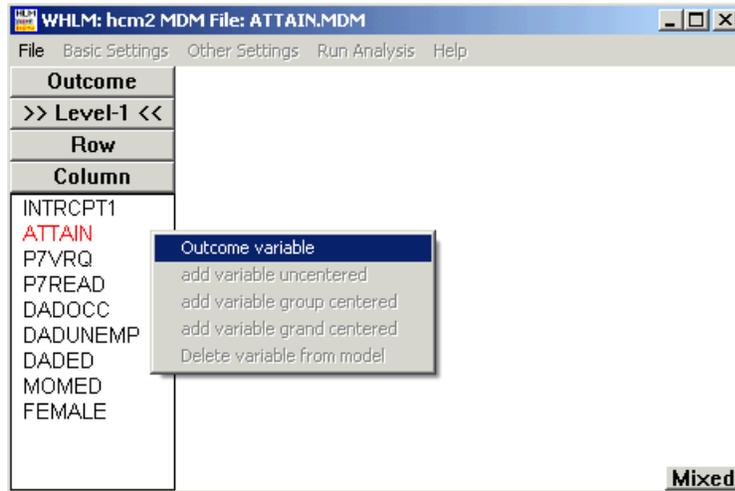
The unconditional model will appear in equation format as shown below.

The next step is to set up the level-1 model. The variables available for inclusion are:

ATTAIN, a measure of educational attainment

P7VRQ, denoting primary 7 verbal reasoning quotient

P7READ, denoting primary 7 reading test scores

DADOCC, indicating the father's occupation scaled on the Hope-Goldthorpe scale in conjunction with the Registrar General's social-class index (Willms, 1986)

DADUNEMP, an indicator for father's unemployment status (1 if unemployed, 0 otherwise)

DADED, an indicator for father's educational level (1 if schooling past the age of 15, 0 otherwise)

MOMED, an indicator for mother's educational level (1 if schooling past the age of 15, 0 otherwise)

FEMALE, an indicator for student gender (1 if male, 0 if female)

Click on the variable P7VCRQ from the list of variables at the left of the screen, and select the **add grand-mean centered** option from the pop-up menu as shown.
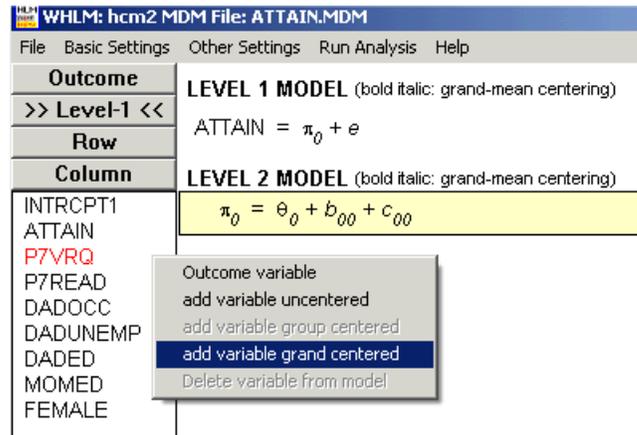
The following model is now displayed in the main window. Note that, by clicking the **Mixed** button at the bottom of the main window, the complete model can also be displayed in mixed model notation, which shows the model as a single equation including all effects from the various levels.
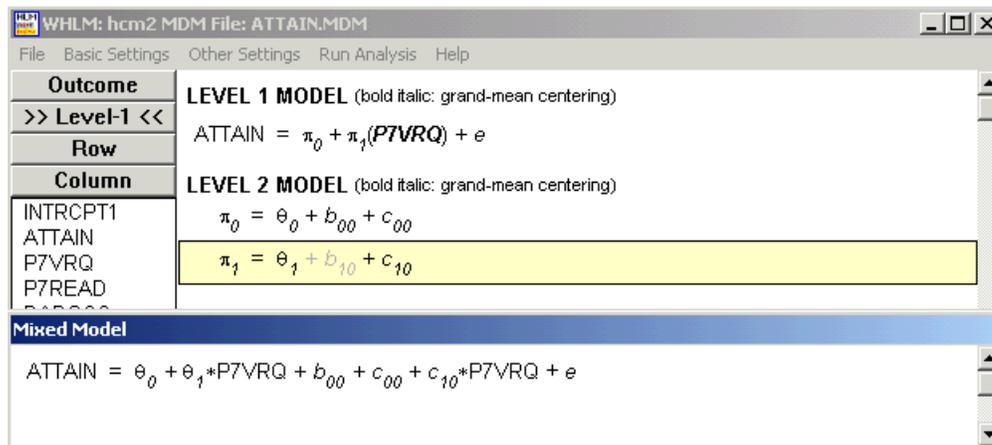
Add the level-1 variables P7READ, DADOCC, DADUNEMP, DADED, MOMED, and MALE in the same way as P7VRQ to obtain the following model:

WHLM: hcm2 MDM File: ATTAIN.MDM

File   Basic Settings   Other Settings   Run Analysis   Help

| Outcome |
| >> Level-1 << |
| Row |
| Column |

INTRCPT1
ATTAIN
P7VRQ
P7READ
DADOCC
DADUNEMP
DADED
MOMED
FEMALE

LEVEL 1 MODEL (bold italic: grand-mean centering)

$$\text{ATTAIN} = \pi_0 + \pi_1(P7VRQ) + \pi_2(P7READ) + \pi_3(DADOCC) + \pi_4(DADUNEMP) + \pi_5(DADED) + \pi_6(MOMED) + \pi_7(FEMALE) + e$$

LEVEL 2 MODEL (bold italic: grand-mean centering)

$$\pi_0 = \theta_0 + b_{00} + c_{00}$$
$$\pi_1 = \theta_1 + b_{10} + c_{10}$$
$$\pi_2 = \theta_2 + b_{20} + c_{20}$$
$$\pi_3 = \theta_3 + b_{30} + c_{30}$$
$$\pi_4 = \theta_4 + b_{40} + c_{40}$$
$$\pi_5 = \theta_5 + b_{50} + c_{50}$$
$$\pi_6 = \theta_6 + b_{60} + c_{60}$$
$$\pi_7 = \theta_7 + b_{70} + c_{70}$$

Mixed

In the interest of parsimony, given the small cell sizes and within-neighborhood sizes, all level-1 coefficients are fixed. (To specify any of them as randomly varying, select the equation containing a specific regression coefficient, π_p, and click on b_{p0}.

To set up the level-2 row-factor prediction model, select the equation containing π_0. A list box for row-factor variables (>>**Row**<<) will appear. Click DEPRIVE and apply the grand-mean centering scheme.

WHLM: hcm2 MDM File: ATTAIN.MDM

File   Basic Settings   Other Settings   Run Analysis   Help

Outcome
Level-1
>> Row <<
Column
ICPTROW
DEPRIVE

LEVEL 1 MODEL (bold italic: grand-mean centering)

$$ATTAIN = \pi_0 + \pi_1(\textit{P7VRQ}) + \pi_2(\textit{P7READ}) + \pi_3(\textit{DADOCC}) + \pi_4(\textit{DADUNEMP}) +$$
$$\pi_5(\textit{DADED}) + \pi_6(\textit{MOMED}) + \pi_7(\textit{FEMALE}) + e$$

LEVEL 2 MODEL (bold italic: grand-mean centering)

> add variable uncentered
> **add variable grand centered**
> Delete variable from model

$$\pi_2 = \theta_2 + b_{20} + c_{20}$$
$$\pi_3 = \theta_3 + b_{30} + c_{30}$$
$$\pi_4 = \theta_4 + b_{40} + c_{40}$$
$$\pi_5 = \theta_5 + b_{50} + c_{50}$$
$$\pi_6 = \theta_6 + b_{60} + c_{60}$$
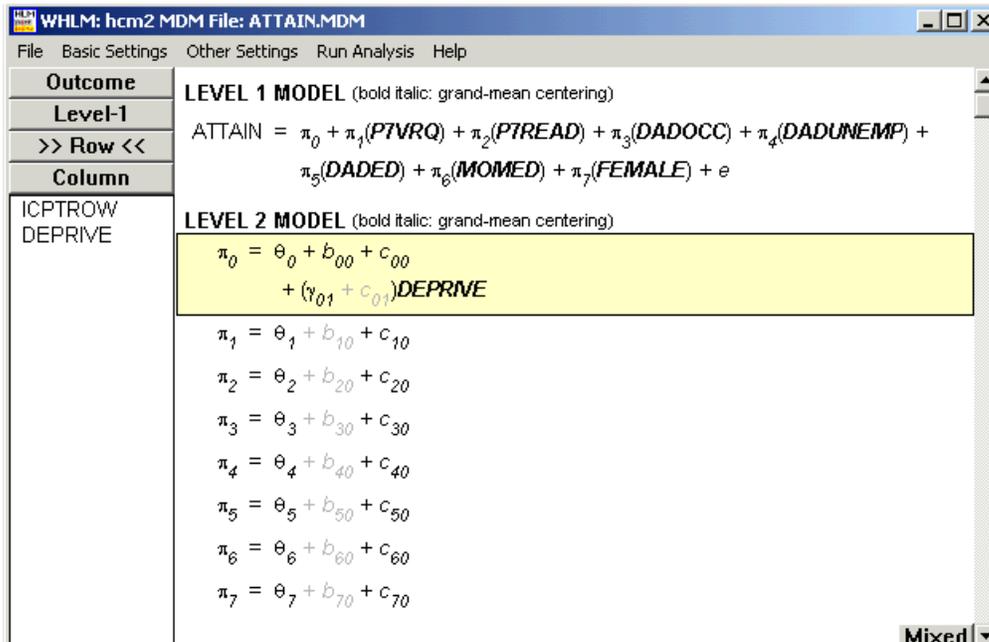$$\pi_7 = \theta_7 + b_{70} + c_{70}$$

Mixed ▼

to obtain the model shown below.

WHLM: hcm2 MDM File: ATTAIN.MDM

File   Basic Settings   Other Settings   Run Analysis   Help

Outcome
Level-1
>> Row <<
Column
ICPTROW
DEPRIVE

LEVEL 1 MODEL (bold italic: grand-mean centering)

$$ATTAIN = \pi_0 + \pi_1(\textit{P7VRQ}) + \pi_2(\textit{P7READ}) + \pi_3(\textit{DADOCC}) + \pi_4(\textit{DADUNEMP}) +$$
$$\pi_5(\textit{DADED}) + \pi_6(\textit{MOMED}) + \pi_7(\textit{FEMALE}) + e$$

LEVEL 2 MODEL (bold italic: grand-mean centering)

$$\pi_0 = \theta_0 + b_{00} + c_{00}$$
$$+ (\gamma_{01} + c_{01})\textit{DEPRIVE}$$
$$\pi_1 = \theta_1 + b_{10} + c_{10}$$
$$\pi_2 = \theta_2 + b_{20} + c_{20}$$
$$\pi_3 = \theta_3 + b_{30} + c_{30}$$
$$\pi_4 = \theta_4 + b_{40} + c_{40}$$
$$\pi_5 = \theta_5 + b_{50} + c_{50}$$
$$\pi_6 = \theta_6 + b_{60} + c_{60}$$
$$\pi_7 = \theta_7 + b_{70} + c_{70}$$

Mixed ▼

The model can now be saved using the **Save As** option on the **File** menu. This enables the user to recall this model and make further modifications to it at a later date. To run the analysis, the **Run Analysis** option on the main WHLM window is clicked.