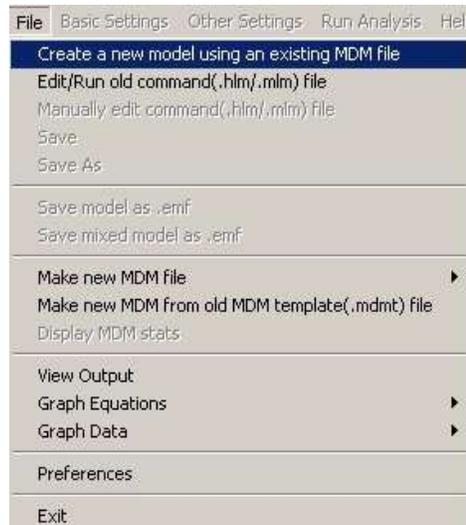


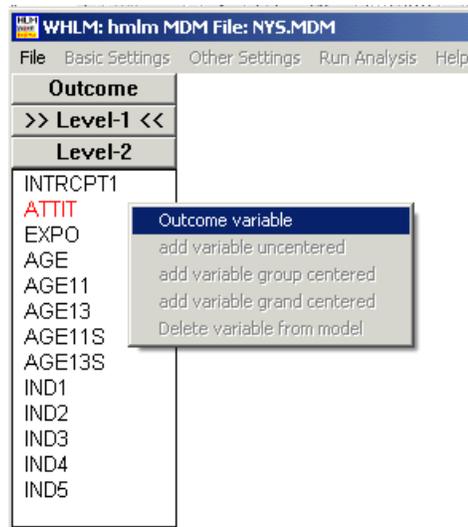
## Example of an HMLM model

To create a new command file based on **nys.mdm**, select **Create a new model using an existing MDM file** option from the **File** menu.



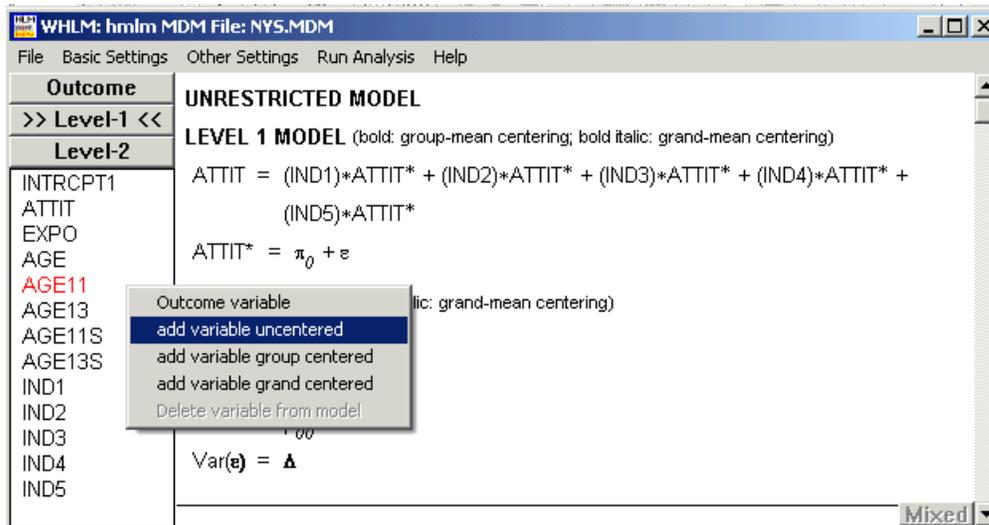
Select the previously created **MDM** file from the **\examples\chapter9** folder when prompted to do so and click **OK** to return to the main **WHLM** window.

The level-1 variables for which information is available in the **MDM** file are displayed on the left of the main window. As a first step, select the variable **ATTIT** as the outcome variable by clicking on the variable name and selecting **outcome variable** on the pop-up menu as shown below.

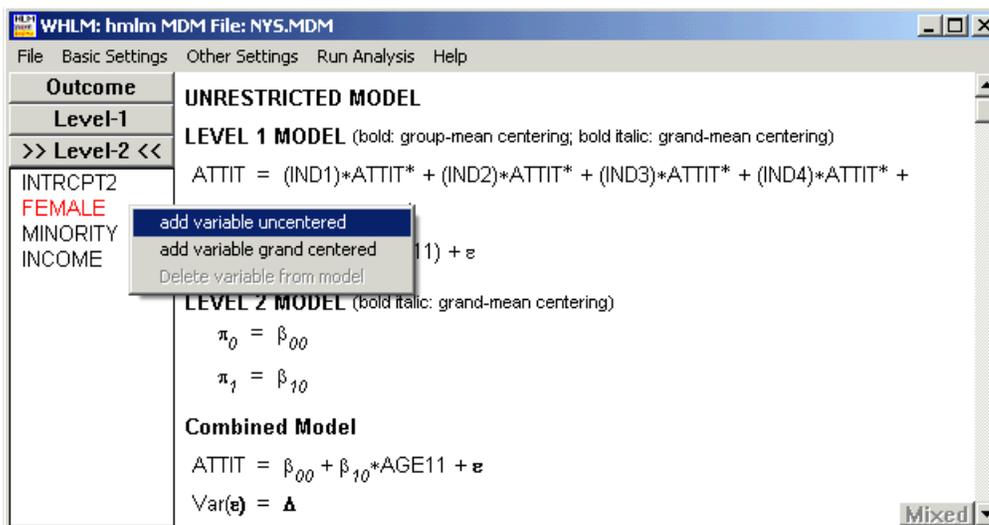


The unconditional models with both unrestricted and homogeneous level-1

variance structures are now displayed by default in the main window. Add AGE11 as an **uncentered** predictor at level-1, as shown below.



Note that the model now displayed is still unconditional at level-2. To add the covariate FEMALE to both the intercept and slope equations, click the **Level-2** button on the left of the window to display the level-2 variables available. Next, click on the intercept equation, add FEMALE **uncentered** to the intercept equation, as shown below.



To add the FEMALE covariate to the slope equation too, first click on this equation and then add FEMALE in the same way as was done with the intercept equation. Also activate the error term for the slope equation by clicking on it. The complete model is now displayed in the main window, as shown below.

WHLM: hmlm MDM File: NYS.MDM

File Basic Settings Other Settings Run Analysis Help

**Outcome**

**Level-1**

>> **Level-2** <<

INTRCPT2  
FEMALE  
MINORITY  
INCOME

**UNRESTRICTED MODEL**

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

$$ATTIT = (IND1)*ATTIT* + (IND2)*ATTIT* + (IND3)*ATTIT* + (IND4)*ATTIT* + (IND5)*ATTIT*$$

$$ATTIT* = \pi_0 + \pi_1(AGE11) + \epsilon$$

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

$$\pi_0 = \beta_{00} + \beta_{01}(FEMALE)$$

$$\pi_1 = \beta_{10} + \beta_{11}(FEMALE)$$

**Combined Model**

$$ATTIT = \beta_{00} + \beta_{01}*FEMALE + \beta_{10}*AGE11 + \beta_{11}*FEMALE*AGE11 + \epsilon$$

$$Var(\epsilon) = \Delta$$


---

**HOMOGENEOUS MODEL**

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

$$ATTIT = (IND1)*ATTIT* + (IND2)*ATTIT* + (IND3)*ATTIT* + (IND4)*ATTIT* + (IND5)*ATTIT*$$

$$ATTIT = \pi_0 + \pi_1(AGE11) + \epsilon$$

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

$$\pi_0 = \beta_{00} + \beta_{01}(FEMALE) + r_0$$

$$\pi_1 = \beta_{10} + \beta_{11}(FEMALE) + r_1$$

**Combined Model**

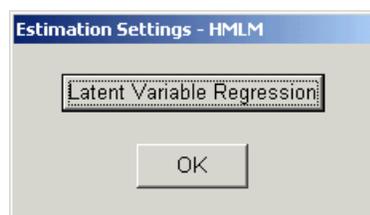
$$ATTIT = \beta_{00} + \beta_{01}*FEMALE + \beta_{10}*AGE11 + \beta_{11}*FEMALE*AGE11 + \epsilon$$

$$\epsilon = r_0 + r_1*AGE11 + e$$

$$Var(\epsilon) = Var(Ar + e) = \Delta = A\tau A' + \sigma^2 I$$

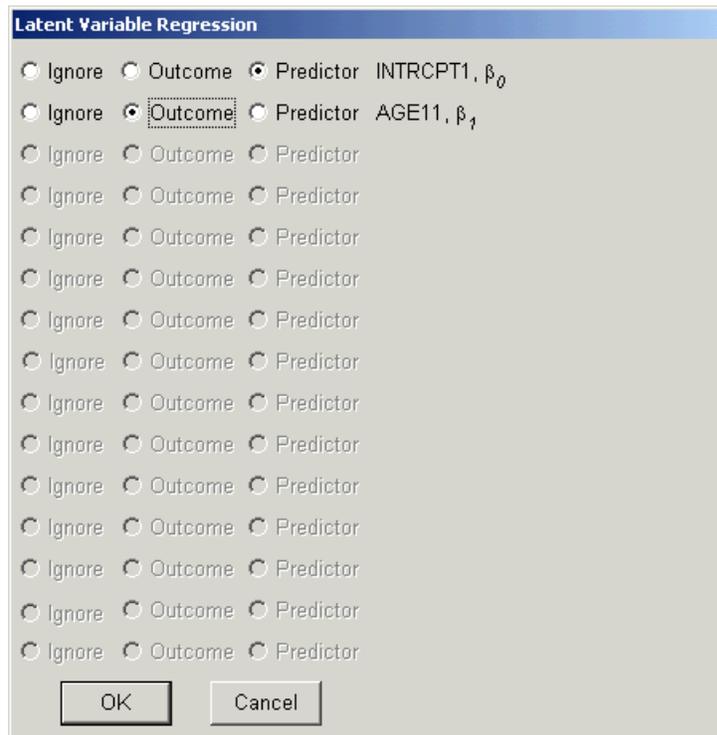
Mixed

In order to run a latent variable analysis with HMLM for the 2-level model, the latent variable must be specified. Select the **Estimation Settings** option from the **Other Settings** menu to open the **Estimation Settings – HMLM** dialog box, then access the **Latent Variable Regression** dialog box by clicking on the **Latent Variable Regression** button provided in the dialog box shown below.



On the **Latent Variable Regression** dialog box, click the radio buttons to indicate that AGE11 is the outcome, and the intercept is the predictor for this

example.



$\beta_0$ , the level of tolerance at age 11, is used to model the linear growth rate, represented by  $\beta_1$ . Both  $\beta_0$  and  $\beta_1$  are latent variables, as they are free of measurement error. The effect of gender on the linear growth rate is assessed, after controlling for the initial status at age 11.

Note that the **homogeneous level-1 variance** option (see the **Basic Model Specifications – HMLM** dialog box) is used for this model. This means that the results obtained for this example will be identical to those obtained using HLM2 instead of HMLM. Also, results for both the unrestricted model and the model with homogeneous level-1 variance will be produced by HMLM.

Finally, save the newly created command file by selecting **Save As** on the **File** menu and assigning a name, in this case **nys2.mlm**, to the command file. Click **Save** to return to the main **WHLM** window and click **Run Analysis** to start the analysis.