Data based graphing: line plots

In scatter plots, observations on a pair of level-1 variables are plotted to examine their association, with and without a level-2 controlling variable. In line plots, level-1 repeated measures observations are joined by lines to describe changes or developments over time during the course of the research study. We illustrate this type of plot with data from two studies of children's vocabulary development (Huttenlocher, Haight, Bryk, and Seltzer, 1991, see also *Hierarchical Linear Models*, pp. 170-179). Twenty-two children were observed in the home on three to seven occasions at 2 to 4-month intervals during their second year of birth. A measure of the child's vocabulary size at each measurement occasion was derived from these observations. In this example, the level-1 file, **vocabl1.sav** has

> AGE   Age in months
> VOCAB   Vocabulary size
> AGE12   Age in months minus 12
> AGE12Q   AGE12*AGE12

The level-2 data file, **vocabl2.sav**, consists of 22 children and an indicator variable for gender

> MALE   An indicator for gender (1 = male, 0 = female)

To prepare a scatter plot

1. From the HLM window, open the **File** menu.

2. Choose **Create a new model using an existing MDM file** to open an **Open MDM File** dialog box. Open **vocab.mdm**.

3. Open the **File** menu, choose **Graph Data...line plots, scatter plots** to open an **Choose X and Y variables** dialog box.

4. Select AGE from the **X-axis** drop-down list box.

5. Select VOCAB from the **Y-axis** drop-down list box.

6. Select number of groups. In this example, we include all the children in the display by selecting **All groups (n = 22)** in **Number of groups** drop-down list box.

7. Select type of line plot and method of interpolation. Users can select line plots with and without markers or asterisks showing where the data points are. The two types of interpolation are linear and cubic. In linear interpolations, the data

points are simply joined by straight line segments. Cubic interpolations may be chosen to provide a smoother function and more continuity between the segments. For our example, suppose we want a line plot with no markers that is graphed with the linear interpolation method. Click the selection button for **Straight line**.
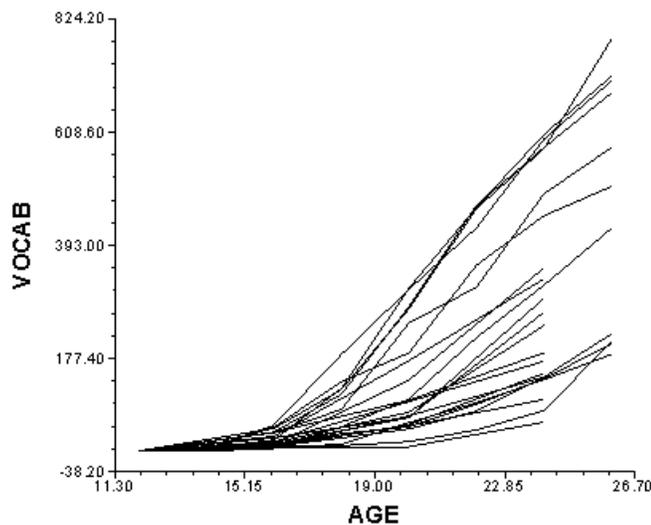
8. Select type of pagination. In this example, we want to have the trajectories for all children on the same graph and select **All groups on same graph** pagination option accordingly. When all the choices are made, the **Choose X and Y variables** dialog box should look like the one shown below.

Click **OK** to make the line plot. The following graph will appear.

We see that, for all children, vocabulary size is near zero at around a year of age (12 – 15 months) and that for each child, vocabulary size increases, typically quite rapidly during the second year of life.

To include a classifying level-2 variable

Now we want to look at the difference between boys and girls. On the menu of the graph dialog box, click **Graph Settings**. Here we choose the level-2 variable FEMALE as a **Z-focus** variable. For illustrative purposes, we will use the cubic interpolation method this time by clicking the selection button for **Cubic interpolation** line. The following graph shows that girls' vocabulary tends to grow more rapidly than that of boys, on average.