INSTRUCTIONS FOR USING AM SOFTWARE TO ANALYZE 2003 NAAL DATA

The National Assessment of Adult Literacy uses complex sampling and state-of-the-art test designs that allow a statistical representation of the adult U.S. population and good coverage of the broad domain of literacy. NAAL administers only a fraction of the assessment items on each scale to each participant. To obtain the best possible estimates of literacy proficiency, special analysis tools are needed. Statistical procedures based on the method of *Marginal Maximum Likelihood (MML)* provide consistent estimates of population statistics, even when there is noise in the measurement of individuals. AIR provides the *AM* software free to users to implement these procedures.

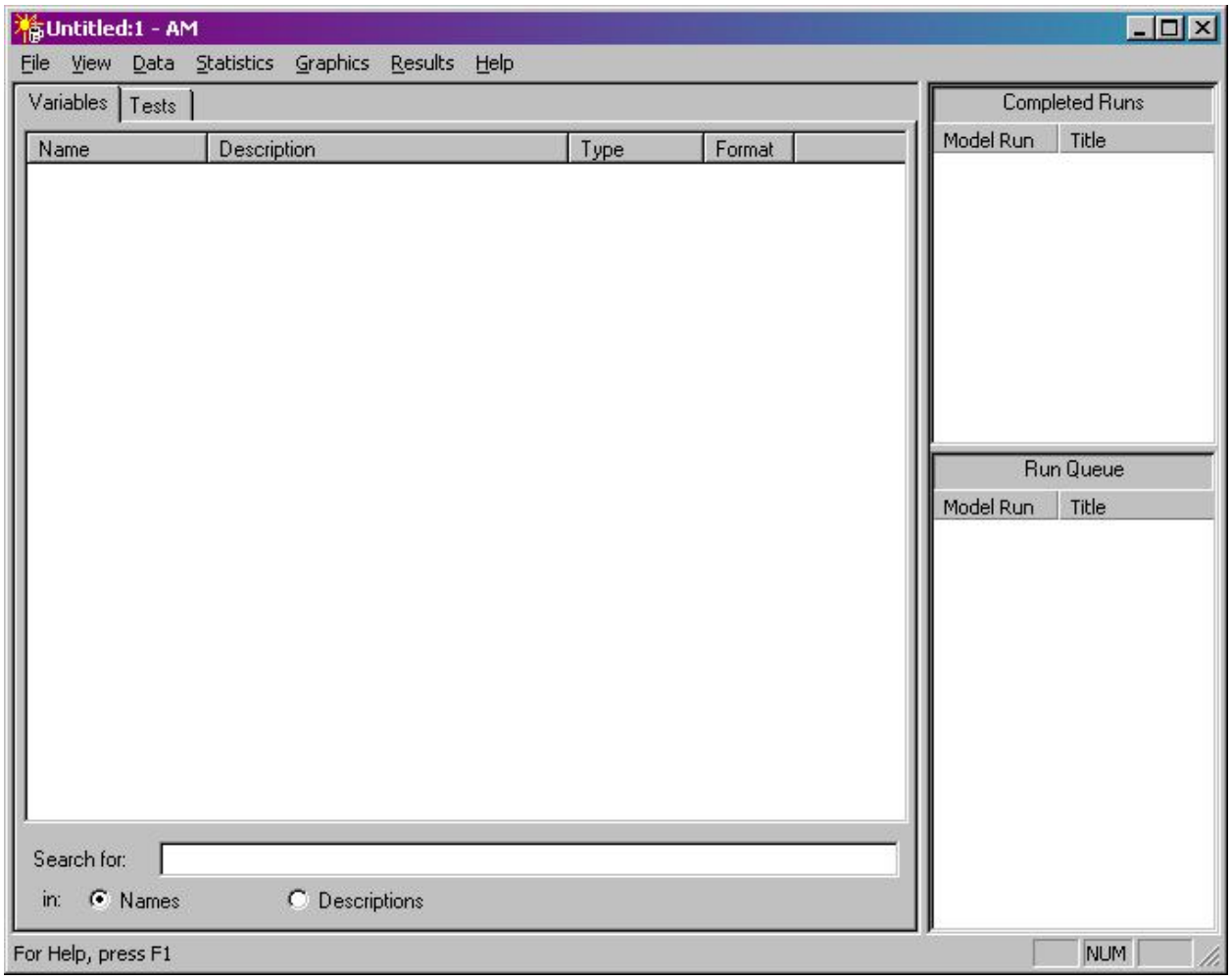
This document will help first-time *AM* users get started analyzing the NAAL data sets. The software also has an interactive help system that explains both how to use the software and the statistical procedures themselves. Users can access the help system by pressing the F1 key within the program.

STARTING AM

To open the program, simply double-click the *AM* software icon. The *AM* program has a main menu bar and three windows:

- The Variables List appears on the left-hand side of the screen. Use the Variables List to view and manage the variables in your data file.
- The Run Queue appears in the bottom-right quadrant. Statistical models that you are preparing appear here until it is their turn to run.
- The Completed Runs Queue holds statistical runs once they are complete. Most statistical models allow you to conduct post-hoc analysis by right-clicking icons in the completed run queue.

The program looks like this when it first opens:



The first step to using the program is getting data into the program.

OPENING THE 2003 NAAL DATA FILE IN AM

Copy the NAAL data file and save it to your local drive. Then:

1. Under the *AM* File menu, select "Open Database."
2. Locate the 2003 NAAL data file and click "Open."

ANALYZING 2003 NAAL DATA IN AM

Literacy scores from the NAAL are reported in two formats: 1) as means and 2) as the percentage of adults within each of four literacy levels. Two procedures in *AM* generate mean literacy scores and the percentage of adults within the literacy levels.

For both types of analyses, you will need to select an **independent variable(s)** and a **dependent variable.**

Independent variables: These variables describe attributes or characteristics of people, such as gender, race/ethnicity, or educational attainment. Use the 2003 NAAL codebook to identify independent variables of interest.

Dependent variable: The dependent variable is the literacy scale for which you want results. Select prose, document, or quantitative.

AM automatically accounts for the NAAL sampling design and includes strata, cluster, and weight variables necessary for analyses. This results in more precise estimates.

Calculating Mean Literacy Scores

1. Once you have opened the 2003 NAAL data file in *AM*, go to the "Statistics" menu, select "MML Procedures for Test Data," and then select "MML Means (Separate Variances)."
2. Select the independent variable you would like to analyze (e.g., race/ethnicity, educational attainment, gender). You can enter independent variables in two ways:
    a. Type the variable name in the small box beneath the Independent Variables box. Click "Enter" after you type the name to move it the list of Independent Variables.
    b. Drag the variable from the Variables List window to the Independent Variables box.
3. Select the literacy scale for which you would like results (prose, document, or quantitative). You can select the scale in two ways:
    a. Type the scale name in the small box beneath the Dependent Variables box. Click "Enter" after you type the name to move it the list of Dependent Variables.
    b. Click the Tests window on the left side of the screen. Expand the "NAAL Rescale" icon and drag the scale of interest to the Dependent Variables box.
4. Select the format in which you would like the results to appear. The default setting is "Web browser." If you would like the results to be outputted as a text file or a spreadsheet, select "Plain Text" or "Spreadsheet" output.
5. Click "OK." *AM* will execute the command and display the results in the output format you specified.

Example: Calculating Mean Prose Literacy Scores for Men and Women

The following example generates mean prose literacy scores for men and women. The results match the literacy estimates presented in Figure 4 of the first NAAL report, *A First Look at the Literacy of America's Adults in the 21st Century.*[1]

1. From the "Statistics" menu, select "MML Procedures for Test Data."
2. Select "MML Means (Separate variances)."
3. As noted in the 2003 NAAL codebook, the variable capturing gender is *d_sex2*. To estimate the literacy of men and women, drag the variable *d_sex2* from the Variables List window to the Independent Variables box (you can also type *d_sex2* in the small box beneath the Independent Variables box and click enter).
4. To estimate prose literacy scores, drag the Prose test from the Tests window to the Dependent Variables box (you can also type "Prose" in the small box beneath the Dependent Variables box and click enter).
5. For the *First Look Report,* some of the advanced specifications were changed to get more precise estimates. For example, the number of iterations was increased to 1,000 and the convergence criterion was decreased to .0000001. You can change these settings by clicking the "Advanced Parameters" tab. However, for general secondary analyses, the default settings should suffice.
6. Click "OK" and the mean prose literacy scores for men and women will appear in the output format you selected.

To estimate means for document and quantitative literacy for men and women, replace Prose in step 4 with the Document or Quantitative test variables. To estimate means for a different population group (e.g., country of birth), replace *d_sex2* in the Independent Variables box with the variable of interest.

Calculating the Percentage of Adults Within Literacy Levels

The 2003 NAAL also reports results by using four literacy levels: *Below Basic, Basic, Intermediate,* and *Proficient*. Each of the three literacy scales (prose, document, and quantitative) has unique cutpoints for the literacy levels:

Prose		Document		Quantitative	
Below Basic:	0–209	Below Basic:	0–204	Below Basic:	0–234
Basic:	210–264	Basic:	205–249	Basic:	235–289
Intermediate:	265–339	Intermediate:	250–334	Intermediate:	290–349
Proficient:	340–500	Proficient:	335–500	Proficient:	350–500

[1] Kutner, M., Greenberg, E., and Baer, J. (2005). *A First Look at the Literacy of America's Adults in the 21st Century* (NCES 2006-470). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

1. Once you have opened the 2003 NAAL data file in *AM*, go to the "Statistics" menu, select "MML Procedures for Test Data," and then select "NALS Table."[2]
2. Select the independent variable you would like to analyze (e.g., race/ethnicity, educational attainment, gender). You can enter independent variables in two ways:
   a. Type the variable name in the small box beneath the Independent Variables box. Click "Enter" after you type the name to move it the list of Independent Variables.
   b. Drag the variable from the Variables List window to the Independent Variables box.
3. Select the literacy scale for which you would like results (prose, document, or quantitative). You can select the scale in two ways:
   a. Type the scale name in the small box beneath the Dependent Variables box. Click "Enter" after you type the name to move it the list of Dependent Variables.
   b. Click the Tests window on the left side of the screen. Expand the "NAAL Rescale" icon and the scale of interest to the Dependent Variables box.
4. Enter the appropriate cut scores for the literacy scale you have selected. The cut scores for the scales are as follows:

Prose	Document	Quantitative
Cut 1: 210	Cut 1: 205	Cut 1: 235
Cut 2: 265	Cut 2: 250	Cut 2: 290
Cut 3: 340	Cut 3: 335	Cut 3: 350

   a. To enter cut scores, double-click "Cut 1" in the Cut Scores box. Type the first cut score for the appropriate scale in the box. For example, if you had selected prose as your dependent variable, you would type "210" for Cut 1. Click "OK" after entering the cut score.
   b. Enter the remaining two cut scores for the scale you have selected, following the same steps used to set the first cut score. Double-click "Cut 2," enter the appropriate score (e.g., 265 for prose), and click "OK." Enter the last cut score by double-clicking "Cut 3," enter the cut score (e.g., 340 for prose), and then click "OK."
5. Select the format in which you would like the results to appear. The default setting is "Web browser." You can also select "Spreadsheet" or "Plain Text" output.
6. Click "OK." *AM* will execute the command and display the results in the output format you specified.
7. In the output file, you'll see that the column headings correspond to the cut scores you specified. These labels correspond to the 2003 NAAL literacy levels. For example, if you entered cut scores for the prose scale, the column headings will be the following:

[2] The procedure is called "NALS Table" after the 1992 National Adult Literacy Survey (NALS), the precursor to the 2003 National Assessment of Adult Literacy (NAAL).

Weighted N	Percent in 210.000	(Standard Error)	Percent in 265.000	(Standard Error)	Percent in 340.000	(Standard Error)	Percent above 340.000	(Standard Error)

The labels correspond to the 2003 NAAL literacy levels as follows:

Weighted N	Percent *Below Basic*	(Standard Error)	Percent *Basic*	(Standard Error)	Percent *Intermediate*	(Standard Error)	Percent *Proficient*	(Standard Error)

Example: Calculating the Percentage of Men and Women Within Document Literacy Levels

The following example calculates the percentage of men and women in each of the four NAAL literacy levels (*Below Basic, Basic, Intermediate, and Proficient*). The results match the literacy estimates presented in Figure 6 of the first NAAL report, *A First Look at the Literacy of America's Adults in the 21st Century.*

1. From the "Statistics" menu, select "MML Procedures for Test Data."
2. Select "NALS Table."
3. As noted in the 2003 NAAL codebook, the variable capturing gender is *d_sex2*. To estimate the literacy of men and women, drag the variable *d_sex2* from the Variables List window to the Independent Variables box (you can also type *d_sex2* in the small box beneath the Independent Variables box).
4. To estimate Document literacy scores, drag the Document test from the Tests window to the Dependent Variables box (you can also type "Document" in the small box beneath the Dependent Variables box).
5. In the Cut Scores window, enter the appropriate cut scores for the Document scale. Double-click "Cut 1," type "205," and then click "OK." Enter "250" and "335" as the second and third cut scores, respectively.
6. Click "OK" and the weighted percentage of men and women in each Document literacy level will appear in the output format you selected. The results are presented as proportions, so you must multiply each proportion and its corresponding standard error by 100 to convert the numbers to percentages.

To estimate the percentage of men and women in each prose and quantitative literacy level, replace Document in step 4 with the Prose or Quantitative test variables. You will also need to change the cut scores to match the cut scores for the literacy scale you have selected. To estimate means for a different population group (e.g., country of birth), replace *d_sex2* in the Independent Variables box with the variable of interest.

TIPS AND SHORTCUTS

Modifying and Rerunning Models in Current Session

After you execute a procedure in *AM*, the model appears in the Completed Runs window. You can rerun a model by right-clicking a model and selecting "Copy model to modify and rerun." The specifications for the model will appear. You can change any of the specifications (e.g., change the dependent and independent variables) and then rerun the model by clicking "OK."

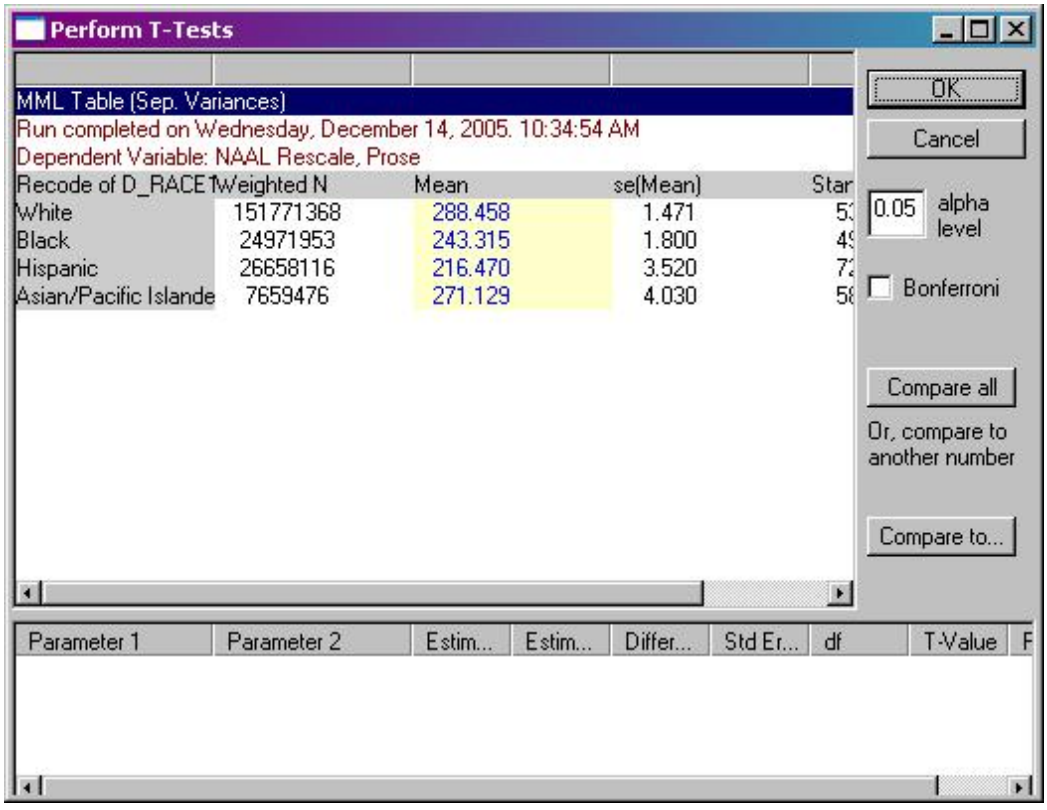
Saving and Rerunning Model Specifications

AM allows you to save the specifications for a statistical run to a file and to reload and run the models specified. To save a file, right-click the model in the Completed Runs Queue and select "Save specification to disk." You can either create a new file or add the specification to an existing specification file. We recommend that you store procedures in files with other related models that were originally run on the same data sets. When you rerun them, they will run properly only on data files with variables of the same name.

If you use this feature, it is beneficial to give all your runs informative titles.

T-Tests

To access the t-test dialog box, right-click an icon next to the menu of the Model Run for which you want t-tests in the Completed Runs Queue and select "T-Tests." That will bring up a dialog box much like this one:



Notice that some parameter estimates are highlighted in yellow. These are available for t-testing.

To conduct a t-test:

1. Move the cursor over the estimate for the first item in the comparison. The cursor will turn into a hand.
2. Click the highlighted item. A blue outline should appear around that cell. This is now the "anchored parameter." Any other cells you click will be compared with the outlined cell.
3. Move the cursor over the parameter to be compared. Again, it should turn into a hand.
4. Click the cell to be compared. The results of the t-test will appear in the window at the bottom of the dialog box. Significant results will be highlighted in yellow.
5. To unanchor the anchored parameter (i.e., to conduct tests not involving the specified parameter), simply click the anchored parameter.
6. When you have completed your t-tests, click "OK" and the results will be sent to the output format you have selected (e.g., web browser or spreadsheet file).

To use a Bonferroni adjustment, select the check box labeled "Bonferroni."

Flip Table (Reversing the Independent and Dependent Variables)

Most analyses using literacy levels present the percentage of adults in a certain group (e.g., gender, race/ethnicity) within each of the four literacy levels. For example, the NAAL *First Look* report shows the percentage of men in each of the four literacy levels as well as the percentage of women in each of the levels.

As noted in the instructions above, these analyses use a population group (e.g., gender, race/ethnicity) as the independent variable and the literacy levels for a particular scale (prose, document, or quantitative) as the dependent variable.

AM can reverse, or "flip," these analyses to show the percentage of adults in a certain literacy level (e.g., *Below Basic* prose literacy) by population groups. For example, the results for employment status summarized in Figure 17 (page 16) of the NAAL *First Look* report show the percentage of adults with *Below Basic* prose literacy who were employed full time, employed part time, unemployed, or not in the labor force. The pool of adults for this analysis is the group of adults with *Below Basic* prose literacy; this group is divided across the four employment categories on the basis of their performance on the prose items.

To "flip" results for literacy levels, follow these steps:

1. Run the NALS Table procedure, following the usual procedures. For example, if you wanted to "flip" prose results for employment status, start by selecting prose as the dependent variable and *d_lforce2* as the independent variable (the variable *d_lforce2* may be truncated as *d_lforce* in the Variables List window).
2. Once *AM* has executed the procedure, right-click the completed model in the Completed Runs window. Select "Flip Table."

3. *AM* will “flip” the results and write the output to the same file.