MMWS Software Program Manual

Software Development

The MMWS program is regularly updated. The latest beta version can be downloaded from

http://hlmsoft.net/ghong/

MMWS

Click **here** to get MMWS.
For a sample MMWS data set, Click **here**

Please report technical problems with the software by sending email to Richard Congdon (richard@hlmsoft.net) and copying Guanglei Hong (ghong@uchicago.edu)

Data Set for Demonstration

Save "MMWS_Stata12.dta" on your computer

Save mmws.exe

Run mmws.exe

In the "Data Selection and Preparation" window,

Click the radio button for "Stata" under "Input Data Type"

Browse the data file on your computer "MMWS_Stata12.dta"

Variable Types

selected from the Early Childhood Longitudinal Study- Kindergarten Cohort (ECLS-k)

public use data

CHILDID	ID (unused)	
T2LEARN	outcome	(spring K learning behaviors)
DMELLSRVC	treatment	(dummy indicator for ELL services)
P1AGEENT	precov	(age at K entry)
T1LEARN	precov	(fall K learning behaviors)
C1MSCALE	precov	(fall K math score)
FEMALE	precov	(sex)
SPANISH	precov	(Spanish-speaking)
RACE	precov	(race/ethnicity)
P1CENTER	precov	(ever in center-based child care)
WKSESQ5	precov	(SES quintile)

Note: "precov" stands for pretreatment covariate

Variable Scales

CHILDID	Unused (string)	
T2LEARN	Continuous	
DMELLSRVC	(0, 1)	Note:
P1AGEENT	Continuous	Choose a scale if asked
T1LEARN	Continuous	to "Describe scale"
C1MSCALE	Continuous	
FEMALE	(0, 1)	
SPANISH	(0, 1)	
RACE	Describe scale: 0, 1, 2	
P1CENTER	(0, 1)	Value labels imported,
WKSESQ5	Describe scale: 0, 1, 2	Click and Choose "OK"

Click "Save" or "Save as" to save your specifications

Click "Next"

Imputation and Descriptives

Imputation control

Number of data sets to impute   5

Maximum number of imputation iterations   100

Click "Impute" if imputation is required

Imputation currently being used for calculation   1 (i.e., the 1st imputed file)

- Complete data are required for the treatment indicator
- A missing category for the missing observations created in a discrete variable
- The missing values in each continuous variable imputed through maximum likelihood estimation under the missing at random assumption
- Subsequently, analyze one imputed data file a time

Imputation and Descriptives

Descriptive Table:

Displays the descriptives for the original unimputed data file and for each of the five imputed data files

Bivariate Table:

Computes the maximum value of the standardized bias for each covariate and conducts a t-test for a continuous covariate and a χ^2 test for a discrete covariate

Tolerance Table:

Displays the tolerance value for each covariate indicating its level of collinearity with other covariates; flags low tolerance variables—i.e., $1 - R^2 < 0.005$

(e.g., two or more missing indicators might be redundant; five dummy indicators for a five-category covariate are intolerable.)

Click "Next"

Select Covariates
for the Propensity Score Model

Select covariates for a logistic regression analysis for predicting the treatment.

Three options:

1. Keep all covariates in the column of "Important variables"
2. Backward stepwise selection of outcome predictors (click the radio button for "linear regression")
3. Backward stepwise selection of treatment predictors (click the radio button for "logistic regression")

Double click a variable to move it to the column of "Other covariates" for backward stepwise selection.

Double click a variable to move it to the column of "Unused covariates" for exclusion from the propensity score model

Select Covariates
for the Propensity Score Models

Click "Do regression"

Show Results:

Displays how the selected covariates predict the treatment in the logistic regression

Click "Next"

Common Support

Choose a range of propensity score values

The histograms compare the distribution of the logit propensity score, eta, between the control condition and the experimental condition

Three options:

1. The entire range—i.e., "Full"
2. The range within the "Common support"
3. The range within the "Common support with calipers"

    (A caliper is 20% of a standard deviation of each logit score.)

Relative Descriptives:

Displays the descriptive statistics of all the variables in the initial sample (and in the sample within the selected common support range if either is chosen)

Strata Selection with MMWS

Stratification

Select the number of strata. The default is **10**. Selecting **1** provides results for the unweighted condition.

Show Strata Lines

Displays the cut-points as vertical lines dividing the histograms of the logit of propensity within each treatment condition.

Balance Check with MMWS

Display Stratum and F Statistics:

Under MMWS adjustment, computes the within-stratum mean difference between treatment groups in the logit of propensity score and conducts a t-test for each.

Conducts a global F test for whether the logit of propensity score predicts the treatment conditioning on stratum membership and stratum-by-treatment interaction.

Displays the MMWS weight for the cross-tabulation of strata and treatment groups.

Balance Check with MMWS

Balance Checking Tables:

Under MMWS adjustment, computes the maximum value of the standardized bias, computes model-based and robust standard errors for t-tests for the logit propensity score and continuous covariates, and conducts χ^2 tests for discrete covariates

Summarizes the number and the proportion of covariates that display a standardize difference greater than 0.2 or a statistically significant difference between the treatment categories (use model-based and robust SE).

Critical Criteria with MMWS

Under "Display Stratum and F Statistics"

The global F statistic should be non-significant. If this critical criterion is not satisfied, the light below the "Display Stratum" button will be **red**; if the critical criterion is satisfied, the light will be **green**.

Under "Balance Checking Tables"

After weighting, the logit of propensity score should be balanced and the proportion of imbalanced covariates should be no greater than 0.05. If these critical criteria are not satisfied, the light below the "Balance Checking" button will be **red**; if the critical criteria are satisfied, the light will be **green**.

Strata Adjustment with MMWS

If either of the critical criteria are not met…

The histograms displaying the strata lines can be used to edit the strata in addition to the option of increasing the number of equivalently-sized strata under the "Propensity Stratification" banner.

Right click a strata cutting line:

Split stratum on left/right: halves the stratum left/right of the cutting line

Join adjacent strata: combines the two strata next to the cutting line

Reset to default: returns the strata to the equivalently-sized default number

Alternatively, left click and hold a strata cutting line to drag it left or right

Estimation of Treatment Effect
with MMWS

Possible Additional Covariance Adjustment:

Double click a covariate to include in the outcome model for covariance adjustment, if necessary

Weighted Estimation of Treatment Effect:

Under MMWS adjustment, estimates the main effect of the treatment (conditioning on additional covariance adjustment covariates if selected).

Combined Imputation Results

At this point, the program will display two tables

- Estimation results from the current imputed data file

- Combined estimation results from all five imputed data files

Save the Analyzed Data

Click the "**Save Results**" button

> The program saves the estimated propensity score, the logit propensity score, and the weight that has been computed by adding them into the original data file

Sensitivity Analysis with MMWS

Sensitivity Analysis Tables

- Quantifies selection bias $\zeta\lambda$ that would be contributed by hypothetical omitted confounders similar to the observed confounders

- Computes the weighted treatment effect estimate d^* with this additional adjustment.

Note: Sensitivity analysis is done only for the current imputed data file