

**Chapter**  
**12**

**Data  
Mapping and  
Transformation Tool**



## CHAPTER 9 – DATA MAPPING AND TRANSFORMATION TOOL

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**T**he Data Mapping and Transformation (DMT) tool is a combination of web-based [Java](#) application and downloadable tool that can be run on virtually any Java-enabled platform such as Windows, UNIX, or Macintosh OS X. The DMT tool (available via the [Data Repository module](#)), runs locally as a Java Web Start application on a user's computer (requires the Java runtime environment). The tool supports data definition, data mapping, data transformation, and data access through the research cycle.

To ensure the quality of uploaded data and to make data easy to load, data should be in a specific format and range values should comply with the values defined in the data dictionary. All submitted research data must be validated against values defined in the data dictionary prior to submission.

Using the Data Mapping and Transformation (DMT) standard user-interface and analysis tools, researchers at remote sites (via the internet) can easily load Data Elements (DEs) and Permissible Values (PVs) to be paired with eligible BRICS elements and values thereby decreasing the time and effort required to input data to the BRICS system. The DMT tool allows users to save off properly formatted file for the validation tool.

The DMT tool accepts the data (in the form of a **CSV file**) from a researcher, switches the variables and validates the source Data Elements (DEs) and Permissible Values (PVs) file.

To help researchers to map and transform data to the data dictionary, BRICS provides a set of tools that includes:

- ❖ **Mapping Tool** – allows users to map Data Elements (DEs) and Permissible Values (PVs) to elements and value from the BRICS Data Dictionary.
- ❖ **Transform Tool** - takes the source data file and the mapping file to create a properly formatted output file.

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## 9.1 SYSTEM REQUIREMENTS

The Data Mapping and Transformation tool runs locally on your machine. **Note** that the most recent version of [Java Runtime Environment \(JRE\)](#) (8 or higher) is required to run the tool. Make sure your computer has it installed.

The **Data Mapping and Transformation** tool (including any sub-modules) are available within the **Data Repository** module.

### 9.1.1 Input and Output

#### Module Input:

- ❖ CSV files with clinical data within form structure templates from the data dictionary.
- ❖ Source DEs and PVs file

#### Module Output:

- ❖ CSV files with clinical data.
- ❖ An error log with validation errors and warnings (if any).

### 9.1.2 CSV Checklist

Before populating the form structure template in the form of a CSV file with data make sure ensure that the downloaded template contains the following:

- ❖ All data elements needed to capture data are included into the CSV file (and the form structure).
- ❖ The **form structure** short name is entered in the cell A1 in the CSV file.
- ❖ The **Main group** (will all data elements) is present in the CSV file.
- ❖ The column A, starting from the A2 cell has no data, but has marks (x) that represent the beginning of a new record.
- ❖ The columns that correspond to require DEs in the FS are populated with data.
- ❖ The group (if any) and data element names are the same as in the FS.

**Note:** the external checked – aka: there is an “X” in the “record” column for each new record. Ensure there are no edits to the template and that the form hasn’t changed since it was downloaded.

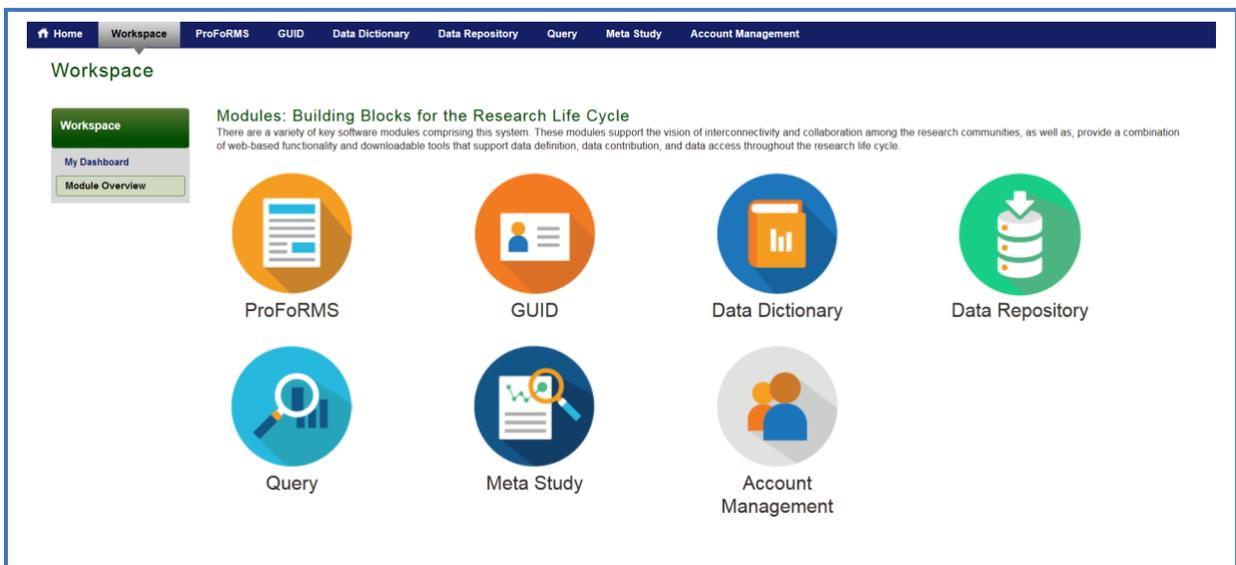
## 9.2 LAUNCHING/RUNNING THE DATA MAPPING AND TRANSMISSION TOOL

The **Data Mapping and Transmission** tool are available within the **Data Repository** module. For steps downloading the CSV template, refer to the [Data Dictionary](#) module.

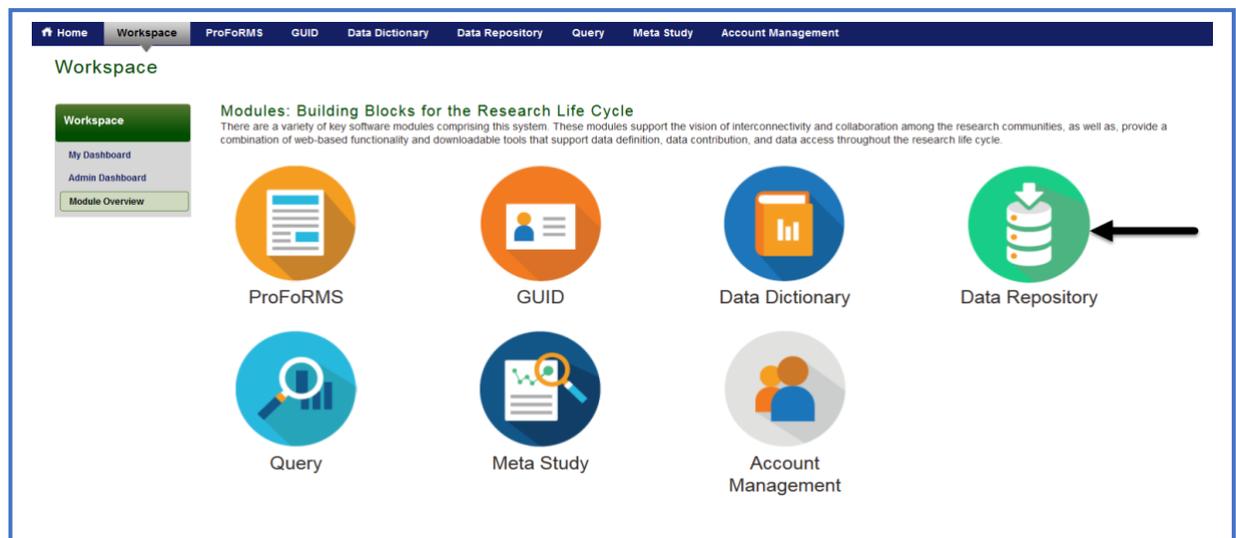
To submit imaging data to the BRICS repository, you are required to run a Java Web Start application, to properly prepare your data for Validation and Upload. Using the MIPAV Image Submission Package Creation Tool, you can prepare your image data for submission by following the steps outlined in the next sections.

To launch the [Data Mapping and Transmission](#) tool: Perform the following actions:

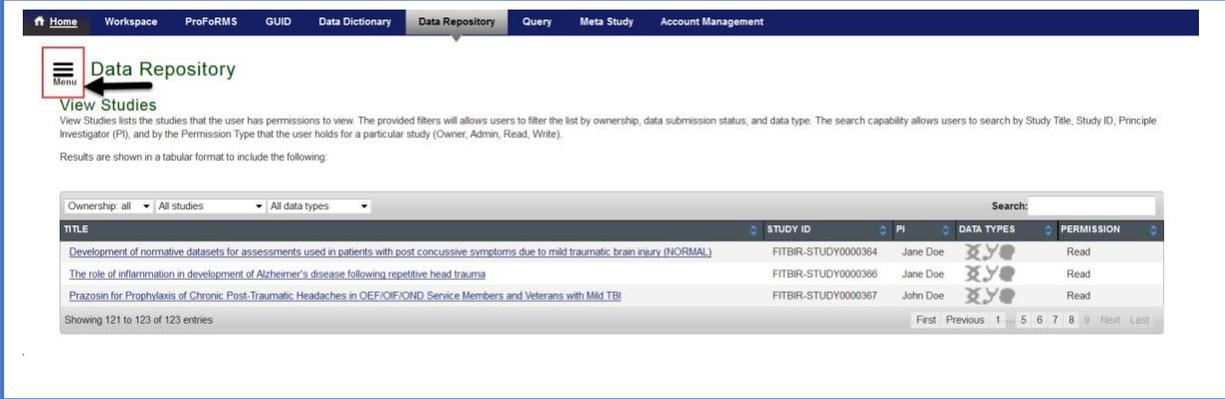
1. Navigate to your Workspace,



2. Click the **Data Repository** module from your Workspace,



- Click on the  collapsible menu button to expand the Data Repository menu options on the left tool bar.



**Data Repository**

**View Studies**

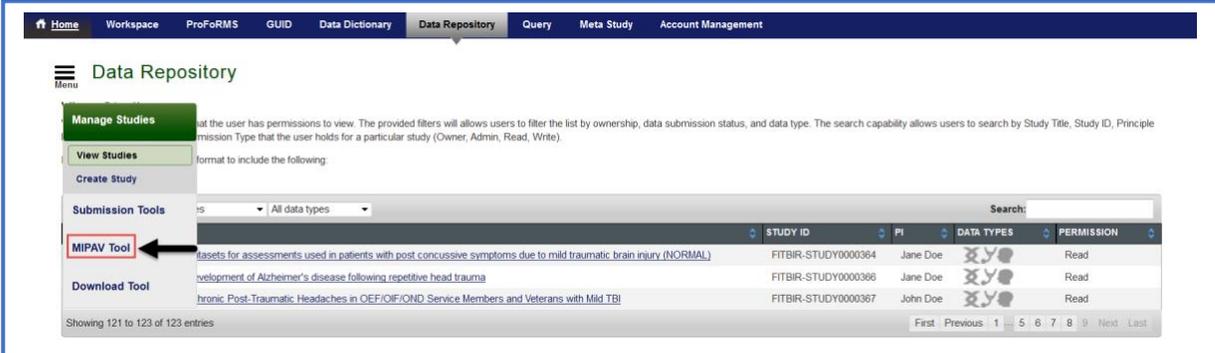
View Studies lists the studies that the user has permissions to view. The provided filters will allow users to filter the list by ownership, data submission status, and data type. The search capability allows users to search by Study Title, Study ID, Principle Investigator (PI), and by the Permission Type that the user holds for a particular study (Owner, Admin, Read, Write).

Results are shown in a tabular format to include the following:

TITLE	STUDY ID	PI	DATA TYPES	PERMISSION
Development of normative datasets for assessments used in patients with post concussive symptoms due to mild traumatic brain injury (NORMAL)	FITBIR-STUDY0000364	Jane Doe		Read
The role of inflammation in development of Alzheimer's disease following repetitive head trauma	FITBIR-STUDY0000366	Jane Doe		Read
Prazosin for Prophylaxis of Chronic Post-Traumatic Headaches in OEF/OIF/OND Service Members and Veterans with Mild TBI	FITBIR-STUDY0000367	John Doe		Read

Showing 121 to 123 of 123 entries

- Click the **Data Mapping and Transmission Tool** on the left-side menu (**Note: This is yet to be developed. Will update screen when the tool is placed here**)



**Data Repository**

**Manage Studies**

**View Studies**

**Create Study**

**Submission Tools**

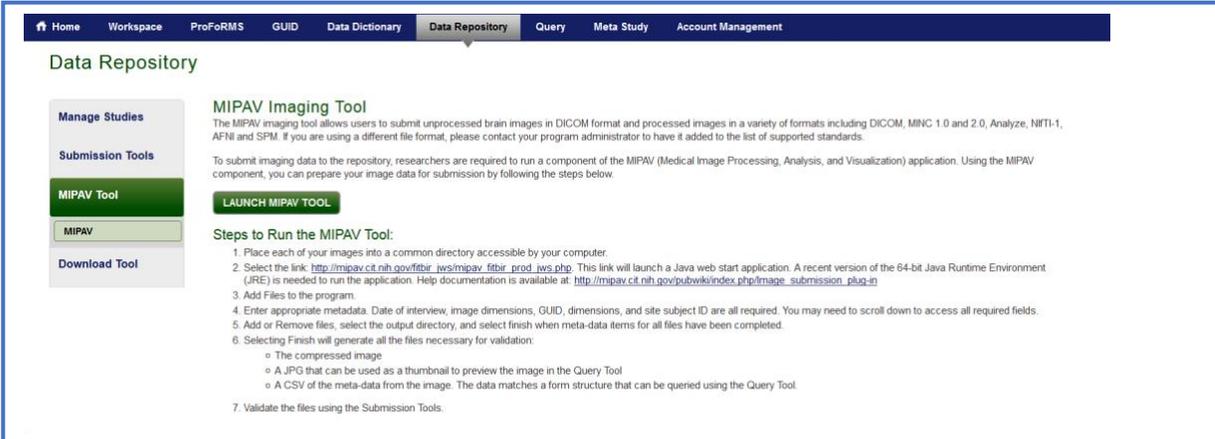
**MIPAV Tool**

**Download Tool**

TITLE	STUDY ID	PI	DATA TYPES	PERMISSION
Development of normative datasets for assessments used in patients with post concussive symptoms due to mild traumatic brain injury (NORMAL)	FITBIR-STUDY0000364	Jane Doe		Read
Development of Alzheimer's disease following repetitive head trauma	FITBIR-STUDY0000366	Jane Doe		Read
Chronic Post-Traumatic Headaches in OEF/OIF/OND Service Members and Veterans with Mild TBI	FITBIR-STUDY0000367	John Doe		Read

Showing 121 to 123 of 123 entries

- The **Data Mapping and Transmission tool** page appears. (**Note: This is yet to be developed. Will update screen when the tool is placed here**)



**Data Repository**

**Manage Studies**

**Submission Tools**

**MIPAV Tool**

**MIPAV**

**Download Tool**

**MIPAV Imaging Tool**

The MIPAV imaging tool allows users to submit unprocessed brain images in DICOM format and processed images in a variety of formats including DICOM, MINC 1.0 and 2.0, Analyze, NIFTI-1, AFNI and SPM. If you are using a different file format, please contact your program administrator to have it added to the list of supported standards.

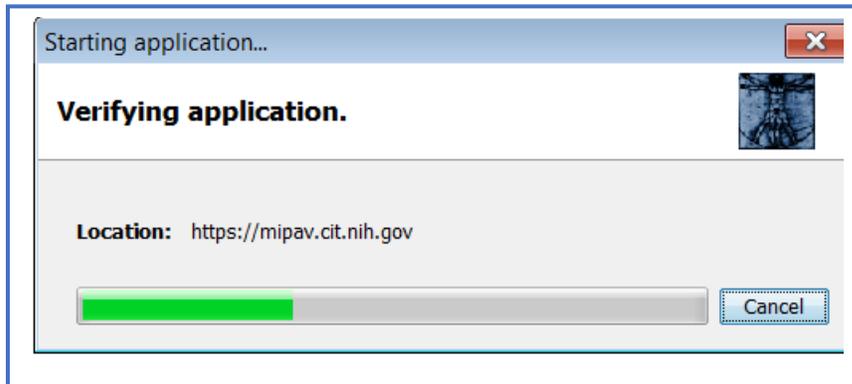
To submit imaging data to the repository, researchers are required to run a component of the MIPAV (Medical Image Processing, Analysis, and Visualization) application. Using the MIPAV component, you can prepare your image data for submission by following the steps below.

**LAUNCH MIPAV TOOL**

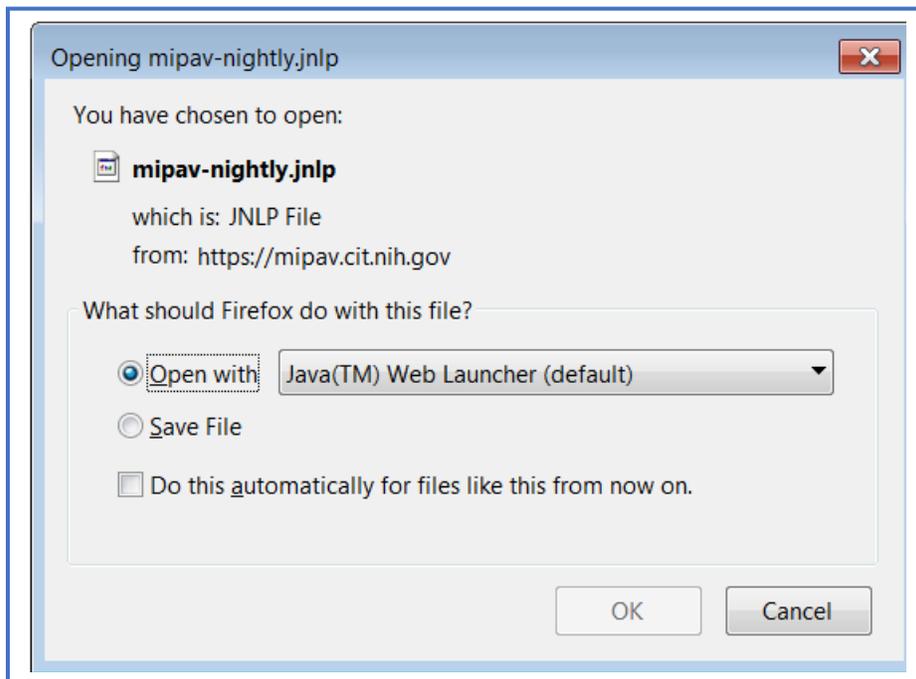
**Steps to Run the MIPAV Tool:**

- Place each of your images into a common directory accessible by your computer.
- Select the link: [http://mipav.ct.nih.gov/fitbir\\_ws/mipav\\_fitbir\\_prod\\_ws.php](http://mipav.ct.nih.gov/fitbir_ws/mipav_fitbir_prod_ws.php). This link will launch a Java web start application. A recent version of the 64-bit Java Runtime Environment (JRE) is needed to run the application. Help documentation is available at: [http://mipav.ct.nih.gov/pubwiki/index.php/image\\_submission\\_plugin](http://mipav.ct.nih.gov/pubwiki/index.php/image_submission_plugin)
- Add Files to the program
- Enter appropriate metadata. Date of interview, image dimensions, GUID, dimensions, and site subject ID are all required. You may need to scroll down to access all required fields.
- Add or Remove files, select the output directory, and select finish when meta-data items for all files have been completed.
- Selecting Finish will generate all the files necessary for validation.
  - The compressed image
  - A.JPG that can be used as a thumbnail to preview the image in the Query Tool
  - A CSV of the meta-data from the image. The data matches a form structure that can be queried using the Query Tool.
- Validate the files using the Submission Tools.

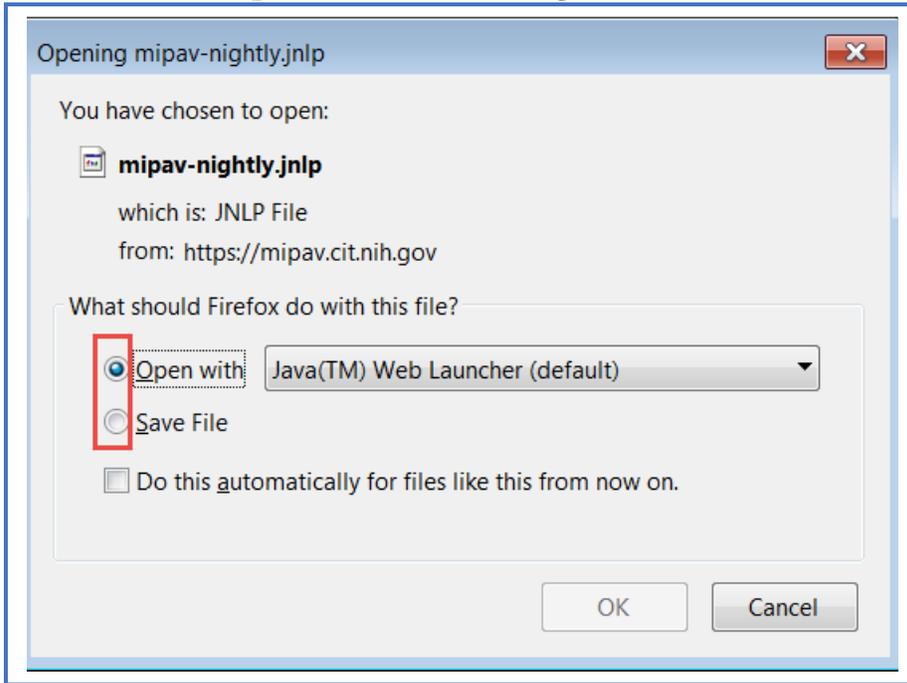
6. Click the **Launch Data Mapping and Transmission Tool** button to start the application verification process.



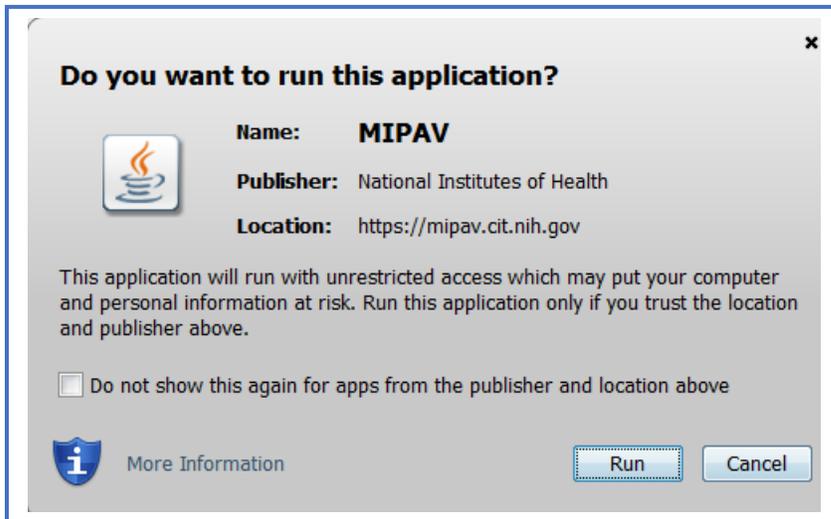
7. Once the application completes the verification process, the **Java Web Start Launcher** opens



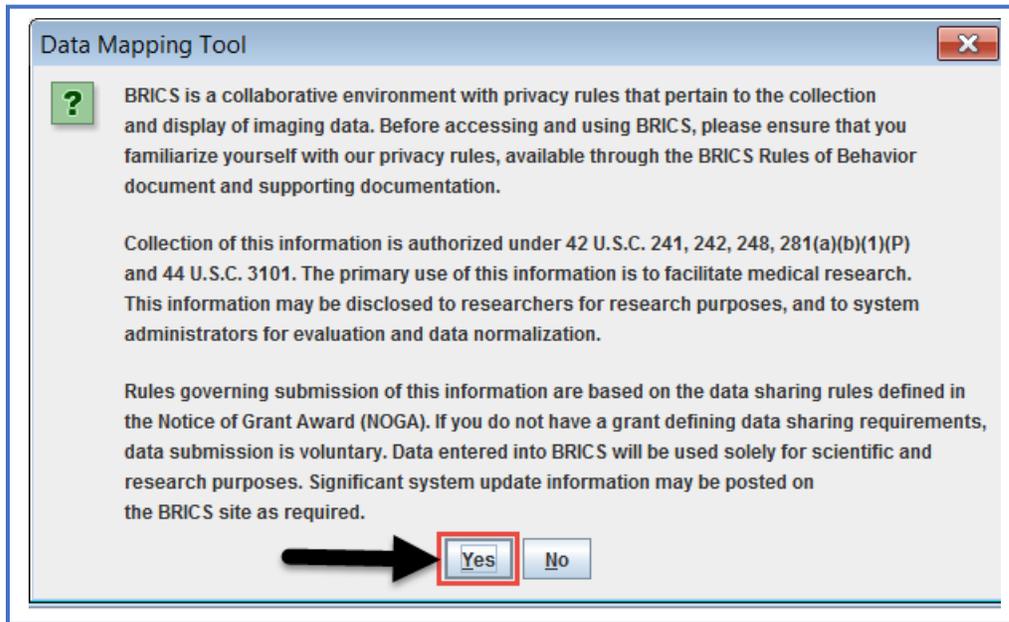
8. Select the **Open with** or **Save File** option to launch the DMT tool.



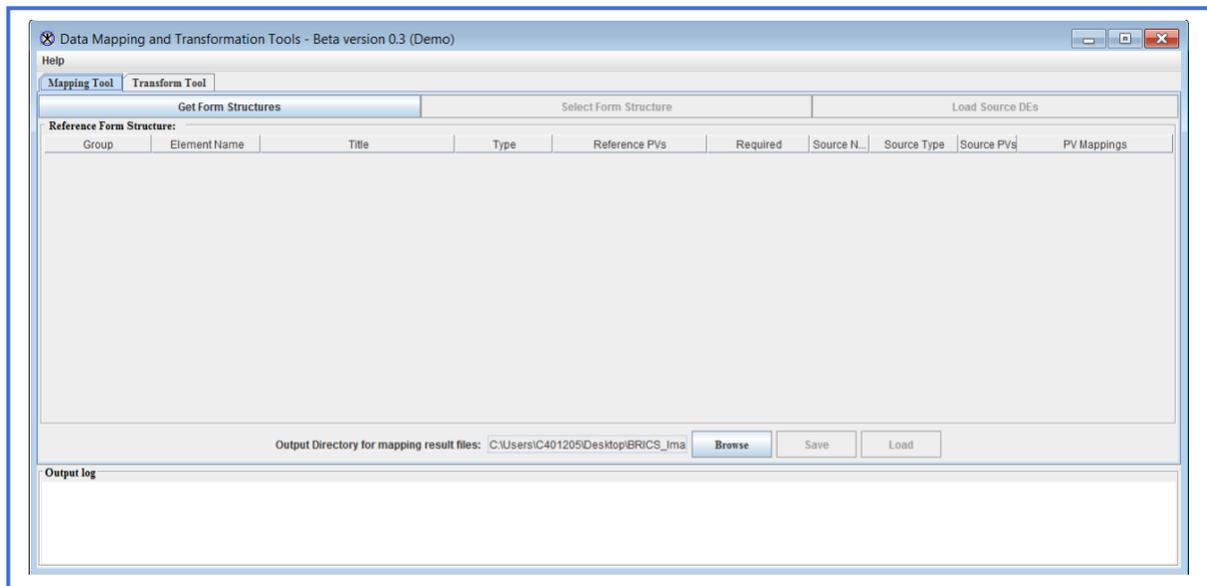
9. Click the **Run** button to run the MIPAV application on your computer.



10. To continue, you **MUST** read and accept the warning banner by Clicking on the **Yes** button. Click the **No** button to exit the application.



11. The **Data Mapping and Transformation Tools** opens.



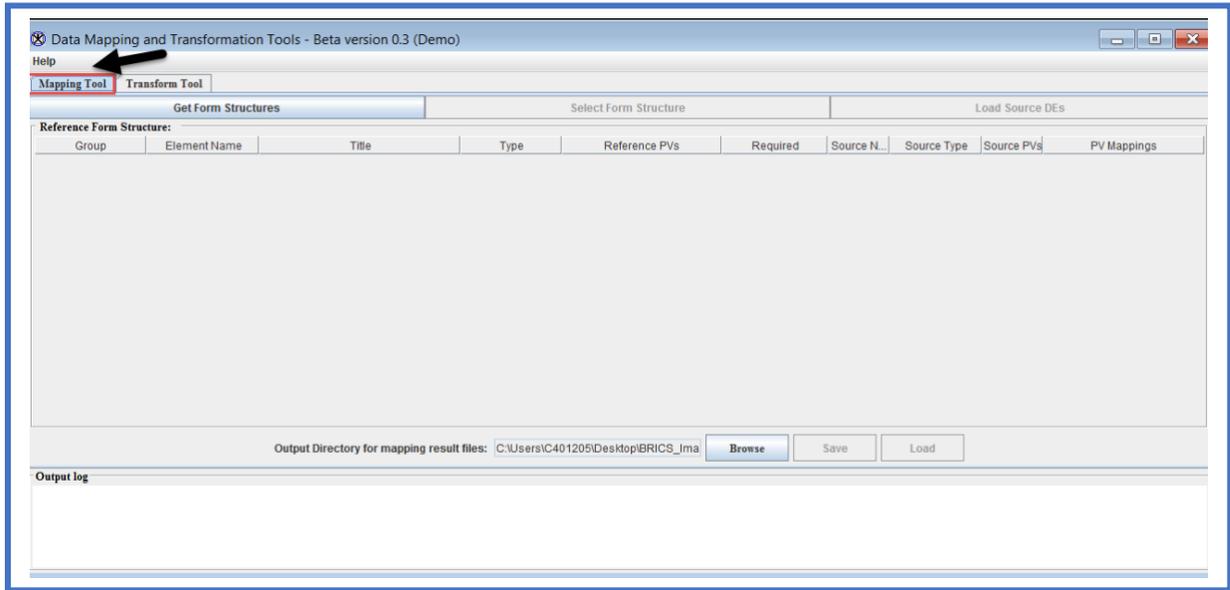
## 9.3 USING THE MAPPING TOOL

The **Mapping Tool** allows users to add files by retrieving Form Structures from the BRICS Data Dictionary. You must first retrieve form structures before attempting to select Form Structures and loading DEs.

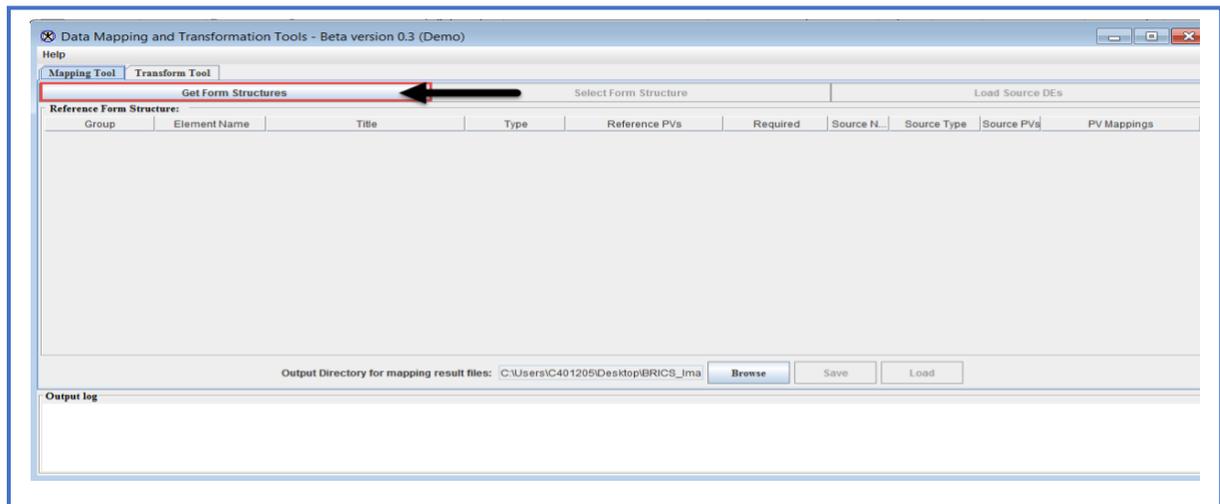
### 9.3.1 Mapping Files

**To Map Files:** Perform the following actions:

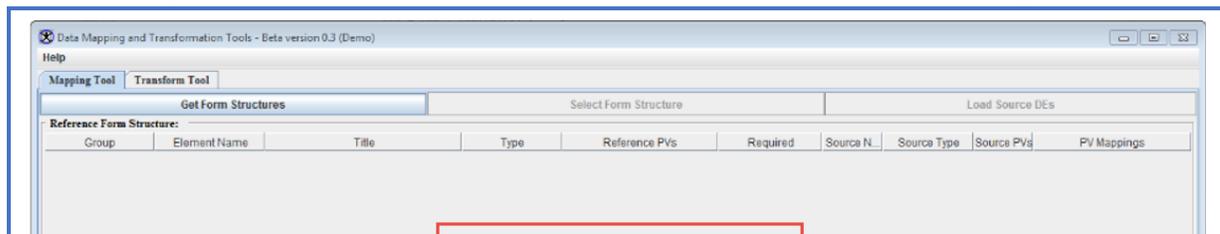
1. In the main Data Mapping and Transformation Tools window, Select the **Mapping Tool** tab option.



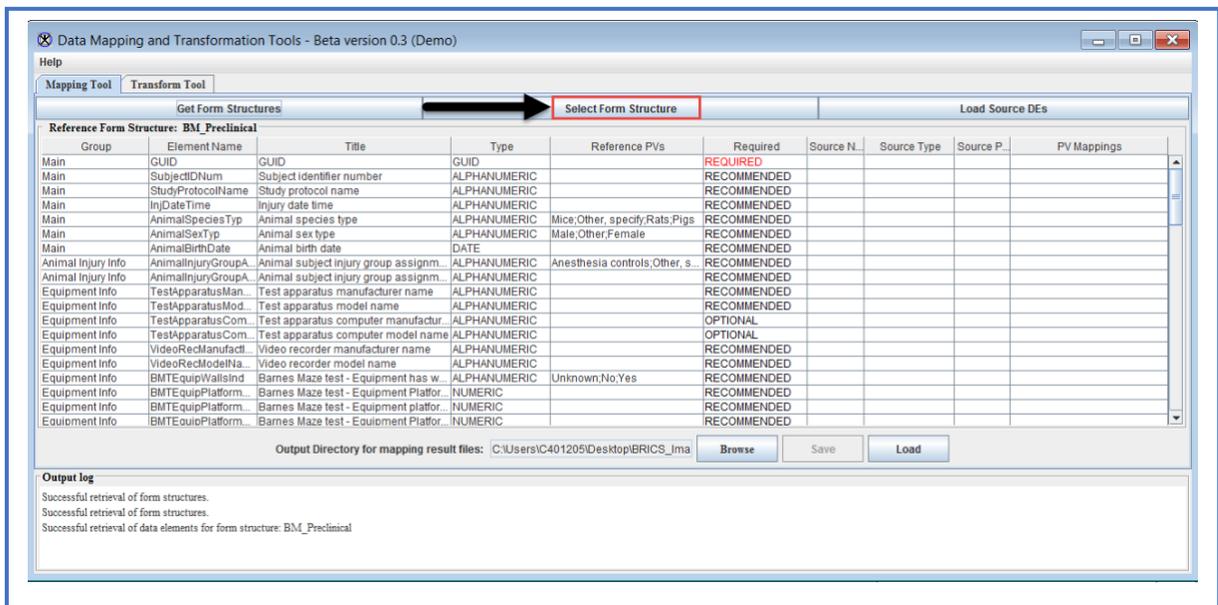
2. Click the **Get Form Structures** button.



3. The system runs to retrieve form structures from the BRICS data dictionary.



4. Click the **Choose Form Structure** button.



The screenshot shows the 'Data Mapping and Transformation Tools - Beta version 0.3 (Demo)' application window. The 'Mapping Tool' tab is active, and the 'Get Form Structures' button is highlighted with a red box and an arrow pointing to the 'Select Form Structure' button. Below the buttons is a table of reference form structures for 'BM\_Preclinical'.

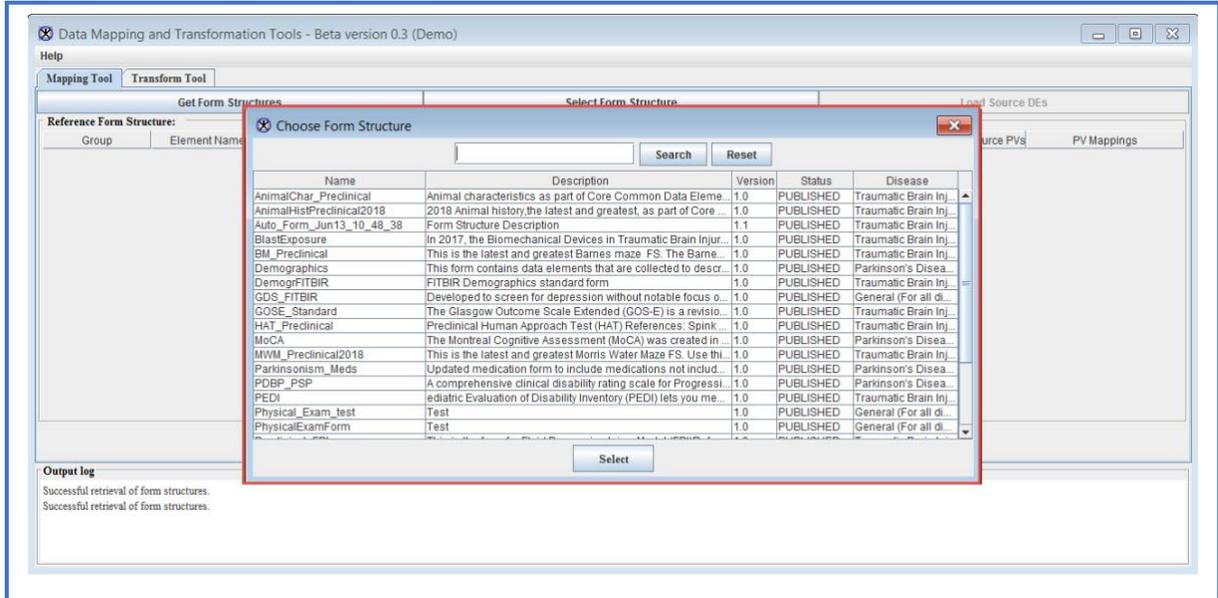
Group	Element Name	Title	Type	Reference PVs	Required	Source N.	Source Type	Source P.	PV Mappings
Main	GUID	GUID	GUID		REQUIRED				
Main	SubjectIDNum	Subject identifier number	ALPHANUMERIC		RECOMMENDED				
Main	StudyProtocolName	Study protocol name	ALPHANUMERIC		RECOMMENDED				
Main	InjDateTime	Injury date time	ALPHANUMERIC		RECOMMENDED				
Main	AnimalSpeciesTyp	Animal species type	ALPHANUMERIC	Mice;Other, specify Rats;Pigs	RECOMMENDED				
Main	AnimalSexTyp	Animal sex type	ALPHANUMERIC	Male;Other;Female	RECOMMENDED				
Main	AnimalBirthDate	Animal birth date	DATE		RECOMMENDED				
Animal Injury Info	AnimalInjuryGroupA...	Animal subject injury group assignm...	ALPHANUMERIC	Anesthesia controls;Other, s...	RECOMMENDED				
Animal Injury Info	AnimalInjuryGroupA...	Animal subject injury group assignm...	ALPHANUMERIC		RECOMMENDED				
Equipment Info	TestApparatusMan...	Test apparatus manufacturer name	ALPHANUMERIC		RECOMMENDED				
Equipment Info	TestApparatusMod...	Test apparatus model name	ALPHANUMERIC		RECOMMENDED				
Equipment Info	TestApparatusCom...	Test apparatus computer manufactur...	ALPHANUMERIC		OPTIONAL				
Equipment Info	TestApparatusCom...	Test apparatus computer model name	ALPHANUMERIC		OPTIONAL				
Equipment Info	VideoRecManufac...	Video recorder manufacturer name	ALPHANUMERIC		RECOMMENDED				
Equipment Info	VideoRecModelNa...	Video recorder model name	ALPHANUMERIC		RECOMMENDED				
Equipment Info	BMTEquipWallsInd...	Barnes Maze test - Equipment has w...	ALPHANUMERIC	Unknown;No;Yes	RECOMMENDED				
Equipment Info	BMTEquipPlatform...	Barnes Maze test - Equipment Platfor...	NUMERIC		RECOMMENDED				
Equipment Info	BMTEquipPlatform...	Barnes Maze test - Equipment platfor...	NUMERIC		RECOMMENDED				
Equipment Info	BMTEquipPlatform...	Barnes Maze test - Equipment Platfor...	NUMERIC		RECOMMENDED				

Output Directory for mapping result files: C:\Users\C401205\Desktop\BRICS\_Ima

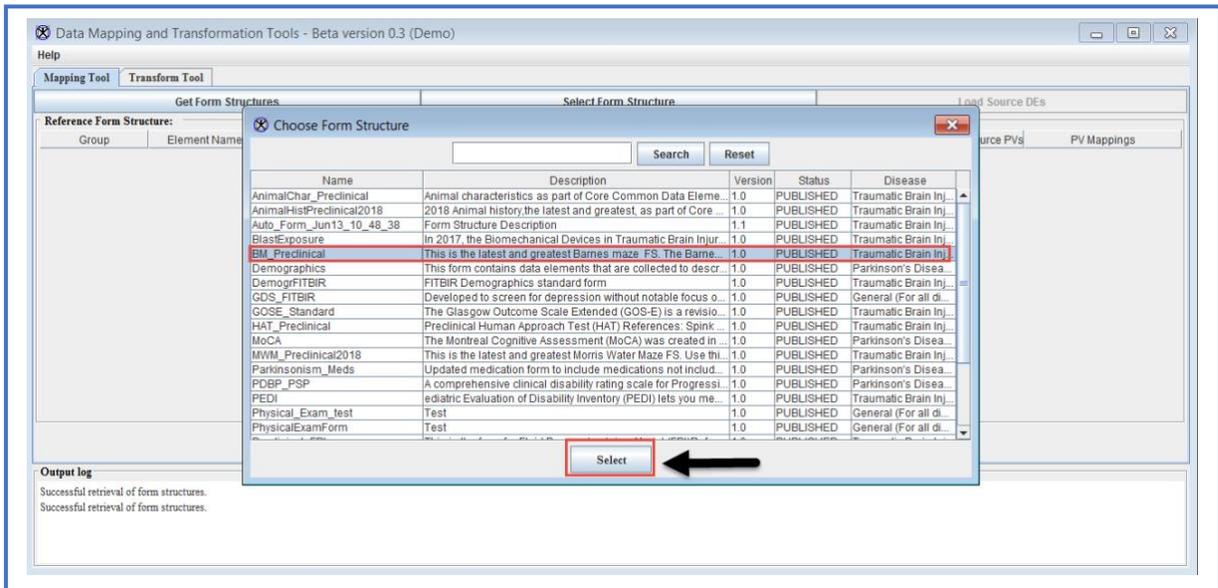
Buttons: Browse, Save, Load

Output log:  
 Successful retrieval of form structures.  
 Successful retrieval of form structures.  
 Successful retrieval of data elements for form structure: BM\_Preclinical

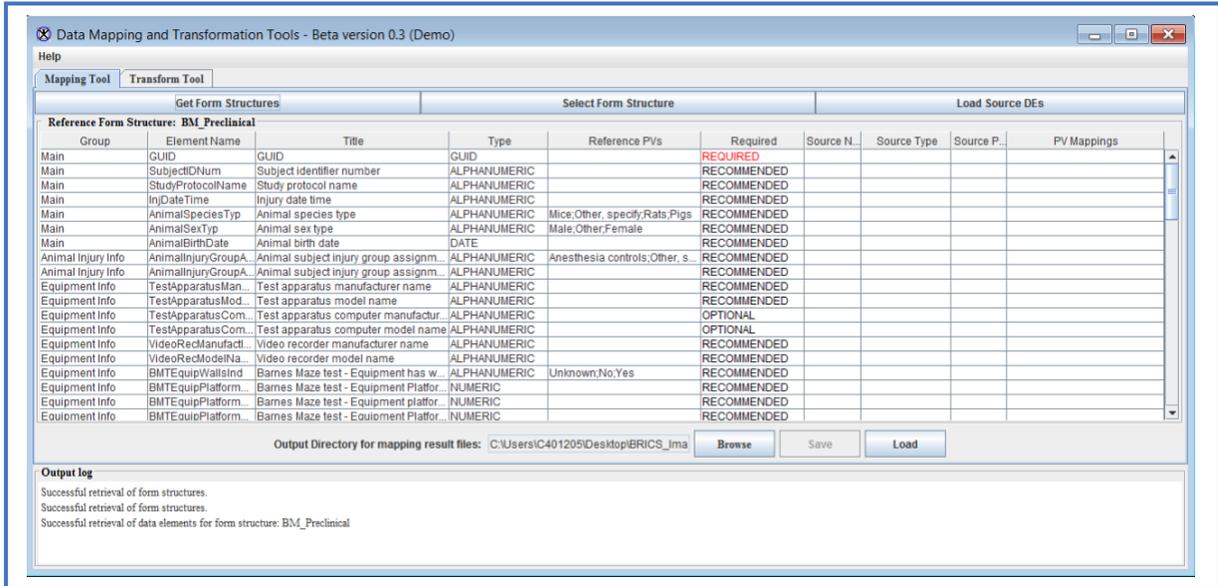
5. The **Choose Form Structure** dialog window appears populated with i) form structure name ii) with description iii) Version, iv) status and, v) the disease. **Note:** This dialog window appears only after the Get For Structures had received all the data from the web service.



6. There are two ways in which you can load the form structures to the table: i) Double-click on the specific form structure to choose ii) Simply, click on the form structure and click the **Select** button. **Note:** You may also use the search text-box to search for the specific form structure you would like to load to the table.



7. **Note:** Upon loading the desired form structures, the **Reference Form Structure** (in this example, BM\_Preclinical) appears in a table as shown below. The **Select Form Structures** button simply loads this table again. The **Search** bar is a partial search that allows the user to find a specific form needed for mapping. The Reset button pulls up the original table. By selecting a form structure and hitting the **Select** button, the form structure data is loaded into the main table.



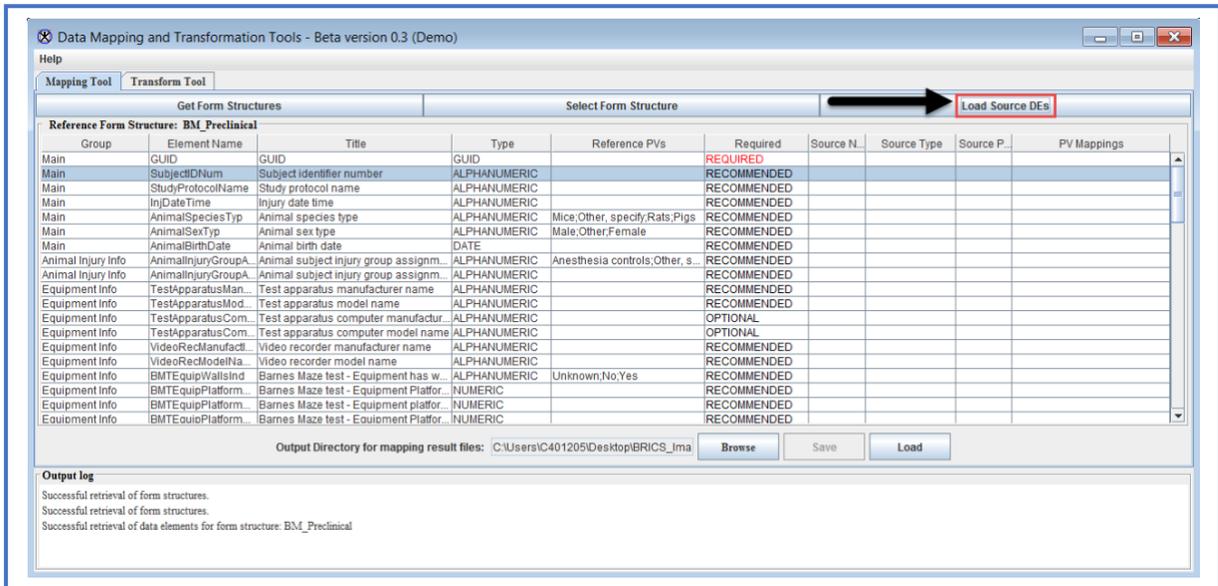
The screenshot shows the 'Data Mapping and Transformation Tools - Beta version 0.3 (Demo)' window. The 'Mapping Tool' tab is active, and the 'Reference Form Structure: BM\_Preclinical' table is displayed. The table has columns for Group, Element Name, Title, Type, Reference PVs, Required, Source N., Source Type, Source P., and PV Mappings. Below the table, there is an 'Output log' section with the following text:

```

Output log
Successful retrieval of form structures.
Successful retrieval of form structures.
Successful retrieval of data elements for form structure: BM_Preclinical
  
```

**Note:** Some of the cells in the above table have tool-tips, double-clicking on any of the first four columns (Group, Element Name, Title, Type) will pull up the DATA Dictionary web page.

8. Click on the **Load Source DEs** button.

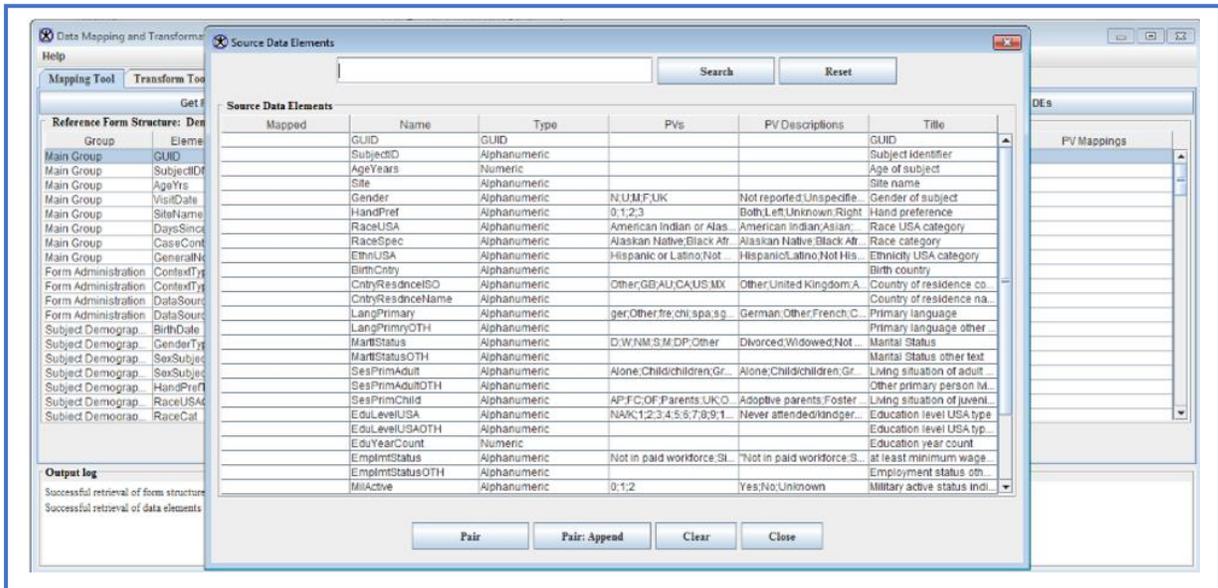


The screenshot shows the same software interface as above, but with the 'Load Source DEs' button highlighted by a red box and an arrow pointing to it from the right. The 'Output log' section contains the same text as in the previous screenshot:

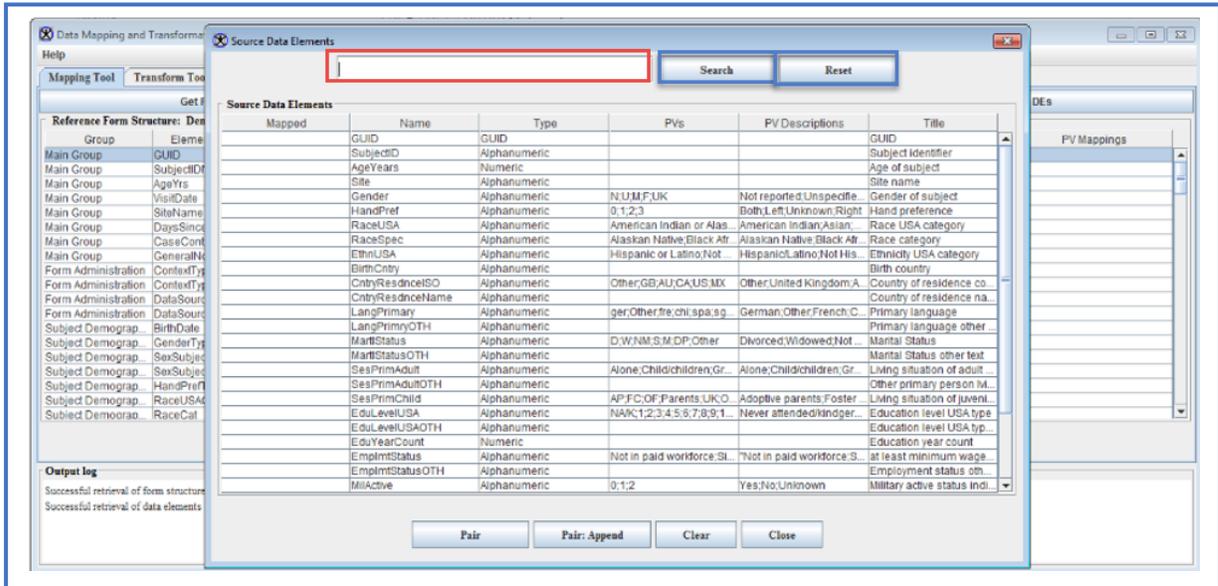
```

Output log
Successful retrieval of form structures.
Successful retrieval of form structures.
Successful retrieval of data elements for form structure: BM_Preclinical
  
```

9. The Load Source DEs button brings up the **Source Data Elements** dialog window from where you can choose the proper Data Elements (DEs) and Permissible Values (PVs) file. If this file is in the correct format, a dialog window with the user's DEs and PVs will load as shown below.



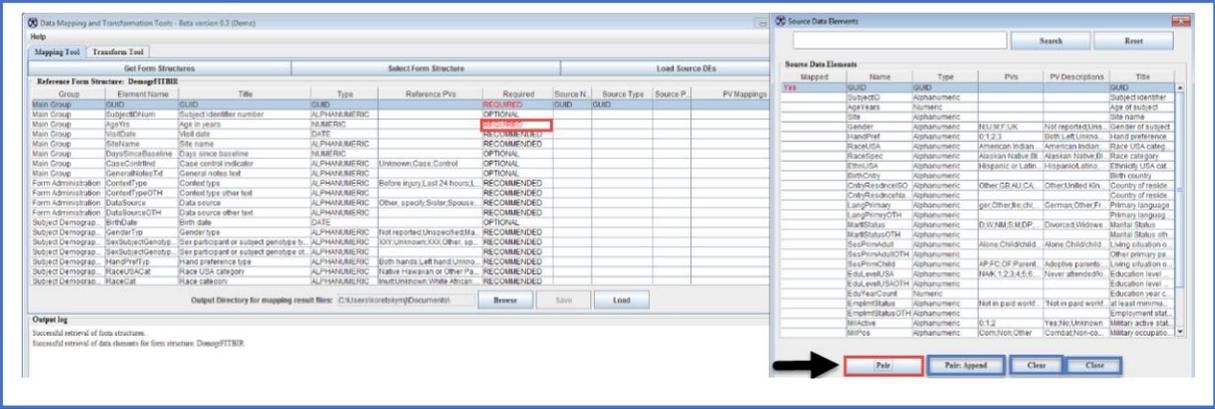
10. The **Search** text-box in the top bar allows you search for a particular DE or PV (partial search). The **Reset** button brings the original table back up. The **Close** button at the bottom will close the entire dialog window.



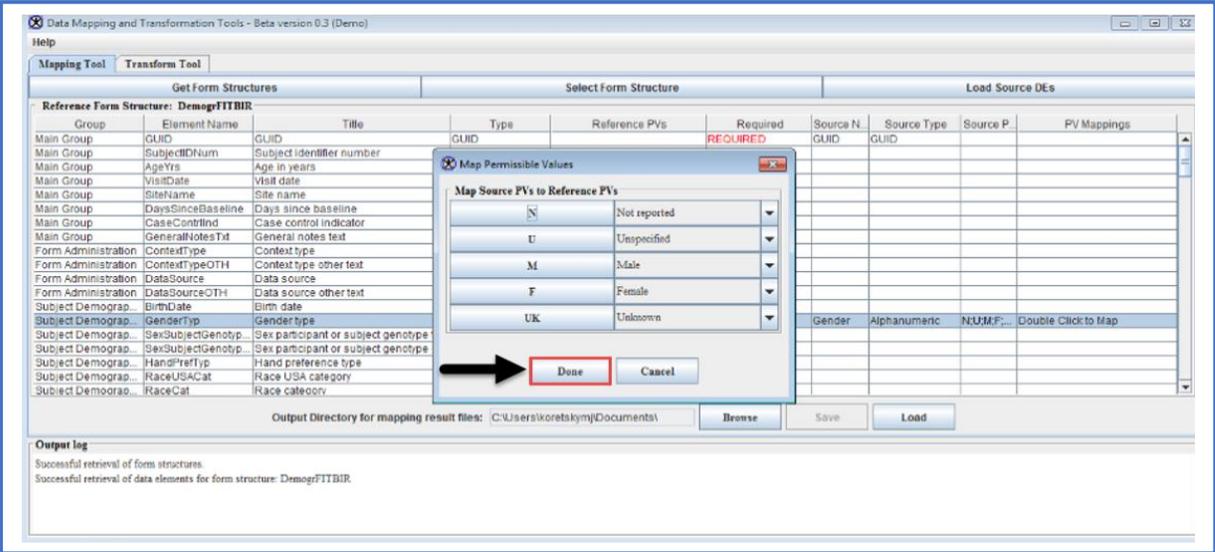
11. Select a row in both the main dialog table and the Source Data Elements table. Click the **Pair** button to place the data from the source data elements table onto the proper column



in the main dialog table. Use the **Pair**: **Append** button to map multiple source data elements to a single BRICS reference data element. The **Clear** button will clear the contents of the selected row in the main dialog table, as well as removing the red Yes that indicates a value has been mapped.

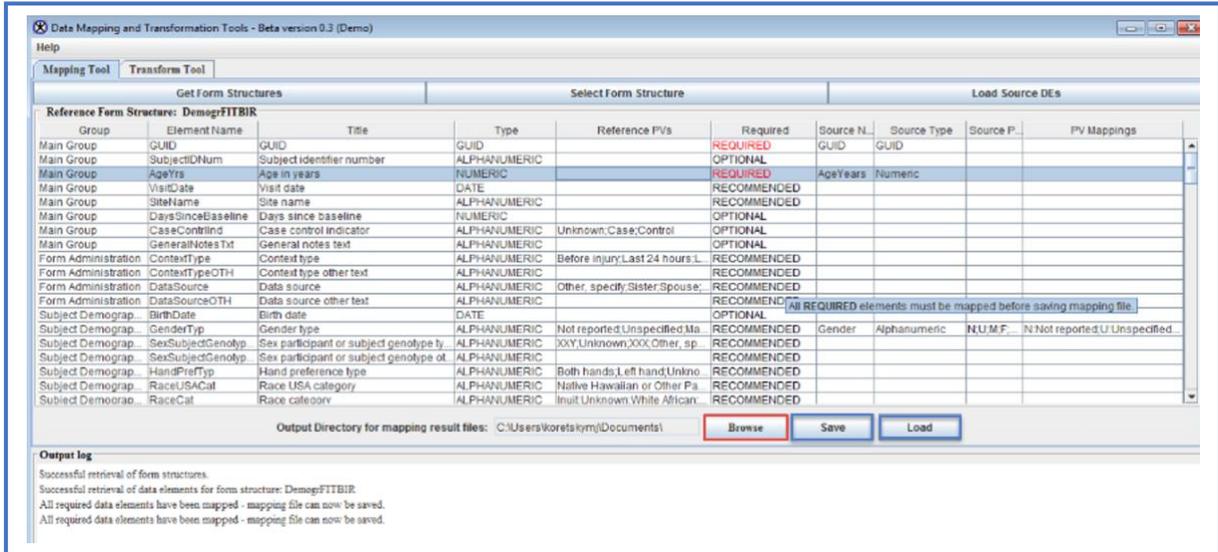


12. For elements that have PV's, the values must also be mapped. This is indicated by the instruction placed in the PV mappings column. When the column is double clicked, a dialog containing the source PV's and the reference PV's is loaded. This allows you to map each of their PV's (left) to a BRICS PV (right). Note: You may map multiple PV's to a single BRICS PV, as well as map a variable to a blank. When mapping is complete click on the Done button to place the information in the PV mappings column.



13. **Note:** The **Save** button on the main table is only activated after all required elements must have been mapped (required elements are highlighted in red). Click the **Browse** button at

the bottom to select the output folder that the mapping output file will be saved to. The **Save** button brings up another file chooser that allows the user to choose the **.txt** file that the mapping output should go into, as well as create a new file if necessary. The **Load** button allows you to reload the entire mapping table (shown below) from the mapping output file. This allows you user to be able to go back and edit mappings with less effort involved. If an improperly formatted file is being selected to load, an error message will be shown.



Group	Element Name	Title	Type	Reference P/Vs	Required	Source N.	Source Type	Source P.	P/V Mappings
Main Group	GUID	GUID	GUID		REQUIRED	GUID	GUID		
Main Group	SubjectIDNum	Subject identifier number	ALPHANUMERIC		OPTIONAL				
Main Group	AgeYrs	Age in years	NUMERIC		REQUIRED	AgeYears	Numeric		
Main Group	VisitDate	Visit date	DATE		RECOMMENDED				
Main Group	SiteName	Site name	ALPHANUMERIC		RECOMMENDED				
Main Group	DaysSinceBaseline	Days since baseline	NUMERIC		OPTIONAL				
Main Group	CaseControlInd	Case control indicator	ALPHANUMERIC	Unknown;Case;Control	OPTIONAL				
Form Administration	ContextType	Context type	ALPHANUMERIC	Before injury;Last 24 hours;L	RECOMMENDED				
Form Administration	ContextTypeOTH	Context type other text	ALPHANUMERIC		RECOMMENDED				
Form Administration	DataSource	Data source	ALPHANUMERIC	Other; specify;Sister;Spouse;	RECOMMENDED				
Form Administration	DataSourceOTH	Data source other text	ALPHANUMERIC		RECOMMENDED				
Subject Demograp...	BirthDate	Birth date	DATE		OPTIONAL				
Subject Demograp...	GenderTyp	Gender type	ALPHANUMERIC	Not reported;Unspecified;Ma	RECOMMENDED	Gender	Alphanumeric	N;U;M;F;N	Not reported;U;Unspecified;
Subject Demograp...	SexSubjectGenotyp	Sex participant or subject genotype ty	ALPHANUMERIC	XXY;Unknown;XXX;Other; sp	RECOMMENDED				
Subject Demograp...	SexSubjectGenotyp	Sex participant or subject genotype of	ALPHANUMERIC		RECOMMENDED				
Subject Demograp...	HandPrefTyp	Hand preference type	ALPHANUMERIC	Both hands;L;left hand;Unkno	RECOMMENDED				
Subject Demograp...	RaceUSACat	Race USA category	ALPHANUMERIC	Native Hawaiian or Other Pa	RECOMMENDED				
Subiect Demograa...	RaceCat	Race category	ALPHANUMERIC	Inuit;Unknown;White;African	RECOMMENDED				

Output Directory for mapping result files: C:\Users\skoret\my\Documents\ **Browse** **Save** **Load**

**Output log**  
 Successful retrieval of form structures.  
 Successful retrieval of data elements for form structure: DemogFTTBIR.  
 All required data elements have been mapped - mapping file can now be saved.  
 All required data elements have been mapped - mapping file can now be saved.

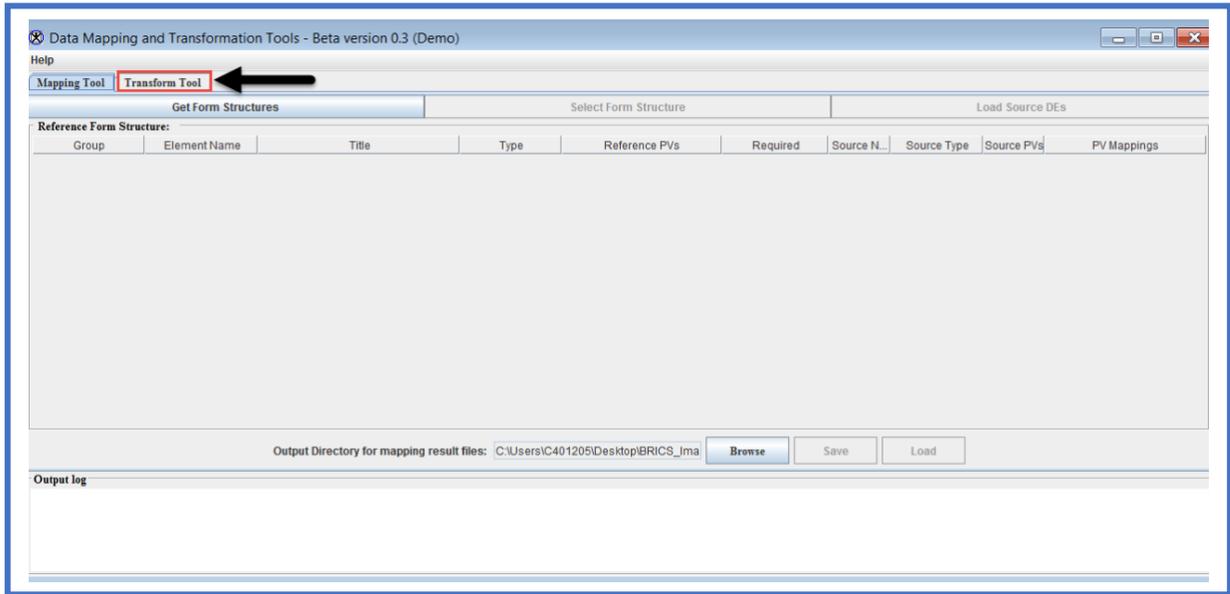
## 9.4 USING THE TRANSFORM TOOL

The **Transform Tool** allows users to choose files saved on your local machine to transform. Transform tool takes the source data and the mapping files to create a properly formatted output file.

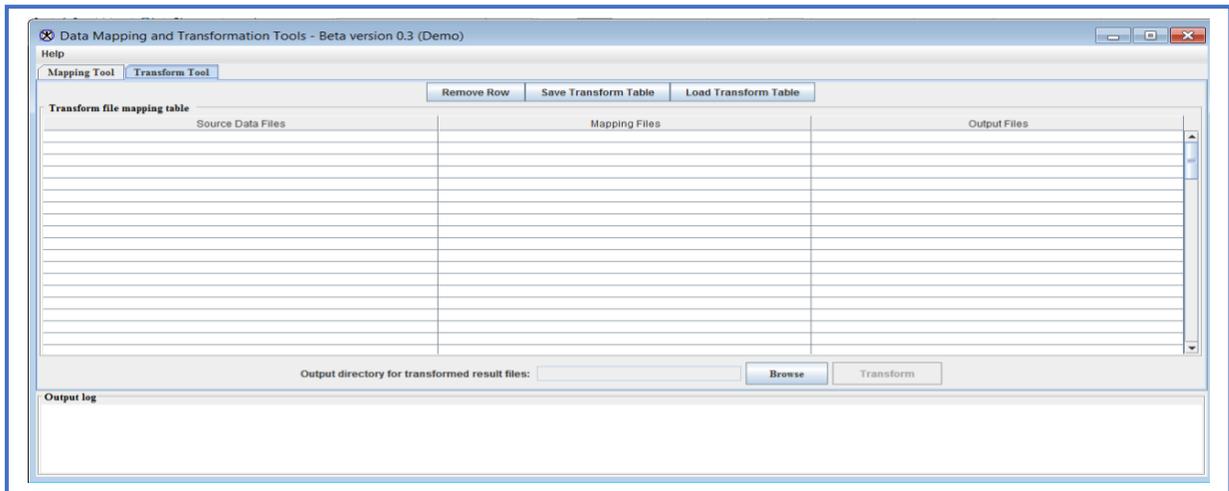
### 9.4.1 Load Transform Table

**To Load Transform Table:** Perform the following actions:

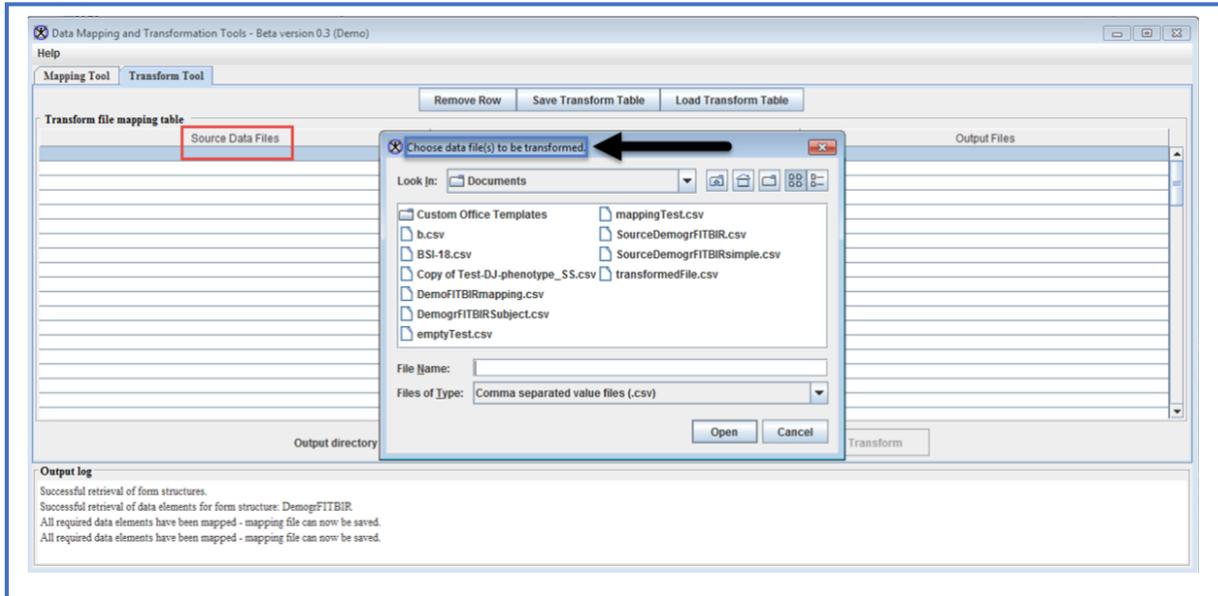
1. In the main Data Mapping and Transformation Tools window, Select the **Transform Tool** tab option.



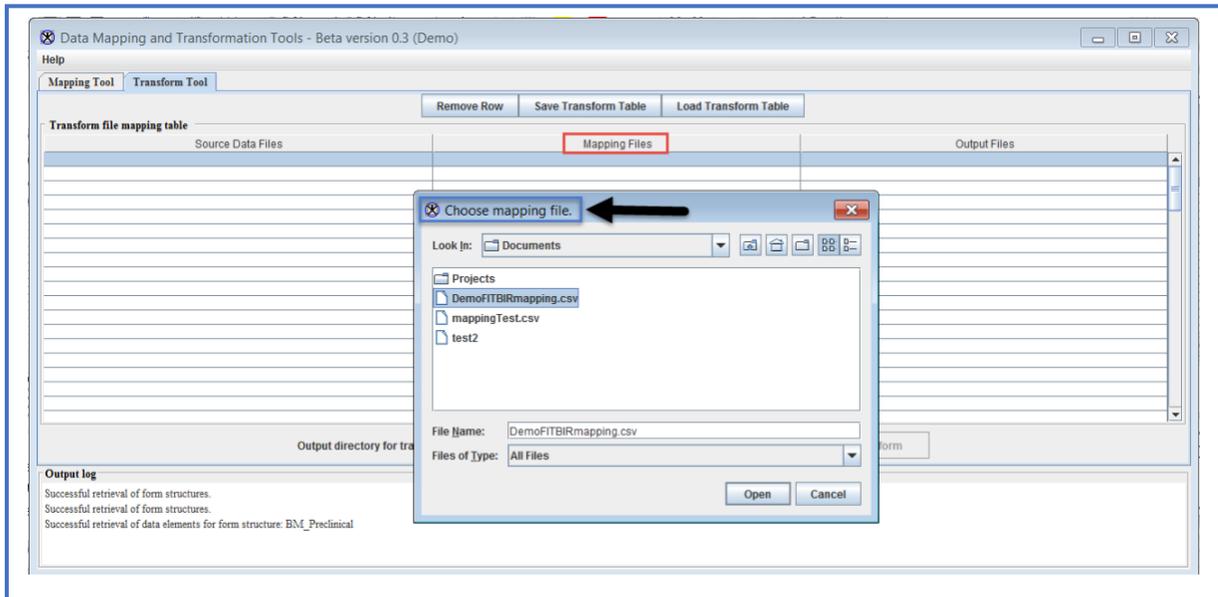
2. The **Transform Tool Table** box appears.



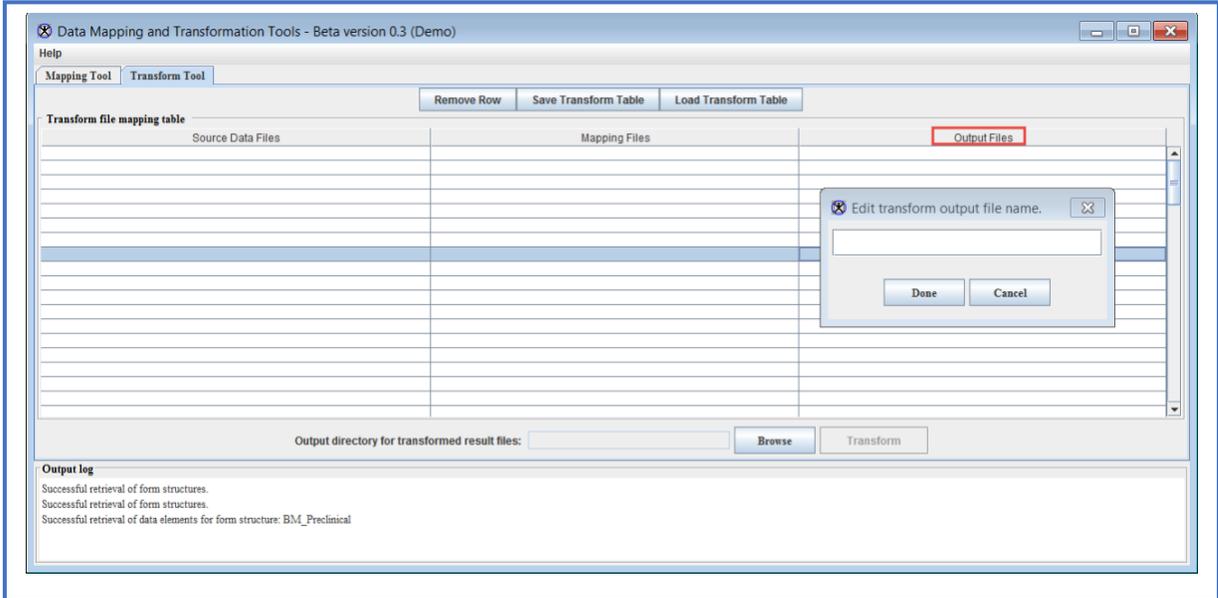
3. Double-click on the **Source Data Files** column to bring up the **Choose Data Files to be Transformed** dialog window where you may choose data files (CSV) to be transformed. **Note:** The path and file name will be written in to the cell.



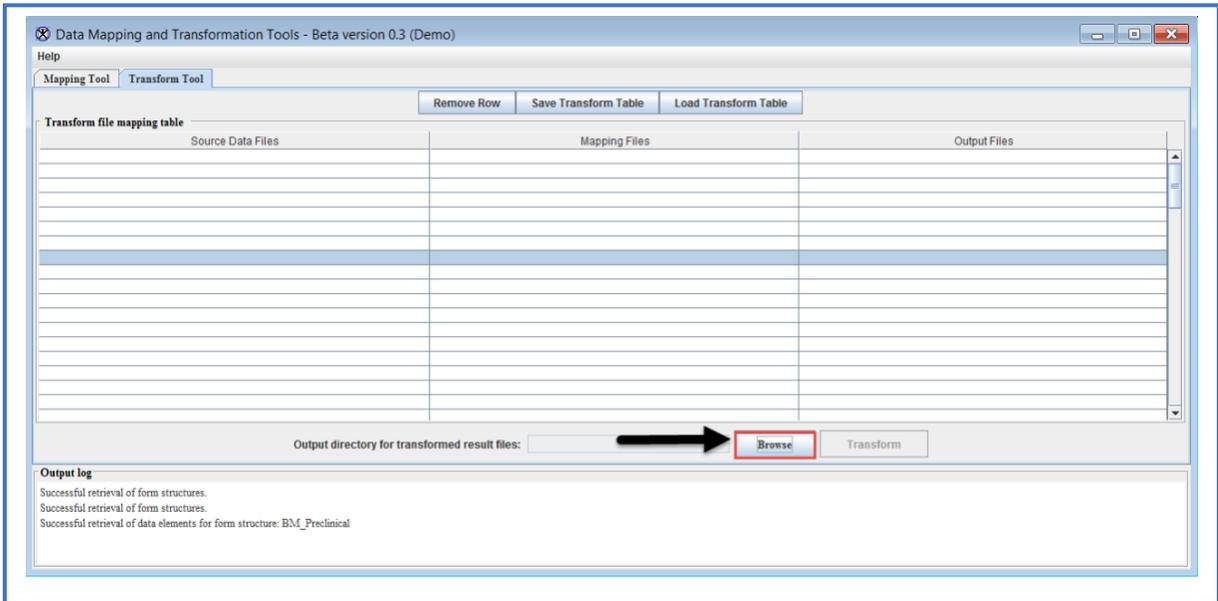
4. Double-click on the **Mapping Files** column to bring up the **Choose Mapping Files** dialog window where you may choose mapping files associated with the source data loaded in the first column. **Note:** The path and file name will be written in to the cell.



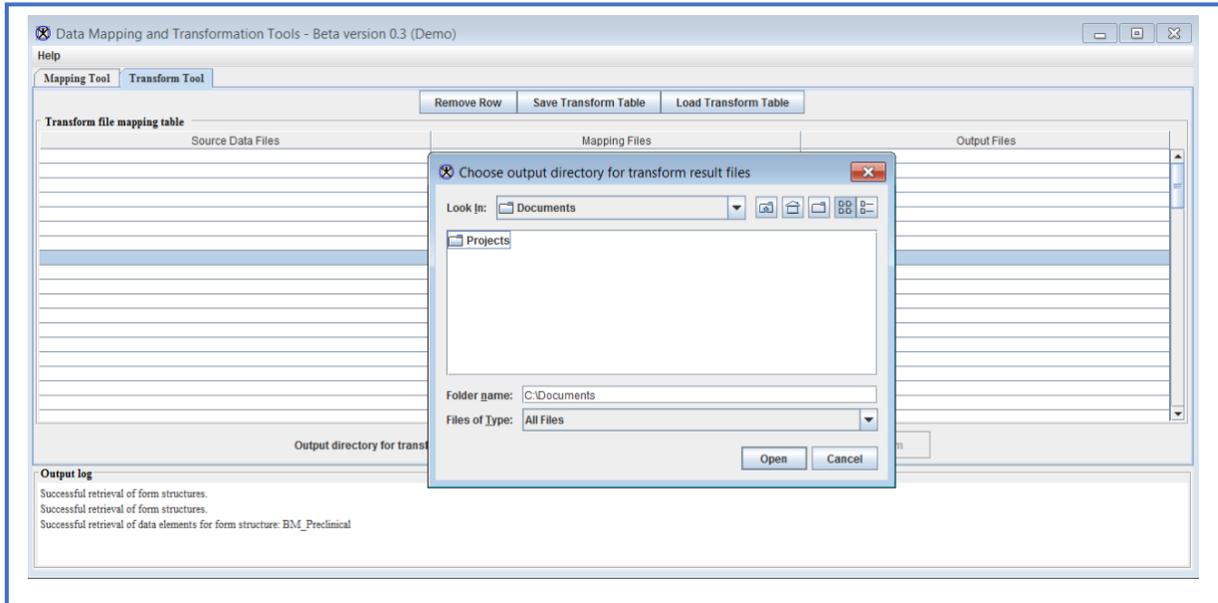
5. **Double-click** on the **Output Files** column to bring up the **Edit Transform Output Name** dialog window where you may name the output file from the transform tool. **Note:** The output file will be in CSV format.



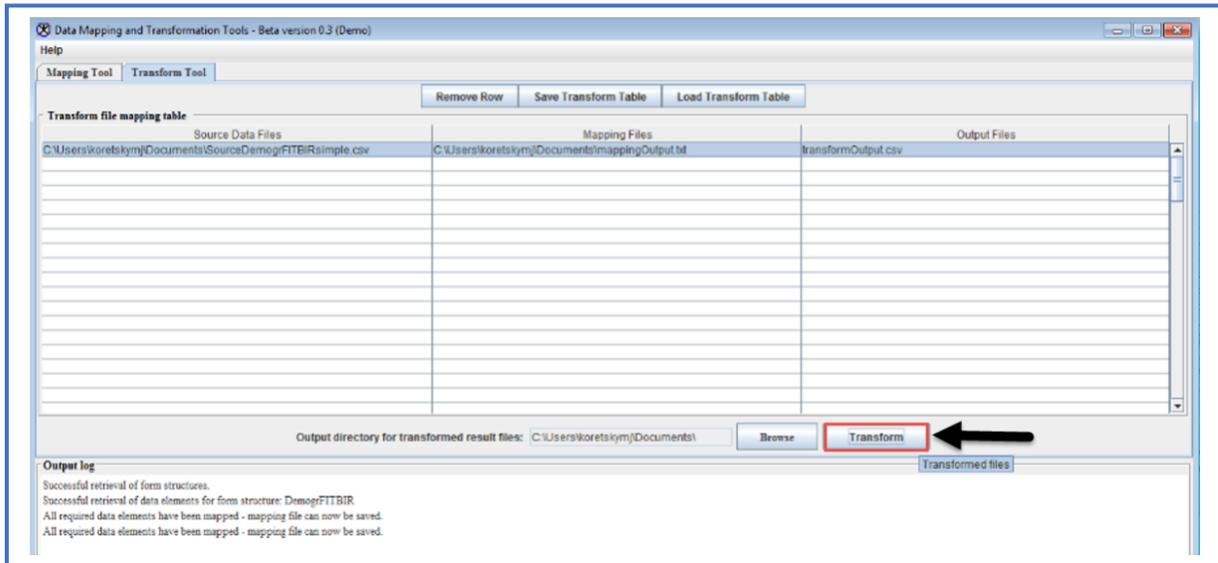
6. Click on the **Browse** button located at the bottom of the tool.



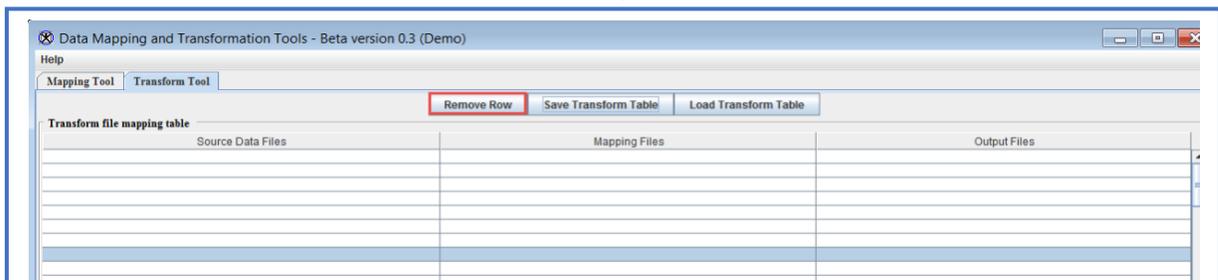
7. The **Choose Output Directory for Transform Result Files** dialog window appears where you can choose the folder that the output file will go into when it is successfully transformed.



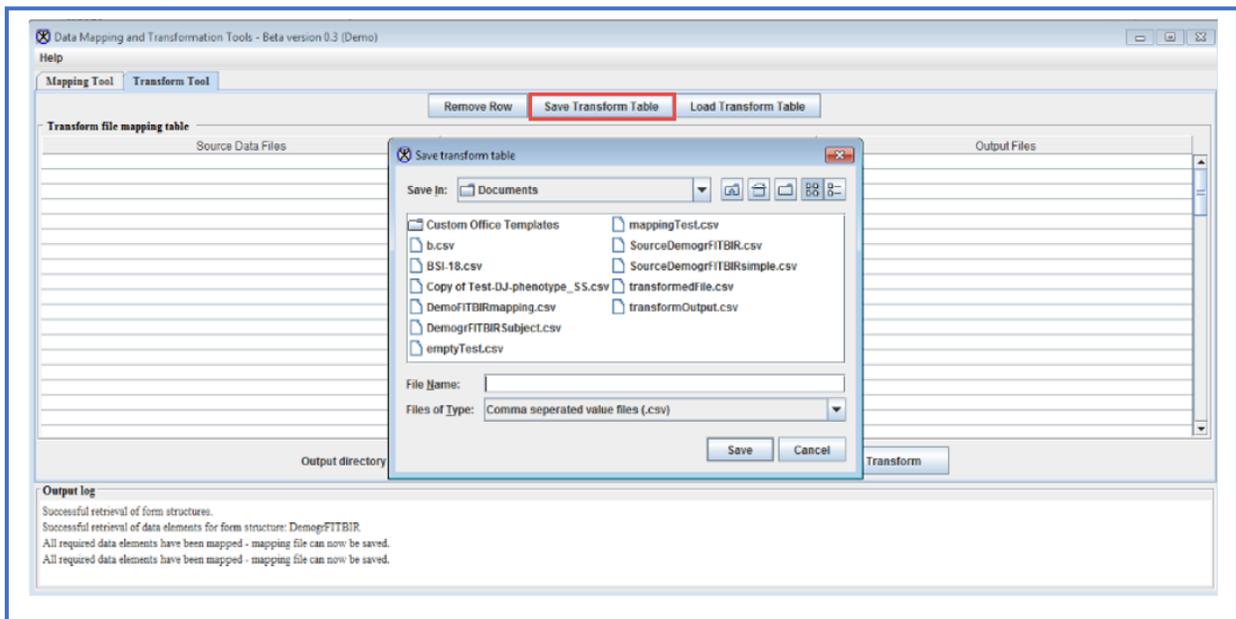
8. **Click** on the **Transform** button which will take the data from the source and mapping files to switch out the source DEs and PVs for the ones that were mapped to in the mapping file. A new file will be created under the name specified in the third column. If all three columns in a row are not filled out correctly, this will create an error message. Additionally, if the source file and mapping file are inconsistent, an error message will appear.



9. To remove the selected row from the, simply click on the **Remove Row** button.

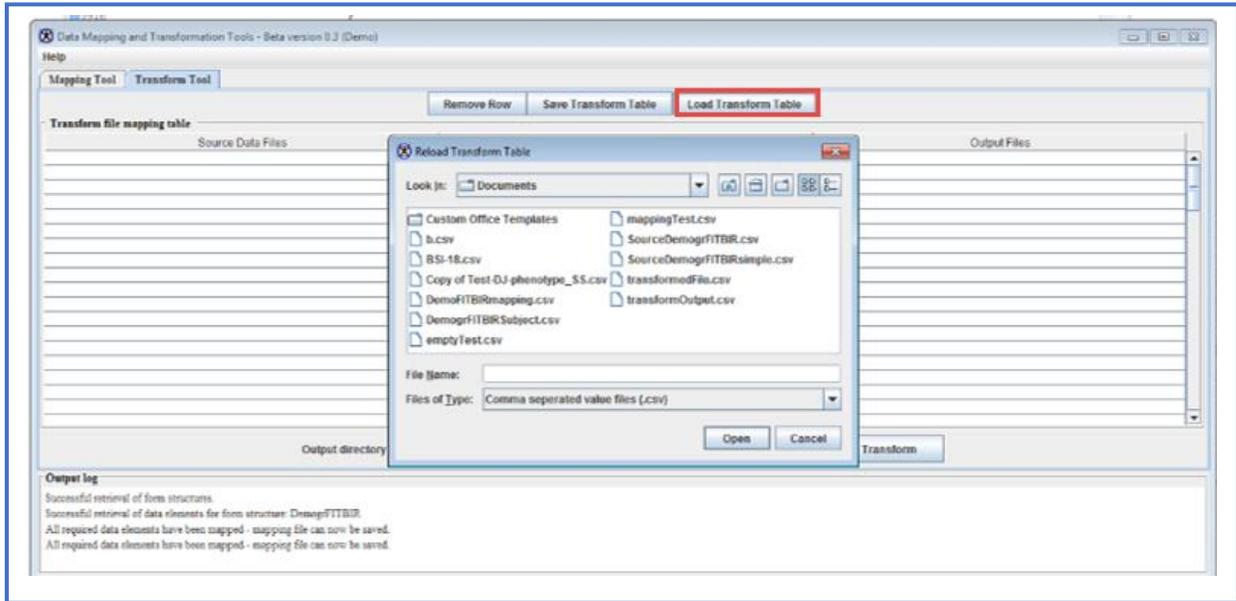


10. Click the **Save Transform Table** button which will bring up the **Save Transform Table** dialog window where you can save the contents of the actual transformation table.

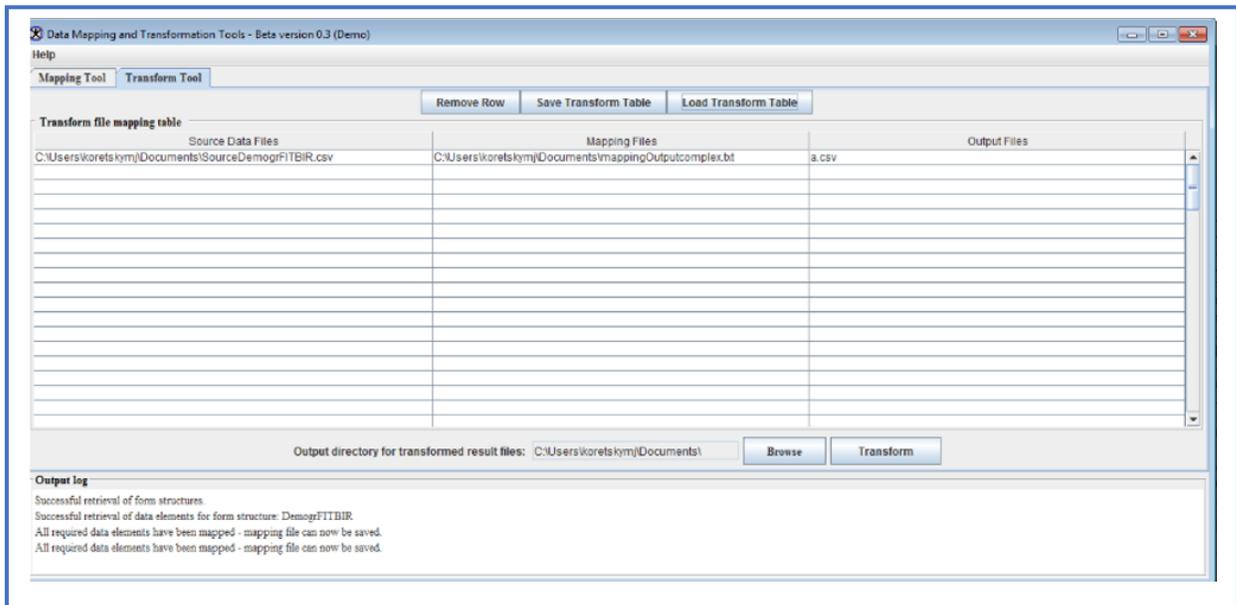


11. Click the **Load Transform Table** button which will bring up the **Reload Transform Table** dialog window where you can select the file where the table was saved. When the Open is

selected, the contents of the previously saved table are written back into the table allowing you to edit the files you are using for the transformation tool.



**12. The Transform Table** showing the reloaded transform table with source data files, mapping files and output (CSV) files.

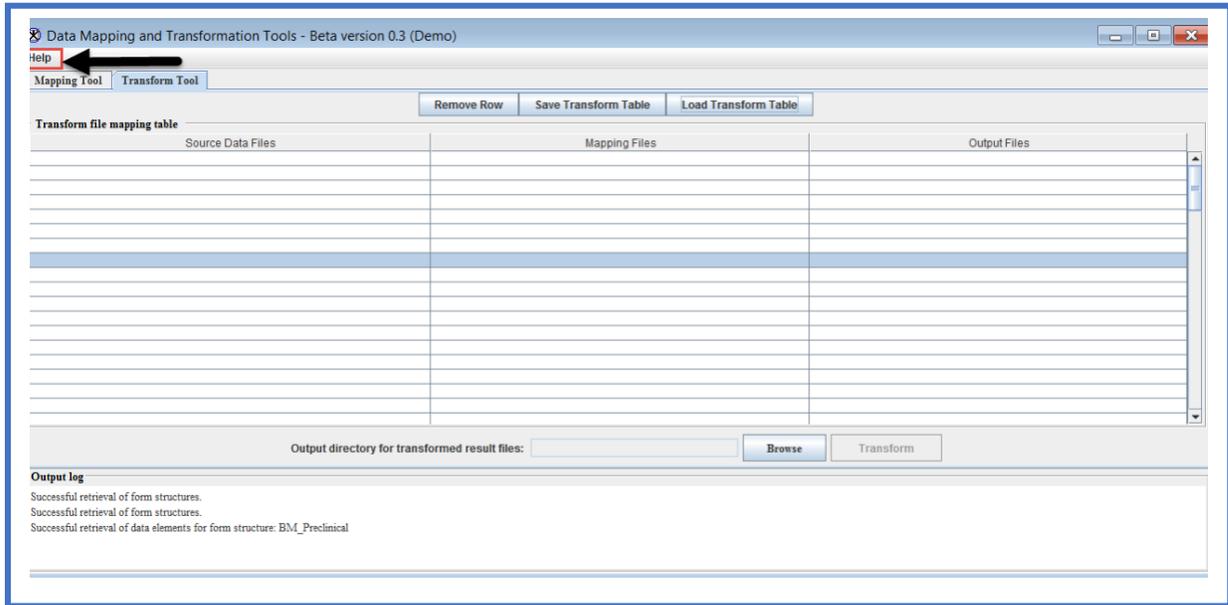


### 9.4.2 Viewing Help Pages

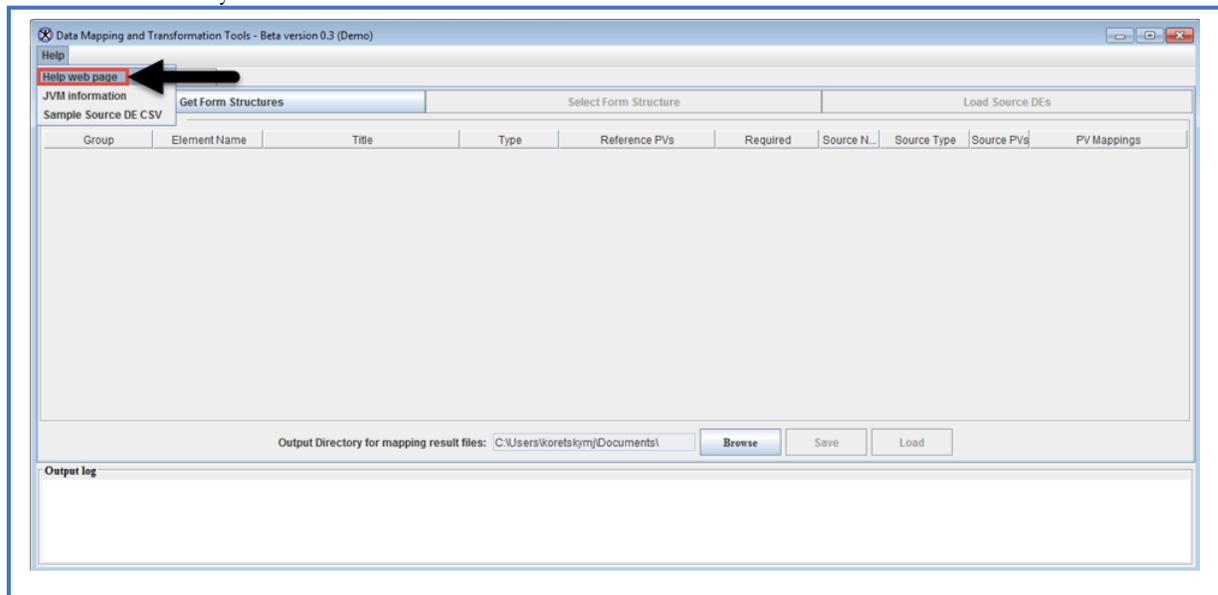
The help pages provide you with some useful information that will help you to effectively perform the functions in the DMT tool.

**To access the help pages:** Perform the following actions:

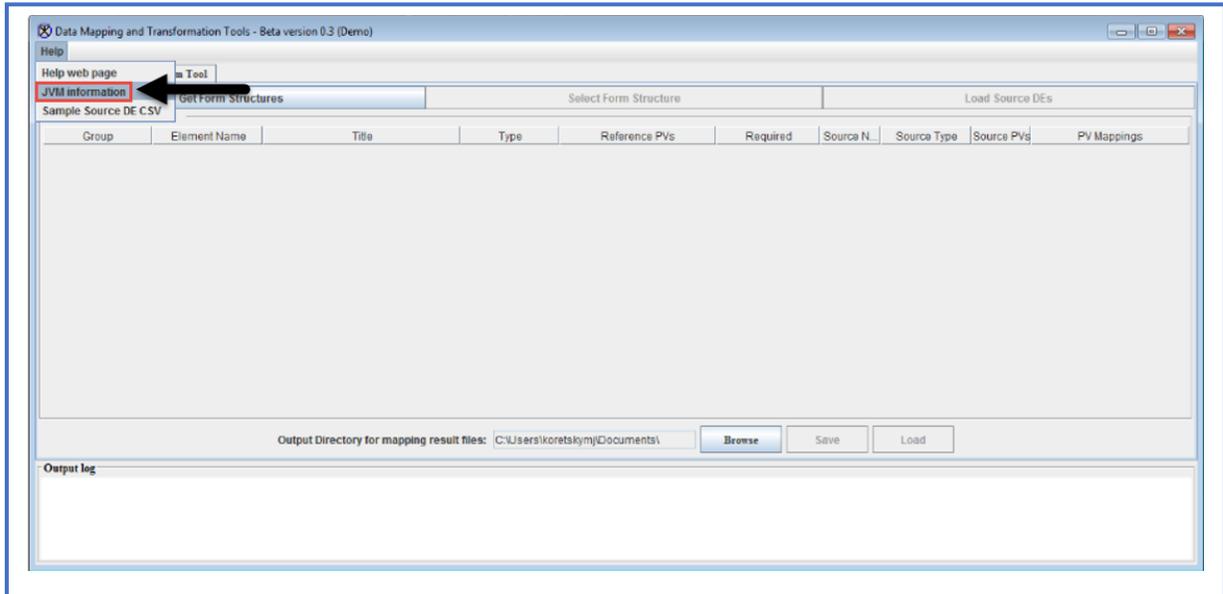
1. In the main Data Mapping and Transformation Tools window, Select the **Help** tab option located on the top-left corner.



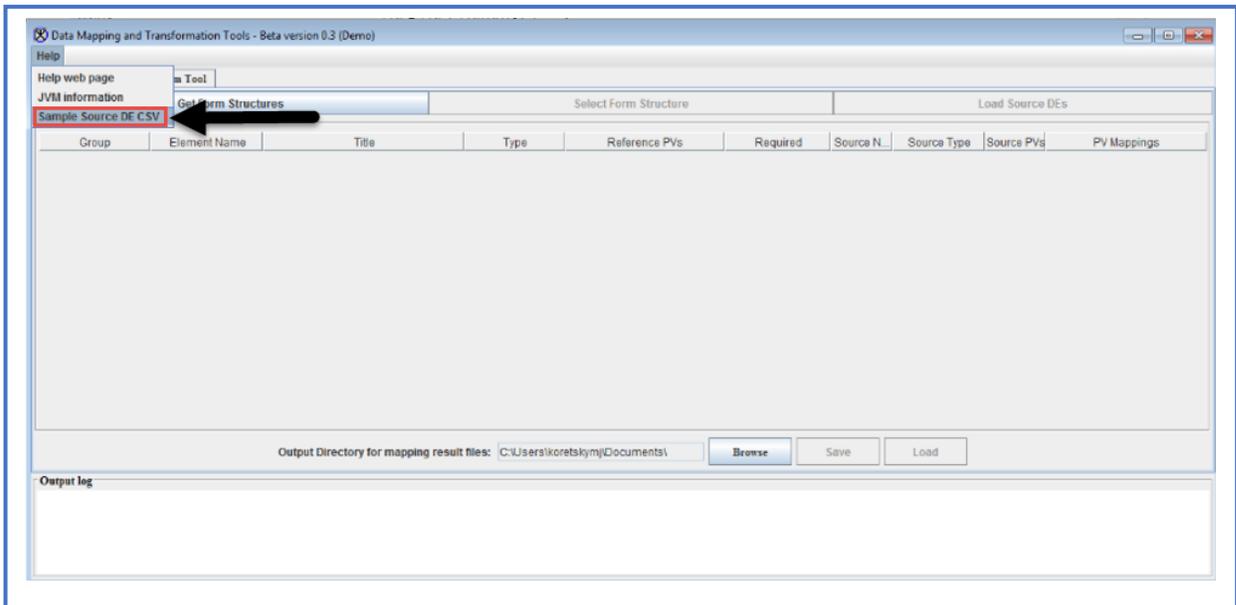
2. The Help menu option opens. Click on the **Help Web Page** which loads the Data Dictionary site.



3. Click on the **JVM Information** option which pulls up an extensive information on the Java Virtual Machine running.



4. Click on the **Sample Source DE CSV** option which pulls up a dialog window showing the format that Data Elements and Permissible Values files must be in for mapping purposes.



5. Sample CSV used for mapping data appears. Click the Close button to close the window.

Sample CSV Used for Mapping Data. Note that PV Description and Title are Optional  
BRICSMap01 ID is needed in first cell in order to map files (shown above table)  
BRICSMap01

Name	Type	PVs	PV Description (Optional)	Title (Optional)
aderwe5	Numeric	1;2;3;5	High;Low;Lower;Lowest	This is a title
aderwe6	Numeric	1;2;3;5;	High;Low;Lower;Lowest	This is a title2
age014x	Numeric			Age of subject
textelement1	Alphanumeric	One;Two	One;Two	Alphanumeric test
truefalse1	Boolean	0;1	True;False	True/False test

Close