



The PNG HIV Model - Software Manual



Introduction to the PNG HIV Model Graphical User Interface Software

This manual provides an overview on how to use the PNG HIV Model software (version 1.0) to evaluate the past and project the future of HIV Epidemics in PNG. This software has been implemented as a graphical user interface (GUI).

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Installing the Software

1. Create a directory where you would like to store the PNG HIV Model software files.
2. Put PNG_HIV_Model_installer.exe in the new folder and run the executable file.
3. Address the simple prompts that appear in the installation process. The required files will be unzipped and a PNG_HIV_Model.exe file will be created. This file can be moved to another location such as the desktop.
4. The PNG HIV Model will be automatically configured to run by double-clicking PNG_HIV_Model.exe.

Opening the PHG HIV Model

Double-click on the PNG_HIV_Model.exe file (note that the software may be slow to start). This will load the model software. The screen pictured in Figure 1 is the initial screen to appear and is the main page for the GUI. The PNG HIV Model stores all the information about an analysis of the HIV epidemic in PNG as a *project*. A project is a collection of settings, scenarios, and result that are combined and saved into a single framework for storage and further analysis.

When the PNG HIV Model opens initially there is no project loaded in the model. For the software to run a new project must be created or a previously generated project must be loaded. The current project being investigated by the PNG HIV Model is shown next to “Current Project:” on the main page. The creating and managing of projects is described in the next section.

The eight buttons on the opening screen perform the following actions:

- **About** – Provides information about in the PNG HIV Model.
- **Help** – Provides a link to a PDF of this user manual as well as a contact address for further information.
- **New Project** – Use this to create a new project to investigate the HIV epidemic in PNG.
- **Load Project** – Use this to load a previously created project to continue investigations.
- **Parameters & Calibration** – Opens the Parameters and Calibration page. This cannot be entered until a project has been created or loaded. This utility is described on page 8.
- **Past Evaluation** - Opens the Past Evaluation page. This cannot be entered until a project has been created or loaded and the Parameters & Calibration Utility has been used to



Creating, Loading, and Managing Projects

To perform an analysis of the HIV epidemic in PNG the user must first create a project using the create project button on the home screen or by selecting the create project menu in the Parameters & Calibration screen. Within a project multiple scenarios can be defined but a project has a single underlying set of parameter values and settings. Undertaking multiple analyses of the same setting (e.g. specific region or populations) with different parameters or interventions can be carried out by creating multiple projects for that setting. Once projects have been created they can be loaded into the PNG HIV Model using the Load Project button or menu. In this manual we will use 'PROJECT' as the name of a generic example project.

- **New Project** - A Windows Explorer window will open in the 'My Documents' directory or the last project folder created by the user. Navigate to or create a directory to store the new project and enter a name for the project (as shown in Figure 2) and click Save. As a recommendation we suggest creating a directory called 'PNG_MODELLING' to store projects and use a subdirectory of the form 'PNG_MODEL_{Description}_{date}'. The current project in the PNG HIV Model will now be this new project and the default settings will be loaded.

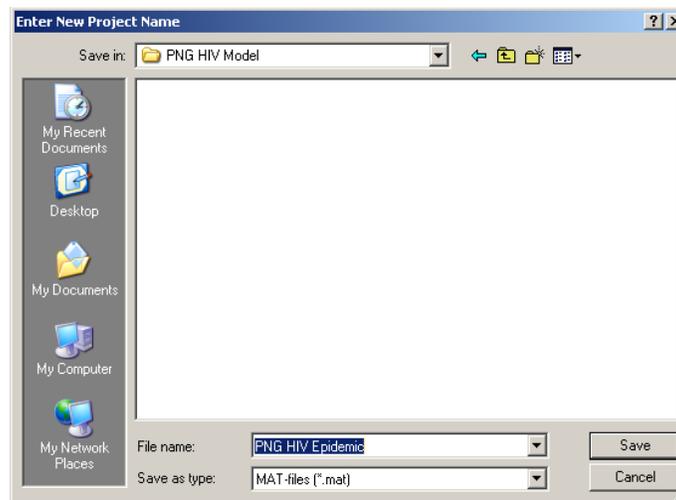


Figure 2: Screenshot of the Enter New Project Name window (when installed in Windows XP; similar screens appear for other versions of Windows)

When the project is created a file with a .mat extension (which may appear as a Microsoft Office Access Table) and directory with the projects name are created to store the default settings and parameters of the PNG HIV Model (Figure 3).

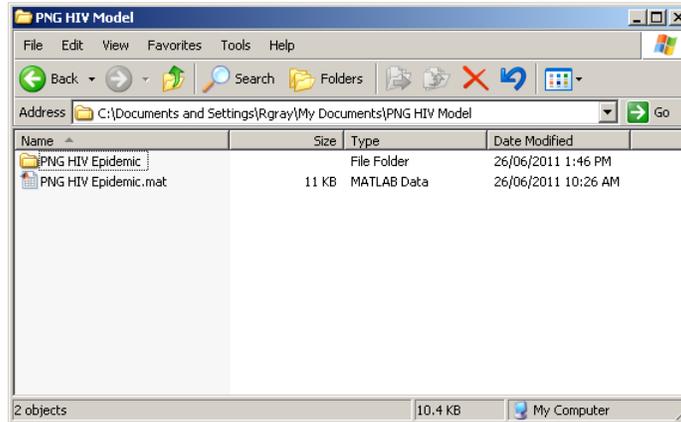


Figure 3: Screenshot of directory containing a project file and associated project directory (when installed in Windows XP; similar screens appear for other versions of Windows).

- **Load Project** – A Windows Explorer window will open (Figure 4). Navigate to the directory where the required project is stored and select the corresponding project file (DO NOT SELECT THE PROJECT'S DIRECTORY) and click open.

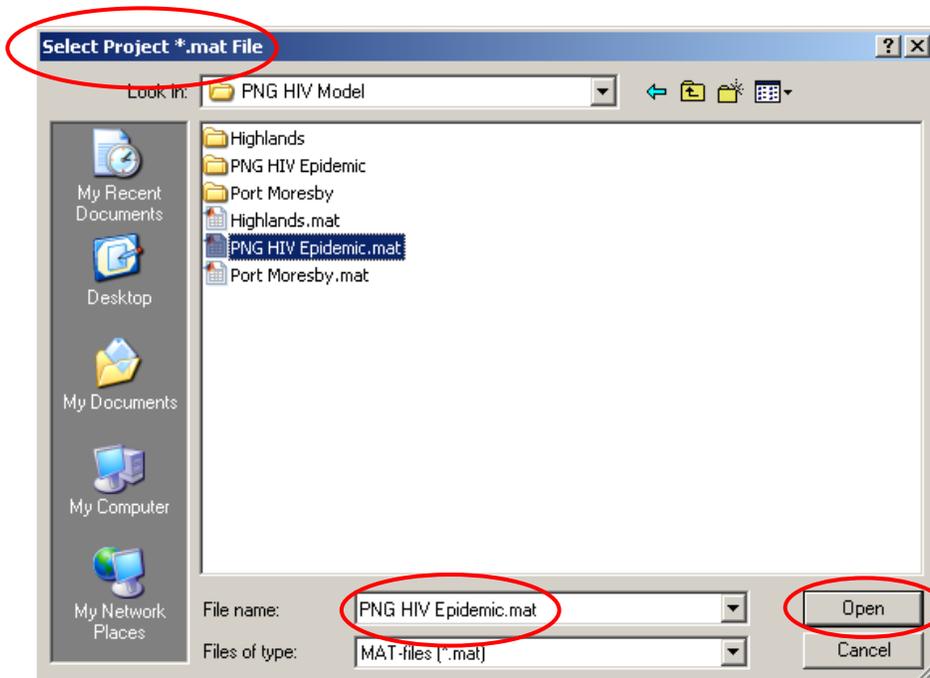


Figure 4: Screenshot of window for selecting a project to load (when installed in Windows XP; similar screens appear for other versions of Windows).

The current project in the PNG HIV Model GUI will now be the selected project and all the settings for the project will be loaded.



Once a new project is created or a previous project is loaded, the Parameters & Calibration page can be opened from the main page of the GUI.

Directory and file structure of a project – A project's file and associated directory are used to store all the settings, parameters, simulations performed, and results generated by the PNG HIV Model. Within a project's directory are a number of sub directories and files that can be browsed. A view of the tree structure of all the sub-directories in the project's directory is shown in Figure 5. The main subdirectories of a project directory are calibration, input, interventions, and pastcompare. The majority of the files in the project directory are storage files for the inputs and simulation outputs generated by the PNG HIV Model. These cannot be opened unless the user has Matlab installed on their computer. However, the directories 'PROJECT \calibration\Results', 'PROJECT \intervention\Results', and 'PROJECT \pastcompare\Results' are the default directories used by the PNG HIV Model to store the outputs generated by the software. By browsing to these directories using Windows Explorer these result files can be accessed.

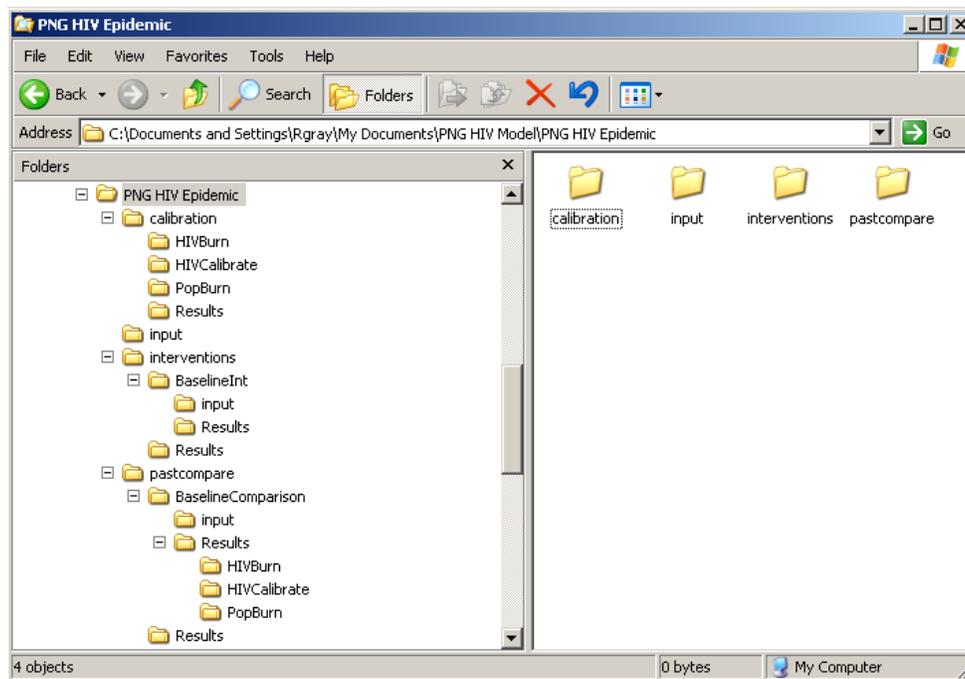


Figure 5: Directory tree for a project (when installed in Windows XP; similar screens appear for other versions of Windows).

Moving, renaming, or deleting a project - If a user wants to move or rename a previously created project then they must ensure that the both the project's file and the associated directory are given the same name and both moved to the same folder otherwise the PNG HIV



Model will not run correctly. To delete a project completely delete both the project file and the project directory.

Parameters and Calibration

When the Parameters & Calibration page is opened the screen in Figure 6 will appear and replace the main page. This page is used to enter parameter values for the main parameters in the PNG HIV Model and to run simulations. Available HIV epidemiological data can also be entered via this page so that parameter values can be calibrated to best match available data.

- The current project loaded into the software is displayed in the top right hand corner.
- The Main Page button is used to return to the PNG HIV Model main page and the Exit button is to close and exit the program.
- The File menu in the top left hand corner of the page contains create and load project options which perform the same action as the corresponding main page buttons.

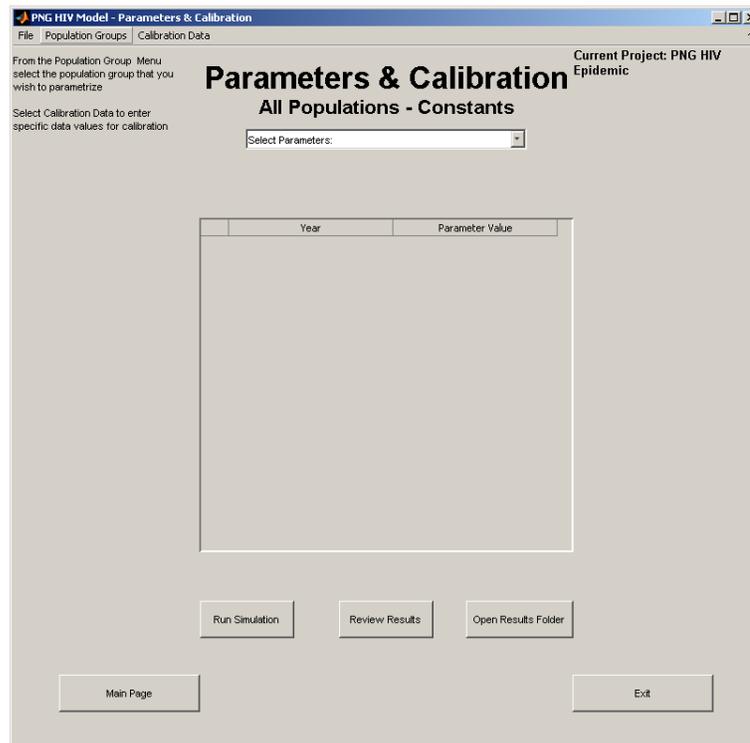


Figure 6: Screenshot of the Parameters & Calibration page.



Entering Parameter Values

When the Parameters & Calibration page is loaded all model parameters are set to default values which are described in ‘The PNG HIV Model –Technical Appendix’ and used to generate the results in ‘The PNG HIV Model – Summary and Results’. They are used to represent the overall PNG HIV epidemic from 1990 to 2010. This means the model can be run immediately by clicking the Run Simulation button. All changes to the input parameters are saved as files in the project’s ‘PROJECT/input/’ directory. These parameters then represent the baseline parameter values for a project.

Parameter values for a project can be changed by:

1. Selecting a population group from the ‘Population Groups’ menu on the top left hand corner of the page (Figure 7). Parameters for specific population groups can be loaded by selecting the corresponding population from the drop down menu. Selecting ‘All Populations – Constants’ loads parameters that are common for more than one population group and are fixed over time while ‘All populations – Varying’ selects common parameters that can change from year to year.

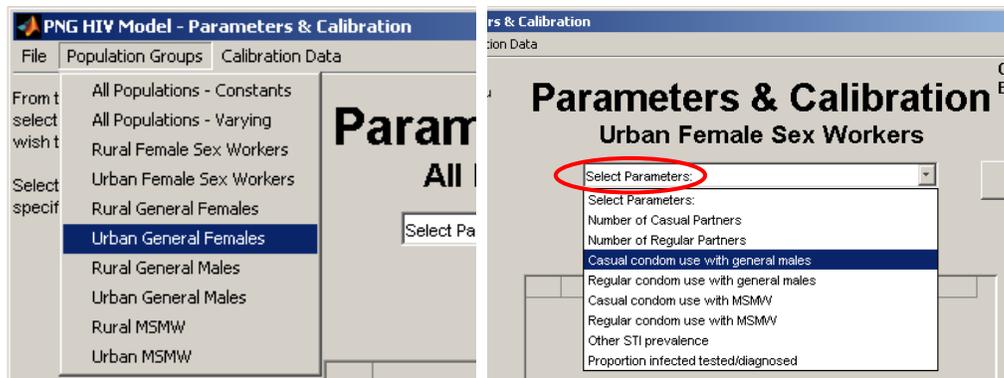


Figure 7: Screenshots of the menus used to select population groups and associated parameters.

2. Once a population group is selected from the drop down menu each parameter associated with that population can be selected from a drop down ‘Select Parameters’ menu under the page title. After selecting a particular parameter from this list the default values for each year are shown in a Table. A detailed description of what the select parameter represents in the PNG Model is shown above the table.

3. Parameter values in the table can be changed by clicking inside the table cell in the Parameter Value column and entering the new value. After entering the new value press ‘Enter’



on the keyboard, navigate to another cell using the up and down arrow keys, or click the mouse outside the cell.

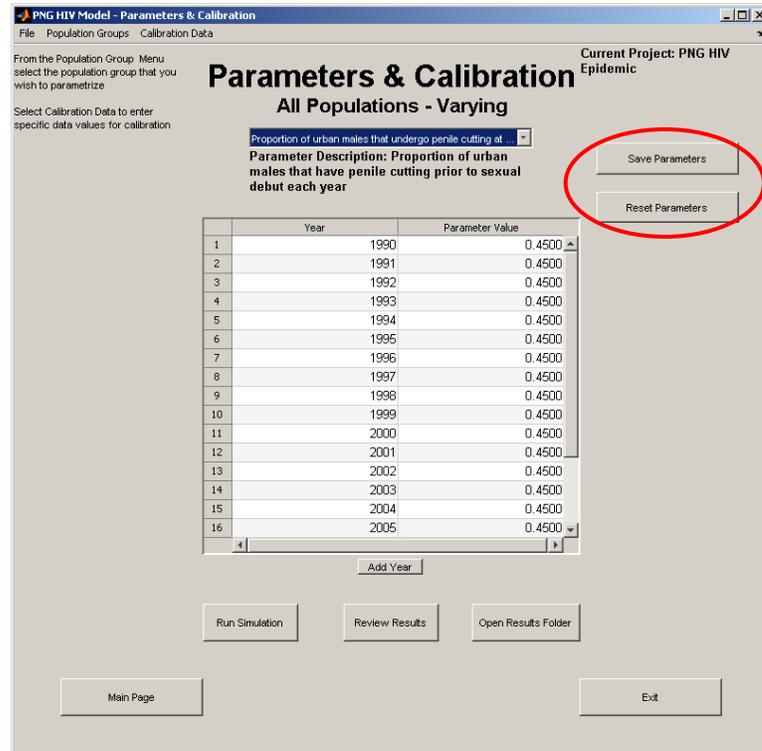


Figure 8: Screenshot showing the 'Save Parameters' and 'Reset Parameters' buttons.

4. When parameter values have been changed in the table the 'Save Parameters' must be clicked (circled in Figure 8) to save the changes before navigating to another parameter type or population group. Parameter values can be reset prior to saving them by clicking 'Reset Parameters'. This provides options to restore the values of the current parameter to their previously saved values or to their original default software values (Figure 9).

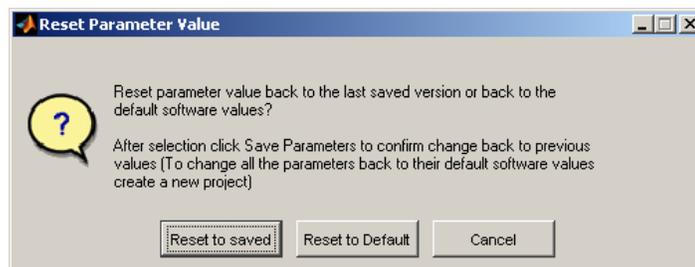


Figure 9: Screenshot of the reset parameter options

5. Clicking the 'Add Year' button (Figure 10) below the table listing the parameter values adds another year to all time varying parameters in the PNG HV Model (not just the parameter



currently viewed) so that the model can be updated in the future. When clicking this button the parameter value of the last year in the parameter table is used for the default value for the added year. After adding a year a 'Remove Year' button appears next to the add year button. Click this button to remove the last year of values from the project's parameters (years prior to 2011 cannot be removed).



Figure 10: 'Add Year' and 'Remove year' buttons below parameter value entry table.

Entering data used to calibrate parameters

Specific data describing HIV prevalence, recorded diagnoses, and ART usage can be entered so that comparisons between simulated HIV outcomes and available data can be compared to assist with parameter calibration.

To enter calibration data:

1. Select the 'Calibration Data' menu from the top left of the page and then select 'Enter Calibration Data' from the drop down menu.
2. Through the same process described above for the population group parameters, known data values for each year can be entered into the table (Figure 11). If a data value is unknown then its value it must be entered as 'NaN'. Click 'Save Parameters' to save any changes made to the default data values.

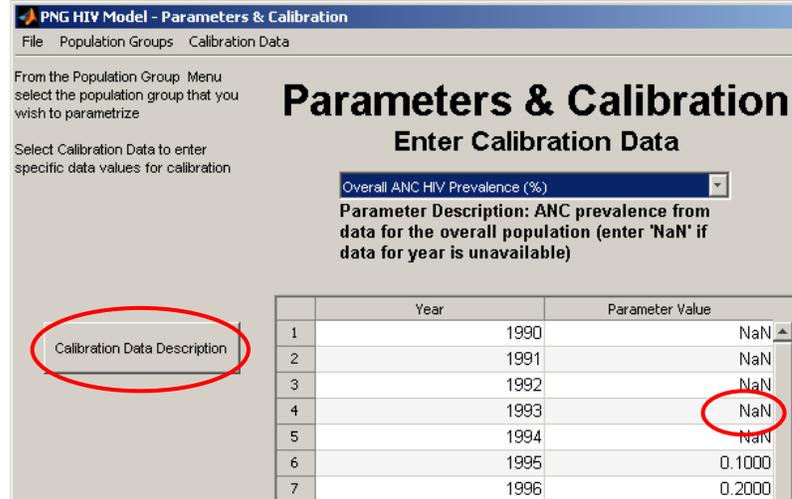


Figure 11: Screenshot of the Enter Calibration Data page.

3. When entering Calibration data a 'Calibration Data Description' button appears. By clicking on this button a short description of the data values can be entered, such as a reference to the source of the data. This description will be used when generating figures of results in the legend corresponding to the data.

Running simulations

Once all the changes to the appropriate parameter values are entered and saved click 'Run Simulation' to run the PNG HIV Model (Figure 12). Behind the scenes the software runs the PNG HIV Model for the entered parameter values in addition a 10 year projection assuming parameters are fixed at their final year value is carried out.

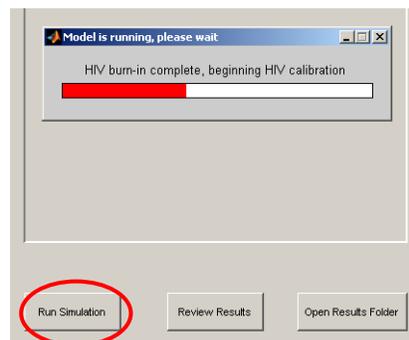


Figure 12: Screenshot showing the running of a simulation.

The results for each phase of a simulation (described in 'The PNG HIV Model - Technical Appendix A') are stored as files in 'PROJECT \calibration\PopBurn\,'



'PROJECT\calibration\HIVBurn\' , and 'PROJECT\calibration\HIVCalibrate\' directories. The results for the 10 year projection into the future (from the final year of entered parameter values; 2010 in the default case) are stored in the project's 'PROJECT\interventions\BaselineInt\Results\' directory created during the simulation process. These results and the corresponding input parameters for the following 10 years, created and stored in 'PROJECT\interventions\BaselineInt\input\' , are used to represent a project's baseline intervention scenario when investigating interventions via the interventions page (described on page 27 below). Similarly a copy of the simulation results and input parameters is copied to the 'PROJECT \pastcompare\' directory for comparing past evaluations using the 'Past Evaluation' page (described on page 16 below).

Whenever changes are made to the baseline parameter values of a project it is important to run a simulation to ensure the baseline past evaluation and intervention parameters are updated. Once the baseline simulation for a project has been completed the user can return to the main page and access the Past Evaluation and Interventions pages.

Generating and viewing results

Once a simulation has been run outputs generated from the results can be created by clicking 'Review Results'. This button opens a window screen shown in Figure 13 where the type of output required can be selected.

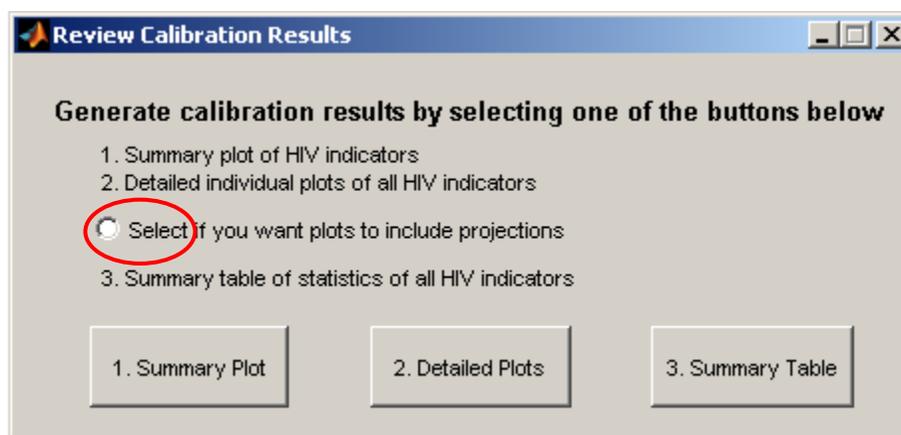


Figure 13: Screenshot of Review Calibration Results window.

In this window there are two options to produce plots from the simulation results and an excel spreadsheet of descriptive statistics. For plotting, the user can choose to plot the simulation



results from 1990 to the final year of parameter values or include the results from the 10 year projection into the future by clicking on the white disc highlighted in Figure 13.

The three buttons on the 'Review Calibration Results' window perform the following actions:

- **Summary Plot** – Produces a large plot with 16 subplots of HIV epidemiological indicators. These subplots included a plot of entered calibration data for comparing results (shown as black discs). Based on these results parameter values can be changed to improve the fit between model outcomes and epidemiological data. An example view of the plots generated is shown in Figure 14.

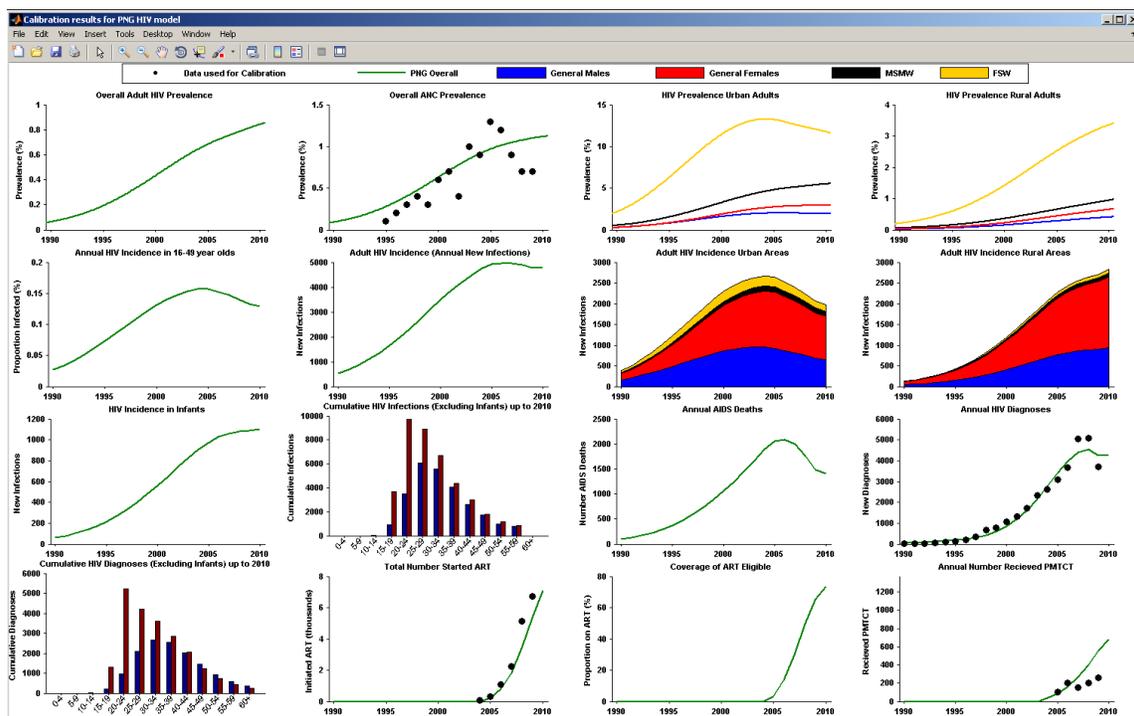


Figure 14: Example screenshot of the figure produced by clicking 'Summary Plot'.

- **Detailed Plots** – Produces individual plots of all simulated HIV indicators produced by the last simulation run of the project parameters. Overall 90 individual plots are produced and saved as image files; due to the number of images created it can take a few minutes generate these images. These plots are saved in three directories in the 'PROJECT \calibration\Results\Figures\' directory. These subdirectories contain figures describing demographic/population indicators (in the 'Demographics' directory), HIV infection indicators (in the 'HIVinfection' directory), and HIV diagnoses and treatment indicators (in the



'HIVclinical' directory). The type of indicator plotted in each figure is described in the figures file name; e.g. a plot of the overall HIV prevalence is stored in 'Figures\HIVinfection\Infection_Prevalence_Overall.png'. These plots are produced in a format that can be easily used in reports or other publications. After all image files have been produced and saved a window box appears stating the directory where the images have been saved.

- **Summary Table** – Produces a large Microsoft Excel spreadsheet containing descriptive statistics of all population and HIV epidemiology indicators from 1990 to the final year of simulation (including the 10 year projection). This spreadsheet is saved in the 'PROJECT \calibration\Results\' subdirectory with the filename 'PROJECT_CalibrationOutput.xls'.

All the output files generated by the calibration simulations can be found by clicking 'Open Results Folder' on the Parameters and Calibration Page.

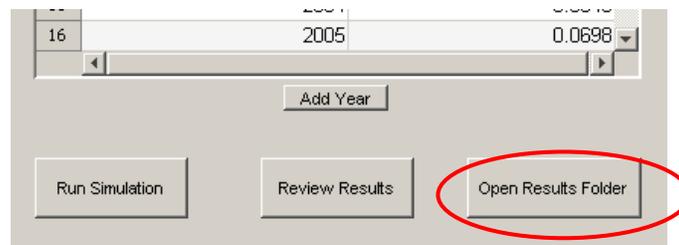


Figure 15: Screenshot of 'Open Results Folder' button.

Alternatively the output files can be accessed by browsing to 'PROJECT \calibration\Results\' using Windows Explorer (Figure 16).

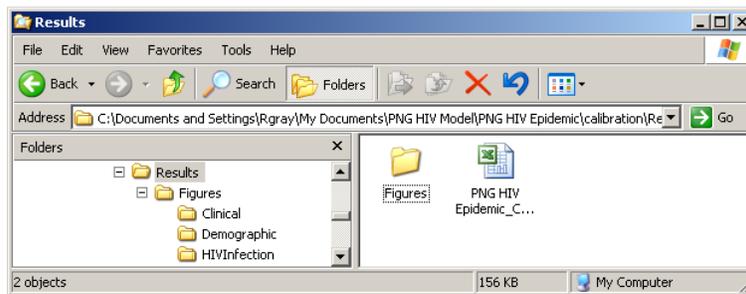


Figure 16: Screenshot of calibration results directory. (when installed in Windows XP; similar screens appear for other versions of Windows).



Past Evaluation

Once the baseline simulation for a project has been run using the Parameters & Calibration page the Past Evaluation page can be accessed from the main page of the GUI. The Past Evaluation page is used to evaluate what could have happened in the past if conditions were different, or to assess the potential impact that past public health programs had on the HIV epidemic in PNG. This is done by comparing the resulting epidemic simulation due to changes in past conditions to the baseline simulation (saved in the BaselineComparison.mat file in the 'PROJECT\pastcompare' directory). For example in 'The PNG HIV Model – Summary and Results' report we used this software to evaluate what would have happened in PNG if ART had not become available in 2004.

There are two past evaluation modes available in the GUI; a 'Simple' mode and an 'Advanced' mode. When the past evaluation is launched the simple mode is displayed by default. The mode used can be changed by clicking on the Past Evaluation menu of the Past Evaluation page (top left hand corner) and selecting the mode required (Figure 17). The simple mode provides an easy and intuitive way to explore potential past changes in condom use, the number of sexual partners and the level of STIs in the population. In contrast the advanced mode allows changes to all parameters from their baseline value.

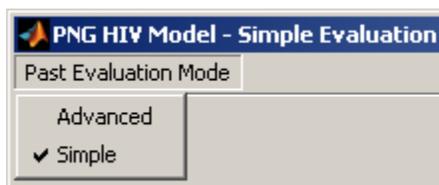


Figure 17: Selection of Advanced or Simple Past Evaluation Mode.

Multiple past evaluation scenarios can be carried out for a single project. Scenarios can be created, loaded, and managed via the buttons on the advanced mode page.

Simple Evaluation Mode

A screen shot of the simple past evaluation mode is shown in Figure 18. This is the initial screen seen after clicking the Past Evaluation button on the main page of the GUI. This mode is used to do a simple evaluation of what impact changes in condom use, the number of sexual partners and the prevalence of STIs had or could have had on the HIV epidemic in PNG.

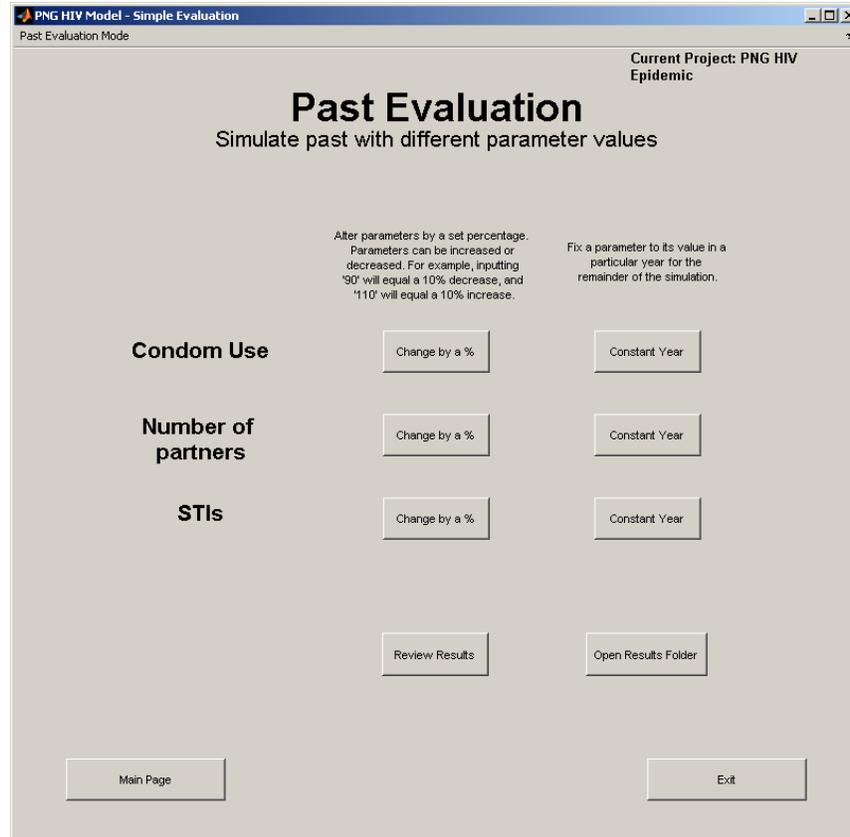


Figure 18: Screenshot of the Simple Evaluation Mode page.

Simple evaluations of past changes in sexual behaviour and STIs can be carried out in two ways using the GUI. These two options are shown in Figure 19.

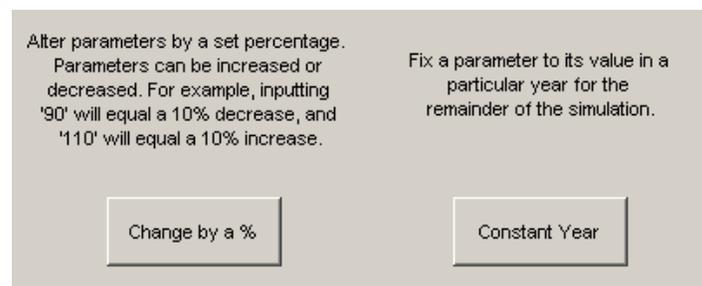


Figure 19: Screenshot of the options available for performing a simple past evaluation.

- **Change by a %** - The first option changes all corresponding parameters over the entire baseline period. Clicking 'Change by a %' first opens a Windows Explorer window. This window opens in the 'Project\pastcompare\' directory by default. An alternative directory can be created or used but it is recommended to save scenarios in this directory for ease of organization and project management. Enter a filename for this evaluation and click 'OK'.



Once the file for the scenario is created and saved the 'Comparison Description' window opens requesting a simple description describing the scenario being evaluated (Figure 20). Enter a simple description and click 'OK' as shown in the example screenshot below.

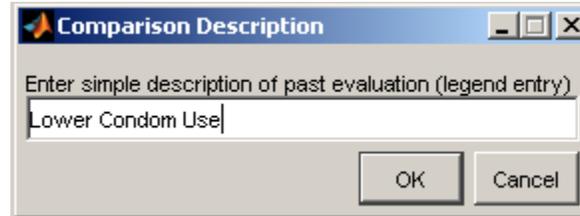


Figure 20: Screenshot of 'Comparison Description' window.

Once a description of the past evaluation is complete another window is opened where the percentage change in the parameter values is entered. This percentage change is entered relative to 100 with a decrease of x% relative to the project baseline entered as 100-x and an increase in condom use of y% entered as 100+y. An example screenshot of this window is shown in Figure 21. Once the percentage change is entered click 'OK'. The appropriate parameter values of the baseline project parameters are then adjusted within the PNG HIV Model and a simulation of the model is run using the changed parameters.

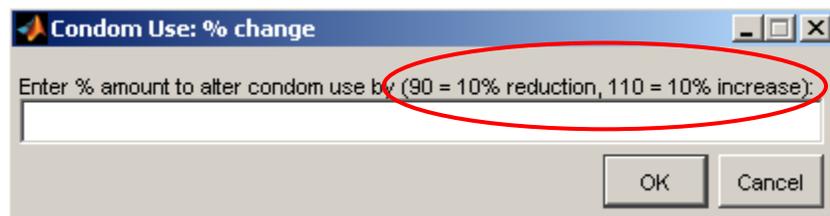


Figure 21: Screenshot of how to enter percentage change for a simple past evaluation.

- **Constant Year** – This option is used to explore what could have happened if conditions hadn't changed since a certain time in the past (e.g. what could have happened if condom use hadn't increased since 2000). When using this option the same process as the 'Change by % option' is followed except that after entering a comparison description a 'Constant Trend' window opens (Figure 22). Enter the year from which the parameter value does not change and click 'OK' and the PNG HIV Model will run.



Figure 22: Screenshot of 'Constant Year' window.

After the past evaluation simulation is run a plot of summary HIV epidemiological indicators is automatically produced comparing the indicators for the past evaluation to the simulated values for the project baseline parameters. An example of this plot is shown in Figure 23 for a 'Constant Year' past evaluation.

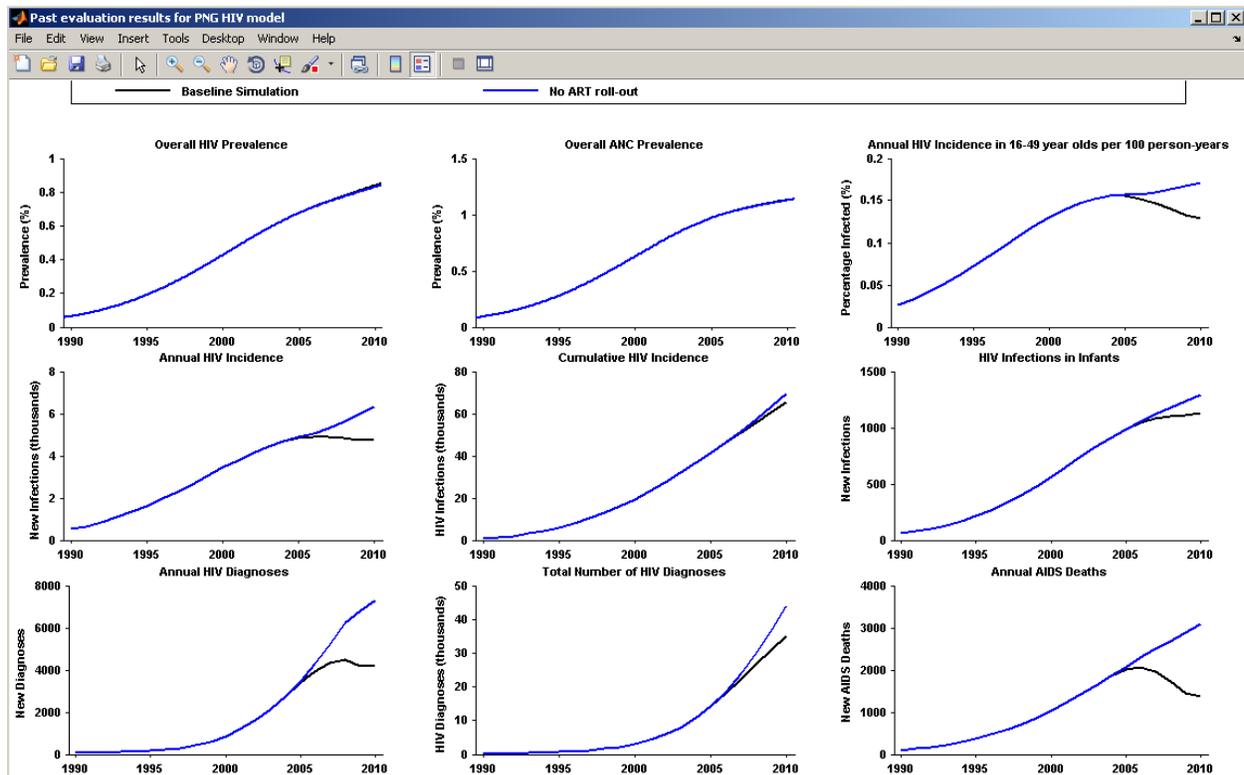


Figure 23: Screenshot of a plot of summary HIV indicators comparisons produced after a past evaluation has been run.

Advanced Evaluation Mode

Selecting the advanced mode of past evaluation replaces the simple mode page and opens a new page (shown in Figure 24) similar to the Parameters & Calibration page described on Page



8. Using this page all the baseline parameters for a project can be altered and the resulting simulation can be compared to the baseline simulation.

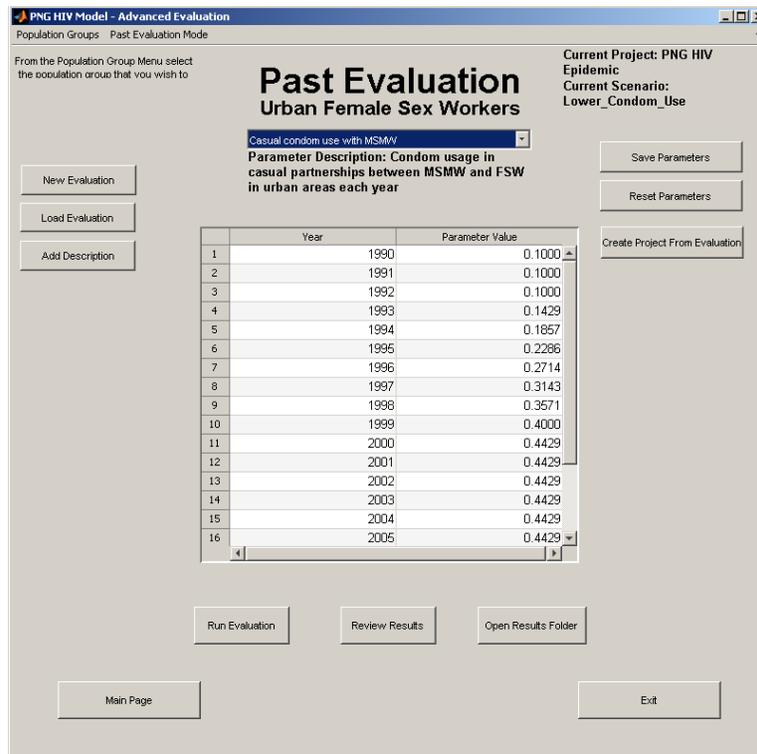


Figure 24: Screenshot of advanced past evaluation page.

Creating, Loading, and Managing Evaluations

When the advanced Past Evaluation page is opened a new evaluation scenario must be created or loaded before parameter values can be altered.

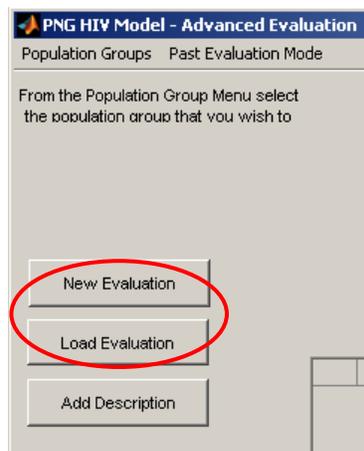


Figure 25: Screenshot of 'New Evaluation' and 'Past Evaluation' buttons.



This is achieved by clicking on the 'New Evaluation' or 'Load Evaluation' buttons (Figure 25). In this manual we use 'EVALUATION' as the name of generic example evaluation scenario.

- **New Evaluation** – A Windows Explorer window will open in the 'PROJECT\pastcompare\' directory. Enter a name for the past evaluation scenario; for example 'Lower Condom Use' and click Save. The baseline comparison parameter values will be loaded and the new scenario will be displayed in the top right hand corner of the Past Evaluation Page (Figure 26). The 'Add Description' button should now be pressed to provide a legend description for the newly created evaluation.

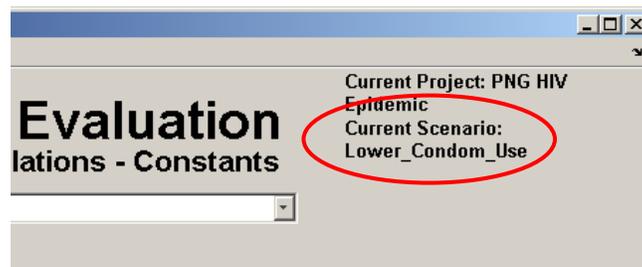


Figure 26: Screenshot highlighting where information about the current project and current scenario can be found.

When a new evaluation scenario is created a file 'EVALUATION.mat' and an associated directory 'EVALUATION\' are created in the 'PROJECT\pastcompare\' directory. Multiple past evaluations can be created for a particular project and stored in the 'PROJECT\pastcompare\' directory.

- **Load Evaluation** – A Windows Explorer window will open in the 'PROJECT\pastcompare\' directory (Figure 27). Select the required file associated with the evaluation (DO NOT SELECT THE PROJECT'S DIRECTORY) and click 'Open'.

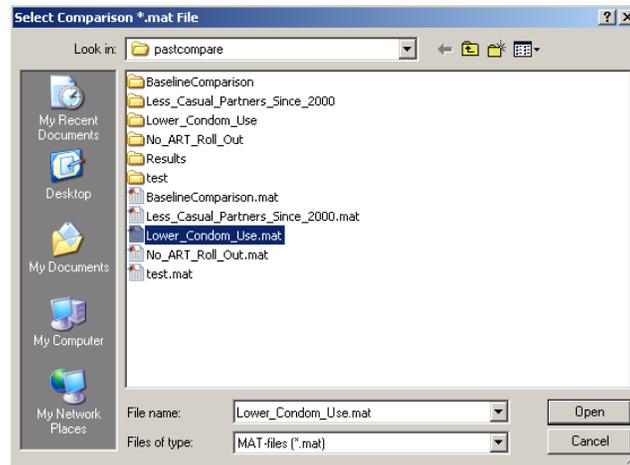


Figure 27: Selecting a single previously created past evaluation file to load (when installed in Windows XP; similar screens appear for other versions of Windows).

- **Add Description** - The 'Comparison Description' window opens requesting a simple description describing the scenario being evaluated. Enter a simple description and click 'OK'.

Altering Past Evaluation Parameter values

Once a past evaluation has been created or loaded the parameter values can be changed by selecting a population group and then specific parameters associated with a population group from the drop down menus (in approximately the same position as in the Parameters & Calibration page described on page 8). Once a parameter is selected its current values are loaded into a table in the middle of the GUI. In this table the parameter values for each year can be changed by selecting a cell in the table and entering a new value. After entering the new value press 'Enter' on the keyboard, navigate to another cell using the up and down arrow keys, or click the mouse outside the cell. Once a new value has been entered they are saved and reset in the same way as for the Parameters & Calibration page by clicking 'Save Parameters' and 'Reset Parameters', respectively. Once the new values of a parameter have been saved other parameters can be selected and changed before running the evaluation.

Create Project From Evaluation – By comparing the results of a past evaluation with the baseline results it may become apparent that the past evaluation results are a better representation of the HIV epidemic being investigated. If this is the case clicking 'Create Project From Evaluation' (Figure 28) and entering a file name for the project will create a new project from the current past evaluation parameters.

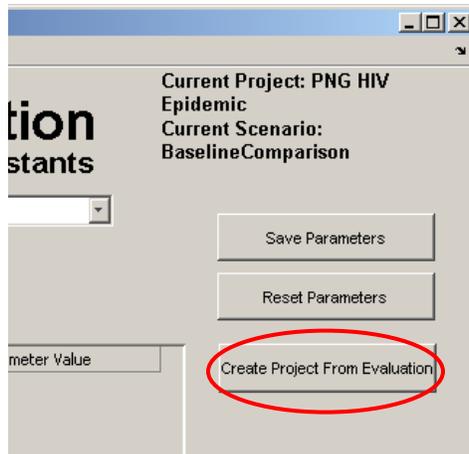


Figure 28: Screenshot showing the location of the 'Create Project From Evaluation' button.

Running an Evaluation

Once the parameters have been entered click 'Run Evaluation' and a simulation of the model will be run behind the scenes. The software runs the PNG HIV Model running the population set-up, the HIV infection set-up, and the post 1990 simulation phases (as described in 'The PNG HIV Model – Technical Appendix) with the altered parameter values. The results for each phase of a simulation are stored as files in corresponding subdirectories in 'PROJECT\pastcompare\EVALUATION\Results'.

Reviewing Results

Once an evaluation simulation has been run outputs generated from the results of simulation can be created by clicking the 'Review Results' button. This button opens a window (shown in Figure 29) where the type of output required can be selected by clicking on one of the four buttons.

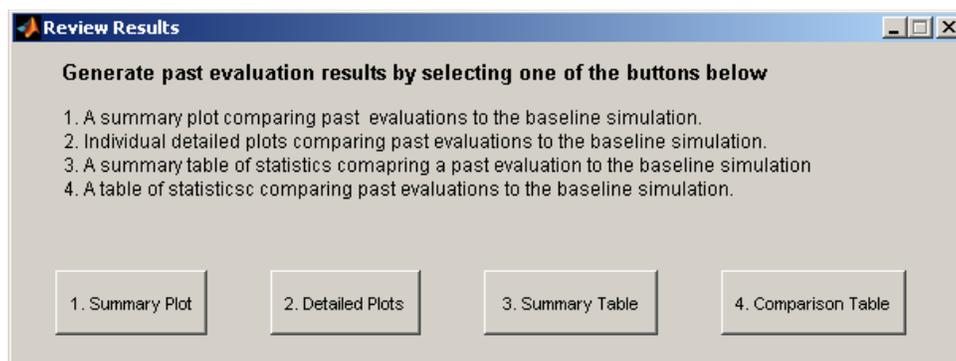


Figure 29: Screenshot of the review results options for past evaluations.



- **Summary Plot** - Creates a summary plot comparing HIV indicators for selected past evaluation scenarios. Opens a file selection Windows Explorer window in the 'PROJECT\pastcompare\' directory which will show all the files for the previous past evaluation scenarios that have been run as shown in Figure 30. To compare a single evaluation with the baseline scenario (BaselineComparison.mat) select that evaluation file and click 'OK'. To compare multiple past evaluations, select up to 5 files, using the CTRL key or highlighting using the mouse, corresponding to the required past evaluation scenarios EXCLUDING the BaselineComparison.mat file and click 'OK'.

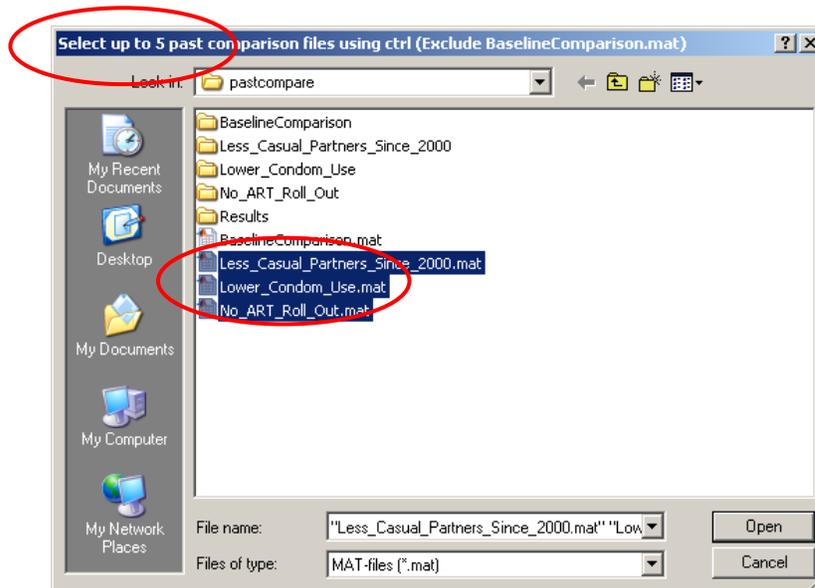


Figure 30: Screenshot of the process for selecting past evaluations for generating results (when installed in Windows XP; similar screens appear for other versions of Windows).

- **Detailed Plots** – Creates a number of individual plots comparing HIV indicators for selected past evaluation scenarios. Following the same procedure as for the summary plot button select 5 past evaluation files and click 'OK'. A Windows Explorer window then opens in the 'PROJECT\pastcompare\Results\' directory (Figure 31). Select or create a folder for the storage of plots and click 'Save'. To create a folder use the directory creation button circled in the screenshot below DO NOT enter a new directory name in the 'File name' box (Figure 31). If a selected folder already contains figures a warning window will appear to confirm if figure files should be over written.

Each individual plot will be saved as a figure file in the user created directory (Figure 32). The type of indicator plotted in each figure is described in the figures file name; e.g. a



plot comparing the overall HIV prevalence in the selected scenarios is stored in a file named 'Compare_Overall_Adult_Prevalence.png'. All the individual plots have the same legend which is plotted in a separate figure named 'Legend_For_Evaluation_Figures.png'.

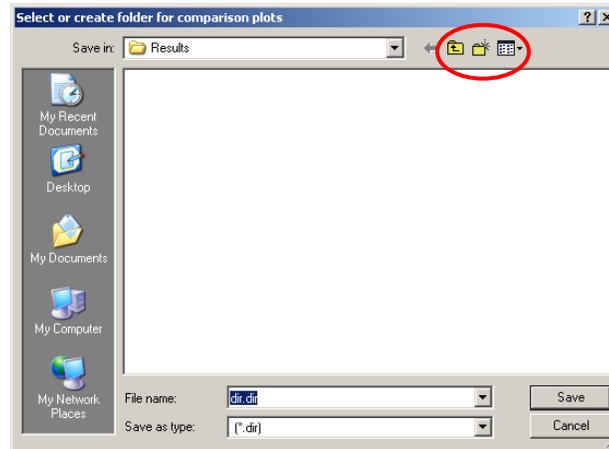


Figure 31: Selecting or creating directory for storage of results. To create a directory the user must use the create folder button circled. (Screenshot when installed in Windows XP; similar screens appear for other versions of Windows).

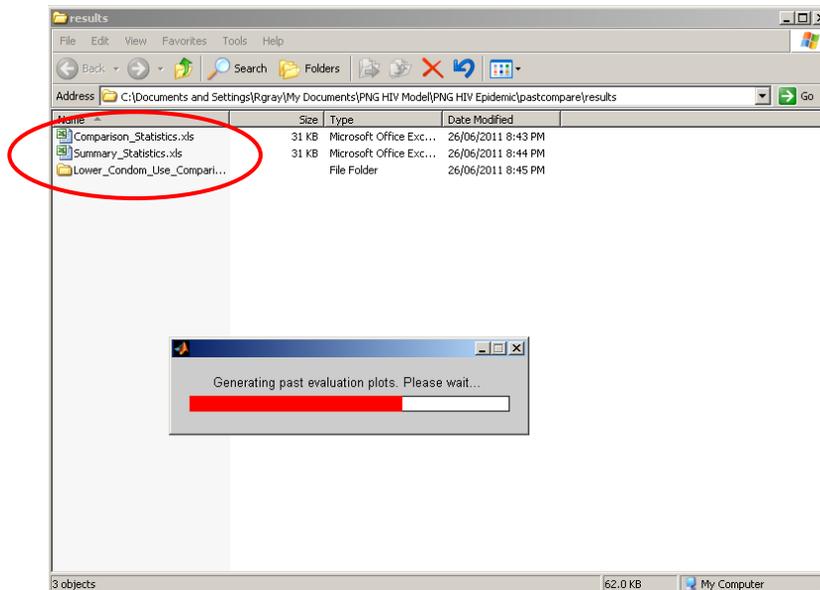


Figure 32: Screenshot showing the creation of past evaluation plots and results directory where they are being saved (when installed in Windows XP; similar screens appear for other versions of Windows).



- Summary Statistics** – Produces summary statistics of HIV indicators for a single past evaluation scenario. Following a similar procedure to that described for the ‘Summary Plot’ button select a *single* past evaluation file and click ‘Ok’. After selecting the file a Windows Explorer window will open in the ‘PROJECT\pastcompare\Results\’ directory requesting a file name. The user can create or browse to another location before entering a file name and clicking save. The software will then generate an excel file of HIV indicator statistics comparing the results of the selected past evaluation file to the baseline simulation. Note that in this file a negative number or percentage shows that for the corresponding statistic the selected past evaluation resulted in an increase or a worsening of that indicator (this is explained in the file itself). An example screen shot of part of a ‘Summary Statistics’ file is shown in Figure 33.

Change in Past Evaluation and HIV Epidemic Statistics						
	A	B	C	D	E	F
1	Change in Past Evaluation and HIV Epidemic Statistics					
2	Note: Positive numbers represent a decrease and negative numbers represent an increase in HIV indicators relative to the baseline simulation.					
3						
4	File Name and Description					
5	Lower_Condom_Use.mat					
6	Lower Condom Use					
7						
8		Overall	Urban	Rural	Urban general males	Urban MSMW
9	Change in number of infants circumcised	12.81481282	7.553855774	5.260957		
10	Change in number of adults circumcised	0	0	0		
11	Change in adult prevalence (percentage points)	-0.23850681	-1.1914206	-0.090115	-1.060433627	-1.674225554
12	Change in ANC prevalence (percentage points)	-0.3278804	-1.64746491	-0.122887		
13	Cumulative number of infections averted	-12303.6534	-9386.54047	-2917.113	-4115.330497	-343.4255173
14	% infections averted	-18.5584686	-24.6006421	-10.36605	-29.65038783	-18.61257235
15	Cumulative number of infections averted in infants	-1145.15672	-813.487878	-331.6688		
16	% infections averted in infants	-9.53391463	-12.6378477	-5.949768		
17	Cumulative reduction in diagnoses	-4049.65368	-3276.75201	-772.9017	-1105.877631	-96.37421203
18	% reduction in diagnoses	-11.343119	-14.264902	-6.071172	-15.28093257	-8.962989722
19	Cumulative AIDS deaths averted	-2253.20927	-1619.16613	-634.0431	-730.7189683	-63.71551295
20	% AIDS deaths averted	-7.58509531	-10.0141254	-4.683805	-12.29984482	-7.473808365
21	Cumulative reduction in number eligible for ART	-14480.4907	-11195.8981	-3284.593	-4916.57124	-420.5214203
22	% reduction in number eligible for ART	-6.1348779	-7.89359283	-3.486819	-9.60467152	-5.787767796
23	Cumulative reduction in number that used PMTCT	-414.163236	-339.525462	-74.63777		
24	% reduction in number that used PMTCT	-18.9060423	-25.1575486	-8.874433		
25	Cumulative reduction in number starting 1st line ART	-1172.06401	-881.603023	-290.461	-379.6922334	-33.65867467
26	% reduction in number starting 1st line ART	-16.484025	-23.9824323	-8.457732	-30.18050472	-16.62542799
27	Cumulative reduction in 1st line ART failures	-203.440466	-130.565782	-72.87468	-57.07366357	-4.907446016
28	% Reduction in 1st line ART failures	-11.1169614	-18.3029827	-6.526231	-23.17818576	-12.80182059
29	Cumulative reduction in number starting 2nd line ART	0	0	0	0	0
30	% reduction in number starting 2nd line ART					
31	Cumulative reduction in 2nd line ART failures	0	0	0	0	0
32	% Reduction in 2nd line ART failures					

Figure 33: Screenshot of the excel file created when clicking the 'Summary Statistics' button.

Once the summary statistics file is created a popup window will appear (Figure 34) giving the exact file path to the created file.

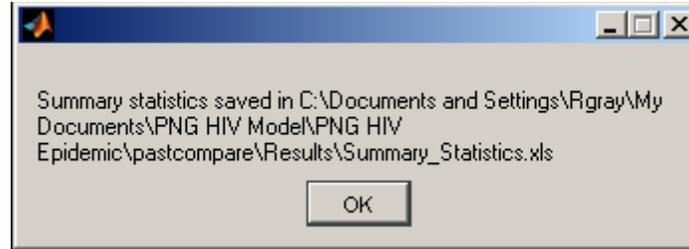


Figure 34: Window showing the file path where the summary statistics are located.

- **Comparison Table** – Produces an excel file of descriptive statistics comparing HIV indicators for selected scenarios. Following the same procedure as for the creation of the summary plot and the detailed plots select the required evaluation files from the 'PROJECT\pastcompare\' directory EXCLUDING the BaselineComparison.mat file. In this case an unlimited number files can be selected. After selecting the file a Windows Explorer window will open in the 'PROJECT\pastcompare\Results\' directory requesting a file name. The user can create or browse to another location before entering a file name and clicking save. The software will then generate an excel file of HIV indicator statistics comparing the results of the selected past evaluation files to the baseline simulation. Note that in this file a negative number or percentage shows that for the corresponding statistic the selected past evaluation resulted in an increase or a worsening of that indicator.

Interventions

Once the baseline simulation for a project has been run using the Parameters & Calibration page, the Interventions page can be accessed from the main page of the PNG HIV Model GUI. This page is used to project and evaluate the likely future impact of interventions and other changes from current conditions. This is done by comparing model projections over the next ten years to the baseline scenario where the parameter values at the end of the calibration period are assumed to remain fixed over the next 10 years. A screenshot of the interventions page is shown in Figure 35.

Intervention scenarios are created, simulated, and analysed in a very similar process to that for the advanced Past Evaluation Mode page.

Creating, Loading, and Managing Interventions



When the Interventions page is opened an intervention scenario must be created or loaded before parameter values can be altered. This is achieved by clicking on the ‘New Intervention’ or ‘Load Intervention’ buttons and is similar to the creation of a project or past evaluation described previously. In this manual we use ‘INTERVENTION’ as the name of generic example intervention scenario.

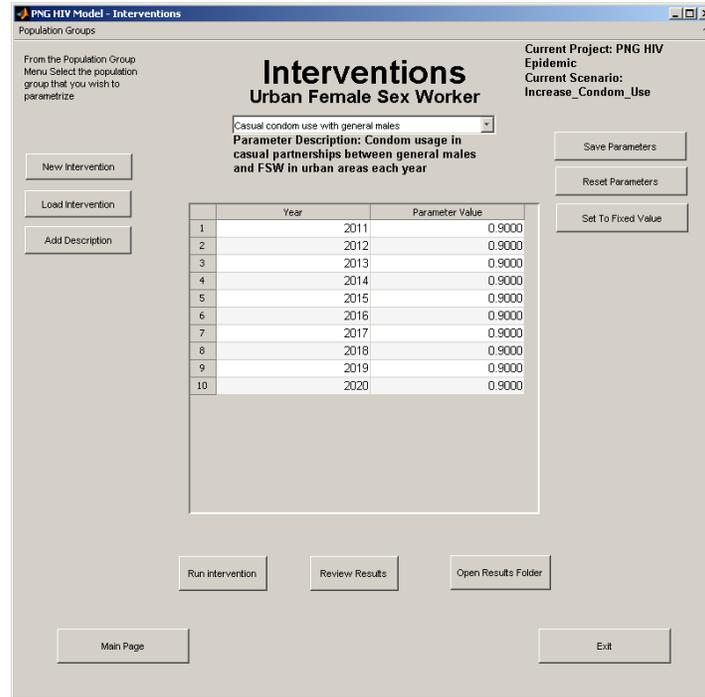


Figure 35: Screenshot of the projections and intervention page of the PNG HIV Model GUI.

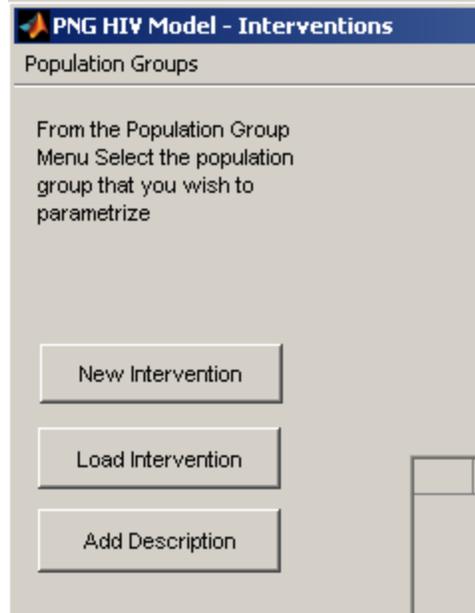


Figure 36: Screenshot of the 'New Intervention' and 'Load Intervention' buttons.

- **New Intervention** - A Windows Explorer window will open in the 'PROJECT\interventions\' directory. Enter a name for the intervention scenario and click 'Save'. The baseline intervention parameter values will be loaded and the new scenario will be displayed in the top right hand corner of the interventions page. The 'Add Description' button should now be pressed to provide a legend description for the newly created intervention.

When a new evaluation scenario is created a file 'INTERVENTION.mat' and an associated directory 'INTERVENTION\' are created in the 'PROJECT\interventions\' directory. Multiple interventions can be created for a particular project and stored in the 'PROJECT\interventions\' directory.

- **Load Intervention** - A Windows Explorer window will open in the 'PROJECT\interventions\' directory. Select the required file associated with the evaluation (DO NOT SELECT THE PROJECT'S DIRECTORY) and click open.
- **Add Description** - The 'Intervention Description' window opens requesting a simple description describing the intervention scenario being evaluated (Figure 37). Enter a simple description as shown below and click 'OK'. This description will be used in the files created when reviewing results.

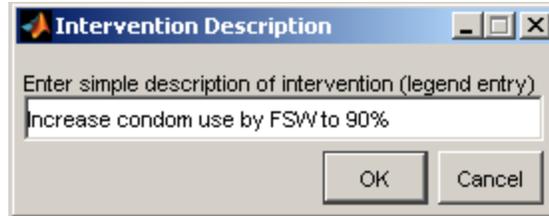


Figure 37: Screenshot of 'Intervention Description' window.

Altering Intervention Parameter values

Once an intervention has been created or loaded the parameter values for the next 10 years can be changed by selecting a population group and then a specific parameters associated with a population group from the drop down menus (in approximately the same position as in the Parameters & Calibration page) the baseline parameter values for a project are loaded into a table in the middle of the GUI. In this table the parameter values for each year can be changed and saved and reset in the same way as the Parameters & Calibration page by clicking 'Save Parameters' and 'Reset Parameters', respectively.

- **Set to Fixed Value** – This opens a 'Set Constant Parameter' Value window. Enter the required value and click 'OK' (Figure 38). The value of the parameters for each year will be set to the entered value these must be saved by clicking 'Save Parameters'. The previously saved parameters or the default parameter values can be restored by clicking 'Reset Parameters'.

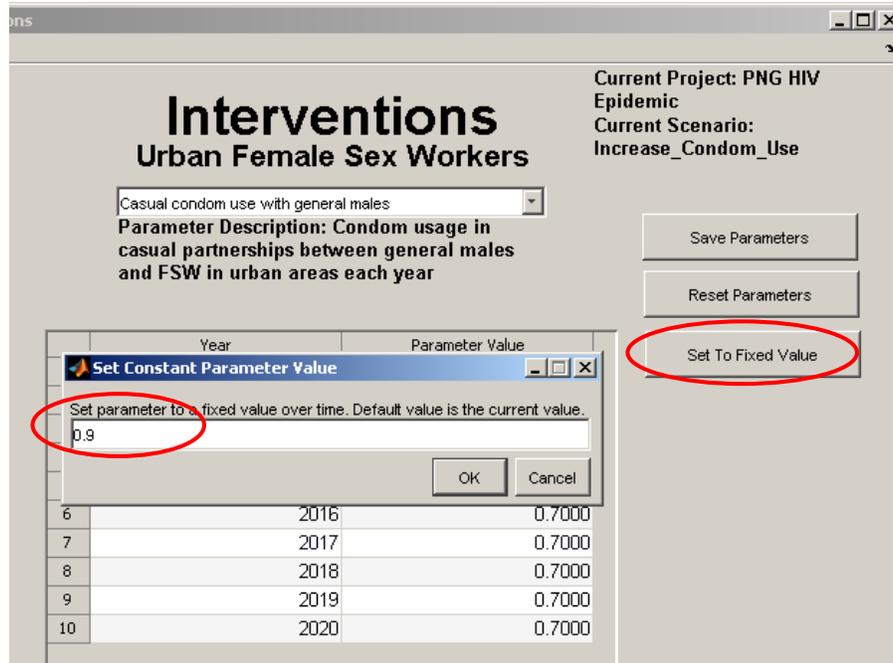


Figure 38: Process of fixing all yearly values of an intervention parameter to the same value.

Running an Intervention

Once the parameters have been entered click 'Run intervention' and a simulation of the model will be run behind the scenes. The software runs the PNG HIV Model from the end of the calibration period for 10 years using the intervention scenarios parameter values. The results for of the simulation are stored as files in corresponding subdirectories in 'PROJECT\interventions\Intervention\Results'.

Review Results

Once an intervention simulation has been run outputs generated from the results of simulation can be created by clicking the 'Review Results' button. This button opens a window (shown in Figure 39) where the type of output required for an intervention can be selected by clicking on one of the 6 buttons. The 'Summary Plot', 'Detailed Plots', 'Summary Table', and 'Comparison Table operate very similarly to the Review Results buttons for the Past Evaluations page.

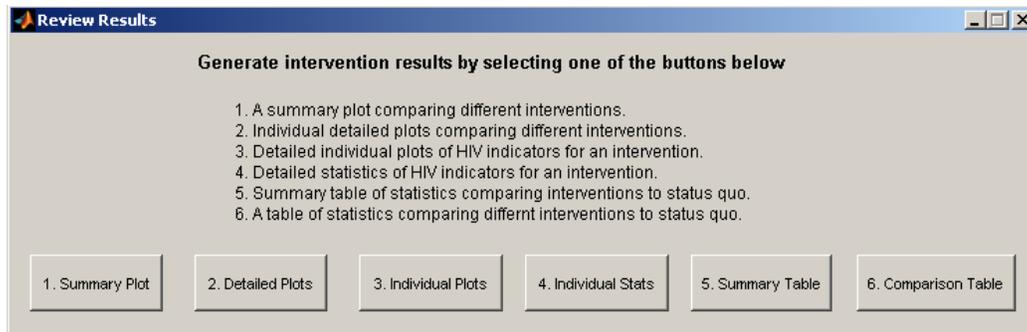


Figure 39: Screenshot of the 'Review Results' window for the interventions page.

- **Summary Plot** - Creates a summary plot comparing HIV indicators for selected intervention scenarios. Clicking the button opens a file selection Windows Explorer window in the 'PROJECT\interventions\' directory which will show all the files for the previous intervention scenarios that have been run. To compare a single intervention with the baseline intervention scenario (BaselineInt.mat) select that intervention file and click 'OK'. To compare multiple interventions select up to 5 .mat files corresponding to the required intervention scenarios EXCLUDING the BaselineInt.mat file, using the CTRL key or highlighting using the mouse and click 'OK' (Figure 40). An example of the plot produced by clicking the summary plot button is shown in Figure 41.

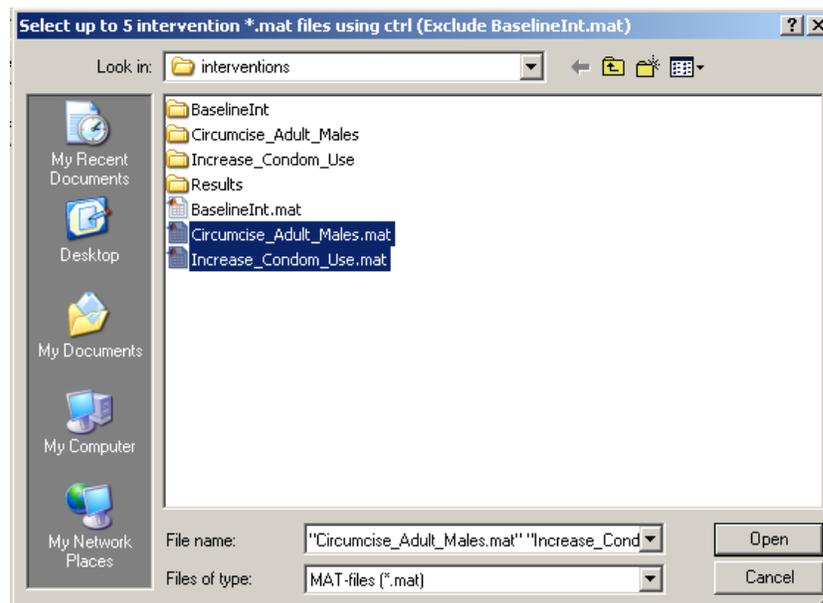


Figure 40: Screenshot of selecting intervention files used to generate results (when installed in Windows XP; similar screens appear for other versions of Windows).

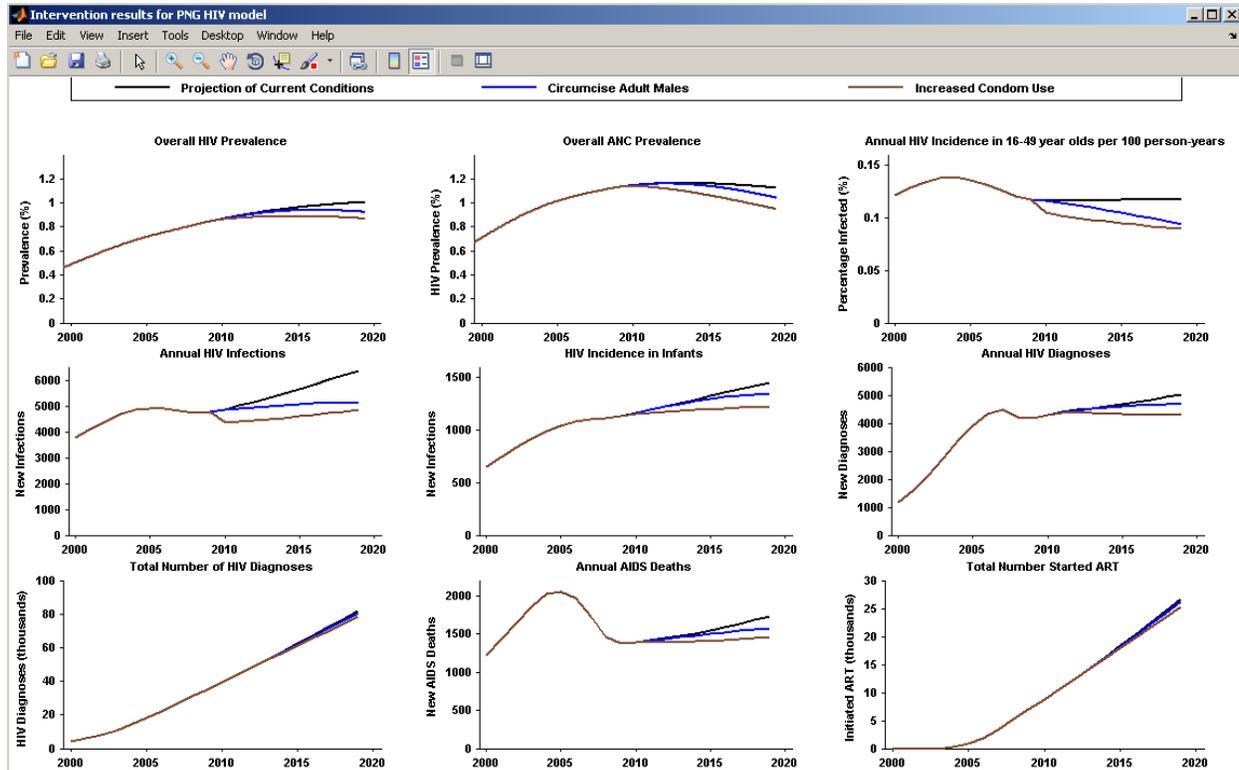


Figure 41: Screenshot of summary HIV indicator comparison plots for selected interventions.

- **Detailed Plots** – Creates a number of individual plots comparing HIV indicators for selected intervention scenarios. Following the same procedure as for the summary plot button select 5 intervention files and click 'OK'. A Windows explorer window then opens in the 'PROJECT\intervention\Results\' directory. Select or create a directory for the storage of plots and click 'Save'. To create a directory use the directory creation button, DO NOT enter new directory name in the 'File name' box. If a selected directory already contains figures a warning window will appear to confirm if figure files should be over written. Each individual plot will be saved as a figure file in the user created directory. The type of indicator plotted in each figure is described in the figures file name; e.g. a plot comparing the overall HIV prevalence in the selected scenarios is stored in a file named 'Compare_Overall_Adult_Prevalence.png'. All the individual plots have the same legend which plotted in a separate figure named 'Legend_For_Intervention_Figures.png'.
- **Individual Plots** – Creates detailed individual plots of all HIV indicators from the results of a single intervention. These plots are saved in a 'Figures\' directory which is created in a user specified directory. Within this directory are three subdirectories contain figures describing demographic/population indicators (in the 'Demographics' directory), HIV infection indicators (in the 'HIVinfection' directory), and HIV diagnoses and treatment indicators (in the



'HIVclinical' directory). The type of indicator plotted in each figure is described in the figures file name; e.g. a plot of the overall HIV prevalence is store in 'Figures\HIVinfection\Infection_Prevalence_Overall.png'. After all image files have been produce and saved a window box appears stating the directory where the images have been saved.

- **Individual Stats** – Produces a large Microsoft Excel spreadsheet containing descriptive statistics of all population and HIV epidemiology indicators for a single intervention simulation. Following a similar procedure to that described for the 'Individual Plots' button select a *single* past evaluation file and click 'Ok'. After selecting the file a Windows Explorer window will open in the 'PROJECT\interventions\Results\' directory requesting a file name. The user can create or browse to another location before entering a file name and clicking 'Save'. The software will then generate an excel file of HIV indicator statistics for the selected intervention. This file is saved in the directory selected by the user with the filename 'Intervention_Individual_Stats.xls'. Once the summary statistics file is created a popup window will appear giving the exact file path to the created file.
- **Summary Statistics** – Produces summary statistics of HIV indicators for a single intervention scenario. Following a similar procedure to that described for the 'Individual Plot' and 'Individual Stats' buttons select a *single* past evaluation file and click 'Ok'. After selecting the file a Windows Explorer window will open in the 'PROJECT\interventions\Results\' directory requesting a file name. The user can create or browse to another location before entering a file name and clicking save. The software will then generate an excel file of HIV indicator statistics comparing the results of the selected past intervention file to the baseline simulation. Note that in this file a negative number or percentage shows that for the corresponding statistic the selected past evaluation resulted in an increase or a worsening of that indicator (this is explained in the file itself). Once the summary statistics file is created a popup window will appear giving the exact file path to the created file.
- **Comparison Table** – Produces an excel file of descriptive statistics comparing HIV indicators for *selected* intervention scenarios. Following the same procedure as for the creation of the summary plot and the detailed plots select the required .mat evaluation files from the 'PROJECT\interventions\' directory EXCLUDING the BaselineInt.mat file. An unlimited number files can be selected. After selecting the file a Windows Explorer window will open in the 'PROJECT\interventions\Results\' directory requesting a file name. The user can create or browse to another location before entering a file name and clicking 'Save'. The



software will then generate an excel file of HIV indicator statistics comparing the results of the selected intervention files to the baseline simulation. Note that in this file a negative number or percentage shows that for the corresponding statistic the selected intervention resulted in an increase or a worsening of that indicator.

If things don't work

Occasionally the PNG Model Software may freeze due to parameter values being incorrectly entered or inappropriate for the context simulated (for example condom usage rates greater than 100%). If this occurs the software should be closed. The software can then be relaunched and the project being worked on can be reloaded. The parameter values can then be edited to ensure simulations run correctly. To close the program click on the 'Exit' button or (if that doesn't seem to work) click on the close window X in the top right hand corner of each page of the PNG HIV Model GUI.