



United States
Environmental Protection Agency
Washington, DC 20460

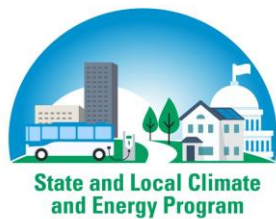
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Multi-Year Scenario Tool Instructions

Co-Benefits Risk Assessment Health Impacts
Screening and Mapping Tool (COBRA)
version 5.0



Developed for
State and Local Climate and Energy Program





About COBRA's Multi-Year Tool

This tutorial provides a step-by-step process for using COBRA's Multi-Year Scenario Tool to assess and evaluate the health and economic impacts of changes in ambient fine particulate matter (PM_{2.5}) and ozone (O₃) air pollution concentrations over multiple, future years (2030-2050).

The Multi-Year Scenario Tool is intended to supplement the analysis of results generated by COBRA 5.0.

Analyzing multiple years with the Multi-Year Scenario Tool requires running two or more scenarios in COBRA, exporting the results to CSV format, and importing them into the spreadsheet tool. The following sections explain each step in detail.

Running Future Year Scenarios with the COBRA Desktop Application

Step 1. Gather baseline emissions, population, incidence, and valuation input datasets and save them on your local drive. Currently, the COBRA model contains detailed 2016, 2023, and 2028 baseline emissions data for every county in the United States by state, county, tier category, and pollutant type. To run analyses for years beyond 2028, users have two options:

- (1) **Download [future year population, incidence, and valuation input files prepared by EPA](#)** for 2030 to 2050. These input files have been formatted for import to COBRA.
- (2) **Prepare your own input files.** COBRA requires that input files be in a specific format. Follow the instructions for formatting input files Chapter 3 of the [User's Manual](#).

Step 2. Import input files gathered from step 1. Once you have downloaded and opened the COBRA desktop tool, select the **1. Select Analysis Year** tab, and click on the **Advanced Options** tab.

- (1) In the Emissions Baseline box, select **Import a custom emissions baseline** and click the **Load a Baseline Emissions CSV**. In the pop-up window, navigate to the location of your baseline emissions CSV file, click the file, and then click **Open**. If you try to import a baseline emissions file that is incorrectly formatted, COBRA will display an error message that an "unhandled exception has occurred in your application."
- (2) In the **Population, Incidence, and Valuation Datasets** box, click on **Use custom**, navigate to the location of your population, incidence, or valuation datasets, and then click **Open**. Typically, the year for the population, incidence, and valuation input file should match with that of the baseline emissions file. For example, if you uploaded a 2030 emissions baseline, you would import the 2030 population, incidence, and valuation datasets.



Step 3. Create the emissions scenario. To define your scenario, click the **2. Create Emissions Scenario** tab and then the **Emissions Scenario** tab.

- (1) In the top left panel, you can select the geographic area(s) to which you want to apply emissions changes.
- (2) The center panel contains a directory tree with all the tier 1, 2, and 3 source categories. You can define emissions changes at any level, but each level always includes all the levels indented underneath it. Click the tier at which you would like to apply your emissions changes. A change entered for a tier category applies to all of the branches under it, but you must enter changes individually for tier categories on separate branches.
- (3) After you have selected your tier and geographic area, you can create a new emissions scenario by defining changes to the baseline emissions scenario. This can either be done manually or by uploading an emissions change data file from EPA's AVOIDED Emissions and geneRation Tool ([AVERT](#)).
- (4) To manually enter the changes to the baseline emissions, use the boxes in the right panel for each of the five pollutants potentially emitted by sources in that category. You can enter emissions increases or decreases by percent or by tons. To the right of the boxes, you will see the total emissions for your selected tier and geographic area for the baseline and control scenarios. Click **Apply Changes** to save your changes.
- (5) To import emissions changes from AVERT, see Chapter 4 of the [User's Manual](#).

Step 4. Run the Scenario. When you have made all of your desired changes, navigate to the **3. Execute Run** tab. This tab asks you to choose a discount rate for the COBRA session. The discount rate you select is used to express future economic values in present terms. Not all health effects and associated economic values occur in the year of analysis. Therefore, COBRA accounts for the 'time value of money' preference (i.e., a general preference for receiving economic benefits now rather than later) by discounting benefits received later. Based on OMB Circular A-4, it is recommended that COBRA users calculate monetized health benefits using a 2% discount rate. However, users have the option of entering a custom discount rate.

After selecting a discount rate, click **Run using above options**.

The time to generate your results will vary, depending on the speed of your computer. COBRA may stop responding while it runs, and it may take 5 to 15 minutes to generate results. Once the results are generated, COBRA will navigate to the **4. View Health Effects and Valuation Results** tab, where you can view the results of your run (see Chapter 5).

Step 4. Download the results to CSV. Note that COBRA gives the option to export to either Excel or CSV formats. For use with the Multi-Year Scenario Tool, export results to the CSV format.



Step 5. Repeat steps 1 through 4 until you have completed runs for all your desired future years.

Using the Multi-Year Scenario Tool

When you have completed all of your runs for future years, you can use the [Multi-Year Scenario Tool](#) to analyze the total benefits across multiple years. This tool will import results from multiple years of COBRA runs and interpolate between years to show the total benefits throughout the analysis period.

For example, if you have done COBRA runs for 2030, 2035, and 2040, the Multi-Year Scenario Tool will estimate the total benefits for the period of 2030 – 2040 by linearly interpolating between years to estimate annual values for each year.

To use the tool, complete the following steps, in the Instructions tab of the tool:

Step 6. Enter a discount rate. This will be used to discount future streams of benefits to the future year.¹ The Multi-Year Scenario Analysis Tool presents both discounted and undiscounted annual benefits.

Step 7. Save output files from COBRA in the same folder as the spreadsheet tool. Output files from Step 4, above, should be exported from COBRA in CSV format and saved in the same folder as the spreadsheet tool.

Step 8. Specify the number of years in the analysis. For example, if you have COBRA outputs for 2030, 2035, and 2040, input 3.

Step 9. Enter data file names and corresponding year of data. In the yellow box at the bottom of the Instruction tab, enter in the filename of each COBRA output file you wish to analyze, and the year of the data corresponding to each output file. EPA has developed inputs to allow users to analyze 2030, 2035, 2040, 2045, and 2050. However, this Multi-Year Scenario Tool can be used to analyze any year. That is, if you develop inputs and run COBRA for other years, you can analyze those years with this tool as well.

Step 10. Click “Load Data.” This will import the files you have listed on the Instructions tab. The results will be saved in separate tabs in the workbook.

Step 11. View Summarized COBRA Results. On the Summary Results – COBRA tab, it will show the estimated annual benefits for each year of your analysis. You can filter

¹ The discount rate is used in the Multi-Year Scenario Tool to discount future-year COBRA benefits results back to the first analysis year. This is different from the discount rate that is used in COBRA. That discount rate discounts the benefits of avoided mortality, which are estimated over a 20-year period in COBRA, back to analysis year from the COBRA scenario. For example, if you run COBRA to analyze benefits between 2025 and 2040, the results for a COBRA run for 2040 will include avoided mortality benefits for the period of 2040-2060, which have been discounted back to 2040, using the discount rate entered into COBRA. Those results will then be discounted back to 2025 in the Multi-Year Scenario Tool, using the discount rate entered in that tool.



the results to show specific results for different health impacts, or for individual states or counties.

Optional – Analyze Benefits of Greenhouse Gas Emission Reductions

Although COBRA does not directly analyze the benefits of greenhouse gas (GHG) emission reductions, many emissions scenarios analyzed in COBRA will also result in GHG emission reductions in addition to other air pollution emission reductions. EPA has developed estimates of the [Social Cost of GHGs](#) that can be used to estimate the benefits of reducing or avoiding GHG emissions.

You can input GHG emissions reductions (in metric tons) by year in the Summary Results – SC-GHG tab, including for carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). EPA developed the Social Cost of GHG estimates for three different discount rates 1.5%, 2%, and 2.5%. Select the discount rate you wish to use at the top of the Summary Results – SC-GHG tab. Note that this discount rate does not necessarily need to match the discount rate entered on the Instructions tab.

The benefits (in millions of dollars) are shown on the Summary Results – SC-GHG tab. They are also shown combined with the benefits from the COBRA results in the Summary Results – Total tab.