

MaxVax User Manual

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Getting Started

What is MaxVax?

MaxVax is an offline decision support tool to maximize vaccination coverage while minimizing vaccine waste from multi-dose vials. The tool takes in information about the clinic, such as how many vials are on hand and when the next shipment of vials is expected, and uses this information to calculate an optimal vaccine distribution policy. This is done through the use of a mathematical model called a Markov Decision Process.

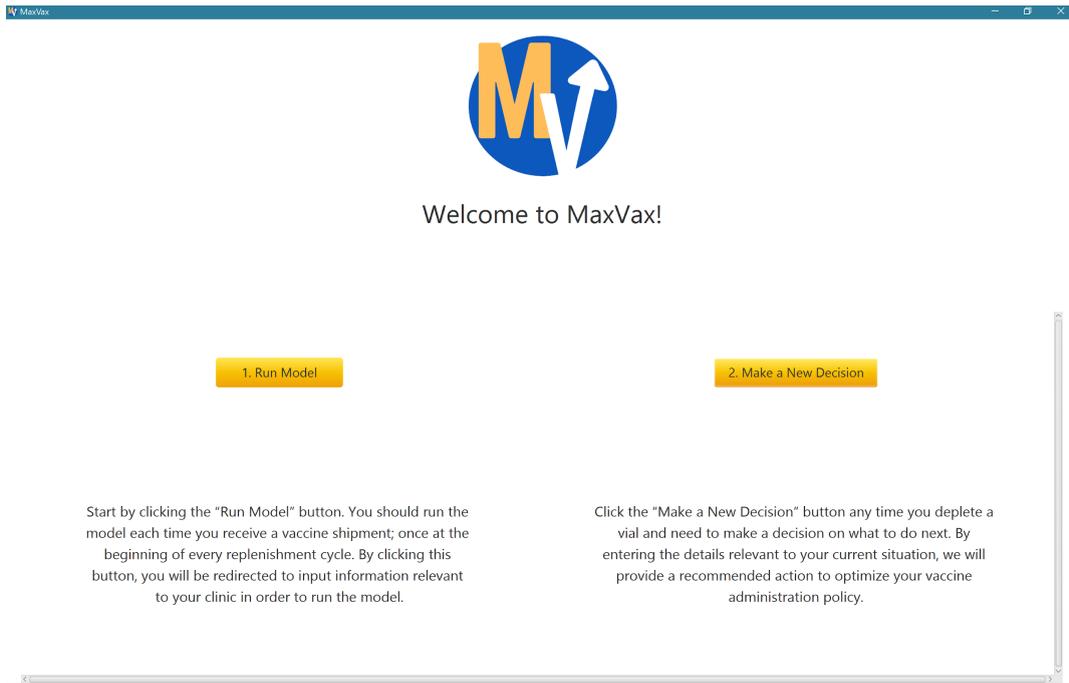
How to Launch MaxVax

After downloading and unzipping the .zip file from www.maxvax.ca, simply double click on the file "MaxVax.exe". The application should launch shortly. Should any launching errors occur, please re-download and unzip the contents of the download file into the directory of your choosing. Do not delete any files or folders in the zip folder as they are necessary for the application to run.

Using MaxVax

1. Getting Started

On the homepage of MaxVax, there are two options: "Run Model" and "See Results". The first time MaxVax is used you will need to run the model, so continue to the Run Model section by clicking the Run Model button. If you have already run the model for your current replenishment cycle, click on the See Results button. The model needs to be run at the beginning of each replenishment cycle (when you get new stock of vaccines).



2. Run Model

Note: Place your cursor over the  icon for more information about the field!

2.1 Vaccine Selection

The input for this field should be the vaccine type that you currently have on hand that you would like this application to minimize the waste for. This application currently only works for the Diphtheria-tetanus-pertussis (DTP3) vaccine.

Which vaccine would you like to minimize wastage for? 

Select one ▼

1. Click on the dropdown menu.
2. Select the vaccine from the available list of vaccines.
 - a. Note: Currently only DTP3 is available, in future iterations infrastructure to parse more vaccines will be implemented.

2.2 Vial Type

The inputs for this field should reflect your current inventory of the vaccine type selected above. The vial size refers to how many doses are in each vial. The number of vials refers to how many vials you have on hand of that specific vial size. We currently only offer you the ability to select two different vial sizes.

For the selected vaccine, how many of each vial do you have on hand? ?

Vial size 1 Number of vials

Vial size 2 Number of vials

1. Click on the vial size 1 dropdown menu.
2. Select from the dropdown one vial size (e.g. 1-dose, 2-dose) you have on hand.

For the selected vaccine, how many of each vial do you have on hand? ?

Vial size 1 Number of vials

Vial size 2 Number of vials

What time does your clinic open and close? ?

Opening time Closing time

3. Click on the text field to the right of the dropdown menu.
4. Type into the text field the number of vials you have on hand of the specified vial size.
 - a. **Example:** I have 15 vials that contain 2-doses on hand. My input is the following.

Vial size 1 Number of vials

5. Repeat steps 1 through 4 for the second vial type.

2.3 Operating Hours

This input should reflect what time your clinic opens and closes for the day. Ensure you input in 24hr time, i.e., if your clinic closes at 5:00pm you would input 17:00.

What time does your clinic open and close? ?

Opening time Closing time

2.4 Terminating Service

Terminating service is the willingness to deny vaccination service after a certain time in order to reduce the possibility of opening a large vial and wasting doses.

1. If you are willing to terminate service, select the “Yes” radio button.
2. If you are not willing to terminate service, leave the selection as “No”
 - a. **Example:** I am not willing to terminate service, so my input is the following:

Are you willing to terminate vaccination service before your typical closing time?

Yes No

2.5 Days in Replenishment Cycle

This value indicates the number of days you typically go between vaccine shipments.

1. Select the text field.
2. Type the number of days remaining until you receive your next vaccine replenishment.
 - a. **Example:** I get a vaccine shipment every 2 weeks which would map to 14 days if my clinic is open 7 days a week or 10 days if my clinic is only open on weekdays.

How many days are there in the replenishment cycle for this vaccine?

14

2.6 Patient Arrival

This value indicates how many patients arrive on an average day for the vaccine you selected. This could otherwise be known as your demand for the vaccine. For example, if I usually have 5 people arrive each day I would put 5.

How many patients arrive on average each day for this vaccine?

10

2.6 Run Model

1. Confirm that all inputs are filled correctly.
2. If so, click the "Run Model" button at the bottom of the screen.
 - a. **Note:** It may take some time for you to be brought to your results. Do not be concerned if your computer says "MaxVax is not responding", this is an indication that the model is running.
3. If the model has been run correctly you will be taken to the 'See Results' page - for questions about this page refer to the 'See Results' section
4. If clicking the "Run Model" button caused an error to appear, please see the ["Addressing Errors"](#) section.

REQUIRED INPUTS

Start by entering these values. Hover over the orange question mark for more details on what each field means.

Which vaccine would you like to minimize wastage for? ?

Diphtheria-tetanus-pertussis (DTP3) ▾

For the selected vaccine, how many of each vial do you have on hand? ?

Vial size 1

5-dose ▾

Number of vials

20

Vial size 2

10-dose ▾

Number of vials

20

What time does your clinic open and close? ?

Opening time

8:00

Closing time

16:00

Are you willing to terminate vaccination service before your typical closing time? ?

Yes

No

How many days are there in the replenishment cycle for this vaccine? ?

15

How many patients arrive on average each day for this vaccine? ?

6

Run Model

3. See Results

3.1 Updating Inputs

In order to retrieve results from the model more inputs are required. It is expected you put in this input after you have depleted a vial and need to decide which size to open next, or if you should terminate service.

Vial size and number of vials has been addressed above in [Section 2.2](#).

Time of day refers to the current time you are inputting this data. Ensure this is inputted in 24hr time (i.e., 13:25 not 1:25pm)

Current day in the replenishment cycle refers to what day you are currently in in your stock cycle. Example: If you got new vaccine stock on Monday morning, you would rerun the model on Monday. Now it's Thursday and you want to retrieve results, you would input 4 for the current day in the replenishment cycle.

MAKE A NEW DECISION

Enter updated values for the following fields.

Vial size 1	<input type="text" value="5-dose"/>	Number of vials	<input type="text" value="15"/>
Vial size 2	<input type="text" value="10-dose"/>	Number of vials	<input type="text" value="5"/>
Time of day (in 24hr time)	<input type="text" value="13:00"/>		
Current day in the replenishment cycle	<input type="text" value="1"/>		

Get an Updated Action

3.2 Interpreting Results

To retrieve results, after inputting the required information you hit 'Get an Updated Action'. Text will appear below telling you the current optimal action, and the upcoming optimal action.

OPTIMAL DECISION

Current Decision

Recommended decision is to open a 5-dose vial.

Next Decision(s)

The optimal decision changes at 15:46. At this time, the optimal decision changes to advise closing the clinic for the remainder of the day.

In this example, the recommended vial administration policy based on your current situation is to open a 5-dose vial. Assuming you do open a 5-dose vial now, at 3:46pm you should close the clinic.

OPTIMAL DECISION

Current Decision

Recommended decision is to open a 10-dose vial.

Next Decision(s)

The optimal decision changes at 08:34. At this time, the optimal decision is to open 5-dose vials.

In this example, the recommended vial administration policy based on your current situation is to open a 10-dose vial. Assuming you do open a 10-dose vial now, at 8:34 you should start administering 5-dose vials.

4. Addressing Errors

An error can occur while entering the required inputs if an input is empty or invalid. If an error message appears, you can click “OK” on the error message popup to close it. You will then be brought back to the initial page, and any incorrect inputs will be highlighted in red. We will outline the possible input errors and how to resolve them.



4.1 Empty Input

All inputs must be filled in order for the model to run and calculate results. Below outlines what empty inputs look like. Please see the [“Entering Required Inputs”](#) section for more details on entering inputs.

REQUIRED INPUTS

Start by entering these values. Hover over the orange question mark for more details on what each field means.

Which vaccine would you like to minimize wastage for? ?

Select one ▾

For the selected vaccine, how many of each vial do you have on hand? ?

Vial size 1 Select the size of your smallest vial ▾

Number of vials 100

Vial size 2 Select the size of your largest vial ▾

Number of vials 100

What time does your clinic open and close? ?

Opening time 8:00

Closing time 16:00

Are you willing to terminate vaccination service before your typical closing time? ?

Yes No

How many days are there in the replenishment cycle for this vaccine? ?

15

How many patients arrive on average each day for this vaccine? ?

10

Run Model

4.2 Invalid Input

If all inputs are filled but an error message is appearing, it is possible that an input is invalid. This can occur for any text field input (see below in red) that contains anything other than a number.

Vial size 1	5-dose ▾	Number of vials	six
Vial size 2	10-dose ▾	Number of vials	ten

Please ensure the following:

- There are no letters in the field (i.e. A,a,b,c,...,z)
- There are no characters in the field (i.e. !, %, +, etc.)
- There are no spaces before, after, or within the field.

4.3 Invalid Vial Types

If there is an error with the vial type inputs, it is possible the vial type selection is invalid. This occurs when the same vial size is selected in both dropdown menus (see below). To resolve this error, make sure that the dropdowns select two different vial sizes.

Vial size 1	5-dose	Number of vials	15
Vial size 2	5-dose	Number of vials	30

4.3 Results Page Errors

In addition to ensuring correct input types, on the results page you will get errors if your input does not match the previous vial sizes that were input when you ran the model initially

YOUR RESULTS

Enter updated values for the following fields since you last ran the model.

Vial size 1	5-dose	Number of vials	10
Vial size 2	20-dose	Number of vials	10
Time of day (in 24hr time)	15:00		
Current day in the replenishment cycle	6		

Get an Updated Action

Error

Input Invalid

ERROR(S): Unexpected vial size. When you ran the model, you had vial of size-2. You entered you have a 5-dose vial.
Unexpected vial size. When you ran the model, you had a vial of size-10. You entered you have a 20-dose vial.

OK

Additionally, the number of vials cannot exceed the number of vials you had when you first ran the model. If you have more vials than before, or different vial sizes, you will need to re-run the model.

Enter updated values for the following fields since you last ran the model.

Vial size 1	2-dose	Number of vials	35
Vial size 2	10-dose	Number of vials	10
Time of day (in 24hr time)	15:00		
Current day in the replenishment cycle	6		

Get an Updated Action

Error

Input Invalid

ERROR(S): You have more small vials now than when the model last ran. Did you get a shipment? If so, please re-run the model. A value less than or equal to 20 was expected.

OK