

VACCINE ALLOCATION MODEL

USER'S GUIDE

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Introduction

The Vaccine Allocation Model is intended to help public health officials determine how many persons in different target groups can receive treatment given a limited number of doses. This model was developed for vaccinations but can also be used for any other type of medication.

The Vaccine Allocation Model can be used either in the advance planning stages of a vaccination campaign or for support during a vaccination campaign. It is based on recommendations for use of vaccine against novel influenza A (H1N1). These recommendations were made by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (ACIP) on July 29, 2009 (<http://www.cdc.gov/media/pressrel/2009/r090729b.htm>).

The Vaccine Allocation Model allows public health officials to enter information about the population in their jurisdiction and the number of doses of a vaccine (or other medication) that will be available in their jurisdiction. The model immediately determines how many persons in different target groups can receive treatment. A user can adjust the population of the target groups, add more target groups, modify the expected demand for each target group, and reprioritize target groups.

Because the Vaccine Allocation Model operates entirely in the Microsoft Excel environment, some familiarity with this package is helpful. In order to run the model, only one file is needed: "VAM 3.0.xls."

This user guide includes details on using the Vaccine Allocation Model. At each step, an example, with snapshots from the model, will be provided.

In 2004, Public Health Services of the Montgomery County, Maryland Department of Health and Human Services became one of the first eleven public health agencies in the nation to be recognized as Public Health Ready by the National Association of County and City Health Officials (NACCHO) and the Centers for Disease Control and Prevention (CDC) of the U.S. Department of Health and Human Services. The county is home to an Advanced Practice Center (APCs) for Public Health Preparedness funded by NACCHO through the CDC. This APC and the University of Maryland have been collaborating since 2004 on providing models to public health officials to improve decision-making and emergency preparedness planning.

Important Terms

1. **Vaccination:** a single dose of a vaccine, a single shot. Also known as a “bolus.” The user can set the number of doses per person in each target group separately.
2. **Population:** the total number of people in a target group in a jurisdiction. Not everyone in a population will necessarily want to receive treatment.
3. **Demand:** the percentage of persons in a target group who will seek treatment. This is also known as uptake.
4. **Target Group:** People targeted for treatment defined by a common occupation, type of service, age group, or risk level. A target group is a group of persons with the same occupation or age and health status. Every person in the United States is included in one or more target groups. Target groups are treated in tiers, with all groups in a tier treated simultaneously.
5. **Tier:** A set of target groups in different categories. Medication will be allocated and administered according to tiers where all groups designated for treatment within a tier have equal priority.

Using the Vaccine Allocation Model

Orientation

Open the “Vaccine Allocation Model.xls” workbook using Microsoft Excel.

The workbook consists of four worksheets:

- Main
- Target Groups
- Allocation
- Calculations

The workbook also contains one chart:

- Tier Allocation Chart

Go to a worksheet (or chart) by clicking on the tab with the corresponding name at the bottom of the worksheet.

The following pages describe each step of creating a Vaccine Allocation Model.

Step 1: Main

Go to the Main worksheet.

In the box to the right of the instructions “1. Enter the total number of doses available,” enter the total number of doses available. This is the number of doses, not the number of persons.

After a total number of doses available is entered, the total number of person who can be treated will appear to the right of the label “Total number of persons who can be treated:”

Vaccine Allocation Model - Version 3.0

This model can be used to estimate how many doses can be allocated to which tiers of target groups.

Instructions:

1. Enter total number of doses available

Step 2: Target Groups

Go to the Target Groups worksheet. Initially, this worksheet contains the list of target groups from the ACIP recommendations. Enter the total population for each target group in the corresponding box in Column D of this worksheet.

Any cells left blank will be treated as 0.

If desired, update the number of doses per person for each target group. By default, the number of doses per person for children 9 and under is two (2), and the number of doses per person for the other target groups is one (1).

If desired, update the demand percentages by entering a new percentage in Column H. (This is also known as uptake.) 100% means that everyone in this target group will seek treatment. Any value between 0 and 100% can be entered.

If desired, update the tiers by entering a new value in Column J. High-priority target groups should be in Tier 1. Lower-priority target groups should be in other tiers (2 and 3, for example). Medication will be allocated and administered according to tiers where all groups designated for treatment within a tier have equal priority.

The group names in Column C can be changed. To do so, just type over the current target group name.

Other groups can be added to this list. Enter the group name in Column C between Row 9 and Row 70. Enter the population in Column D and the other data in Columns F, H, and J of the same row as the group name.

Changes to the list of target groups on this worksheet will appear on the Allocation worksheet.
Note: do not change the list on the Allocation worksheet.

Target Groups worksheet

Enter the total population for each target group.
If desired, update the number of doses per person, the demand percentages, and the tiers.

Target Group	Total population in target group	Number of doses per person in target group	Demand for treatment in target group (percentage)	Tier for target group
Healthcare and emergency medical services (EMS) workers	100	1	100%	1
Pregnant women	2,000	1	100%	1
Household contacts of infants under 6 months old	30,000	1	100%	1
Children and young people aged 6 months through 9 years	40,000	2	100%	1
Children and young people aged 10 years through 24 years	50,000	1	100%	1
People between 25 and 64 with chronic medical conditions	6,000	1	50%	1
Healthy adults, 25 – 64 years old	70,000	1	100%	2
People aged 65 and older	8,000	1	100%	3

Step 3: Main

Go to the Main worksheet. This worksheet now shows the allocation of doses to each tier. These numbers were calculated based on the inputs entered in Steps 1 and 2.

For each tier, the worksheet shows the number of doses needed (based on the corresponding target groups and the demand in each target group) and the number of doses allocated to that tier. The worksheet shows number of persons in that tier who seek treatment (based on the corresponding target groups and the demand in each target group) and the number of persons who can be treated. The worksheet shows the percentage of demand that can be satisfied.

Finally, the worksheet shows totals across all of the tiers.

3. View allocation by tier below:

	Tier					Total
	1	2	3	4	5	
Doses needed for tier:	165,100	70,000	8,000	0	0	243,100
Doses allocated:	165,100	34,900	0	0	0	200,000
Number of persons seeking treatment:	125,100	70,000	8,000	0	0	203,100
Number who can be treated:	125,100	34,900	0	0	0	160,000
Percentage of persons seeking treatment who can be treated:	100%	50%	0%			79%

Step 4: Tier Allocation Chart

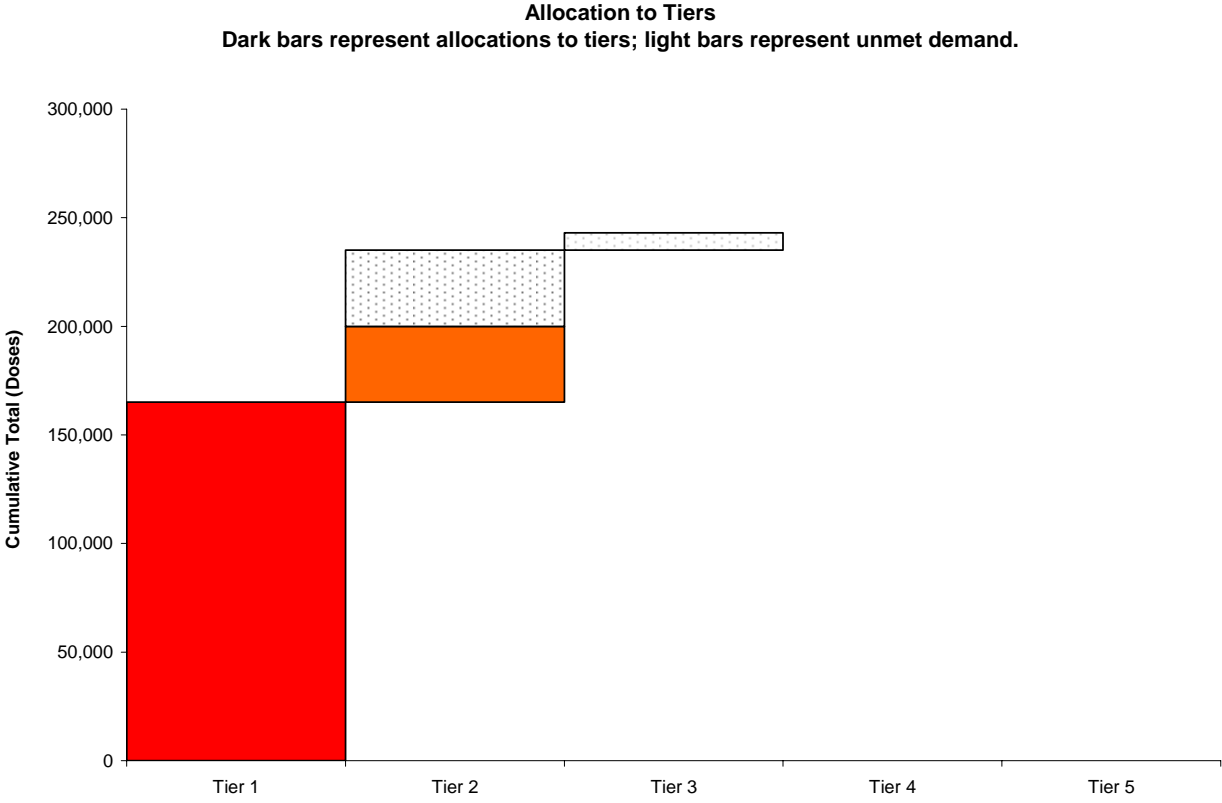
Go to the Tier Allocation Chart. This chart now shows the allocation of doses to each tier (like the table on the Main worksheet). These numbers were calculated based on the inputs entered in Steps 1 and 2.

For each tier, the chart shows the number of doses allocated as a dark (or solid) bar and the unmet demand (in doses) as a light (dotted) bar. The bars are offset vertically to indicate the total number of doses available.

The tiers are color-coded:

- Tier 1: red
- Tier 2: orange
- Tier 3: yellow
- Tier 4: green
- Tier 5: blue

Typically, the high-priority tiers will be completely solid because their allocations are enough to meet their demand. Then there will be a tier in which some of the demand is met and some is unmet. The remaining low-priority tiers receive no allocation, so all of their demand is unmet.



Step 5: Allocation

Go to the Allocation worksheet. This worksheet now shows the allocation of doses to each target group. These numbers were calculated based on the inputs entered in Steps 1 and 2.

For each target group, the worksheet shows the number of doses needed in that target group (based on the population and the demand) and the number of doses allocated to that target group. The worksheet shows number of persons in that target group who seek treatment (based on the population and the demand) and the number of persons who can be treated. The worksheet shows the percentage of demand that can be satisfied.

Allocation worksheet

Target Group	Expected number of persons who will seek treatment in target group	Number of persons who can be treated in target group	Number of doses needed for target group	Number of doses allocated to target group	Percentage
Healthcare and emergency medical services (EMS) workers	100	100	100	100	100%
Pregnant women	2,000	2,000	2,000	2,000	100%
Household contacts of infants under 6 months old	30,000	30,000	30,000	30,000	100%
Children and young people aged 6 months through 9 years	40,000	40,000	80,000	80,000	100%
Children and young people aged 10 years through 24 years	50,000	50,000	50,000	50,000	100%
People between 25 and 64 with chronic medical conditions	3,000	3,000	3,000	3,000	100%
Healthy adults, 25 – 64 years old	70,000	34,900	70,000	34,900	50%
People aged 65 and older	8,000	0	8,000	0	0%

Changing a Model

At any point, one can go back to the Main worksheet or Target Groups worksheet to modify the inputs already entered. The results in the Main worksheet and the Allocation worksheet will change immediately as well.

To change or add target groups, go to the Target Groups worksheet. The group names in Column C can be changed. To do so, just type over the current target group name. To add a target group, enter the group name in Column C between Row 9 and Row 70. Enter the population in Column D and the other data in Columns F, H, and J of the same row as the group name. Changes to the list of target groups on this worksheet will appear on the Allocation worksheet. *Note: do not change the list on the Allocation worksheet.*

Dose Allocation Rules

This section describes the algorithm used to allocate doses to target groups.

1. Each target group's demand equals the target group population multiplied by the demand percentage multiplied by the doses per person.
2. Each tier's demand equals the sum of the demand of the target groups in that tier.
5. The Tier 1 allocation = the minimum of the Tier 1 demand and the total number of doses available. The Tier 1 remainder = the total number of doses available - the Tier 1 allocation.
6. The Tier 2 allocation = the minimum of the Tier 2 demand and the Tier 1 remainder. The Tier 2 remainder = the Tier 1 remainder - the Tier 2 allocation.
7. The Tier 3 allocation = the minimum of the Tier 3 demand and the Tier 2 remainder. The Tier 3 remainder = the Tier 2 remainder - the Tier 3 allocation.
8. The Tier 4 allocation = the minimum of the Tier 4 demand and the Tier 3 remainder. The Tier 4 remainder = the Tier 3 remainder - the Tier 4 allocation.
9. The Tier 5 allocation = the minimum of the Tier 5 demand and the Tier 4 remainder. The Tier 5 remainder = the Tier 4 remainder - the Tier 5 allocation.
10. Each tier's allocation percentage = that tier's allocation / that tier's demand.
11. The allocation to each target group = that target group's demand times the allocation percentage for the tier to which the target group is assigned. Note that this is number of doses allocated to that target group.
12. The number of persons who can be treated in a target group = the allocation to the target group divided by the number of doses per person for that target group.

Example

This example is extremely simplified to illustrate the calculations. It does not represent a realistic scenario. The values are classified as INPUT (those supplied by the user) or CALCULATED (those determined by the Vaccine Allocation Model).

INPUT: The total number of doses available = 200,000.

There are eight target groups. Six target groups (A, B, C, D, E, F) are assigned to Tier 1. One target group (G) is assigned to Tier 2. One target group (H) is assigned to Tier 3.

INPUT: The total population for the six target groups:

A: 100

B: 2,000

C: 30,000

D: 40,000

E: 50,000

F: 6,000

G: 70,000

H: 8,000

INPUT: The number of doses per person for the target groups:

A: 1

B: 1

C: 1

D: 2

E: 1

F: 1

G: 1

H: 1

INPUT: The demand percentages for the target groups:

A: 100%

B: 100%

C: 100%

D: 100%

E: 100%

F: 50%

G: 100%

H: 100%

CALCULATED: The demand for the six target groups:

A: $100\%(100)(1) = 100$

B: $100\%(2,000)(1) = 2,000$

C: $100\%(30,000)(1) = 30,000$

D: $100\%(40,000)(2) = 80,000$

E: $100\%(50,000)(1) = 50,000$

F: $50\%(6,000)(1) = 3,000$

G: $100\%(70,000)(1) = 70,000$

H: $100\%(8,000)(1) = 8,000$

CALCULATED: The demand for the tiers:

Tier 1: 165,100

Tier 2: 70,000

Tier 3: 8,000

CALCULATED: The allocation to the tiers:

Tier 1: 165,100 (with a remainder of $200,000 - 165,100 = 34,900$)

Tier 2: 34,900 (with no remainder)

Tier 3: 0

CALCULATED: Each tier's allocation percentage:

Tier 1: $165,100 / 165,100 = 100\%$

Tier 2: $34,900 / 70,000 = 50\%$ (approximately)

Tier 3: $0 / 8,000 = 0\%$

CALCULATED: Each target group's allocation (number of doses):

A: $100\%(100) = 100$

B: $100\%(2,000) = 2,000$

C: $100\%(30,000) = 30,000$

D: $100\%(80,000) = 80,000$

E: $100\%(50,000) = 50,000$

F: $100\%(3,000) = 3,000$

G: $50\%(70,000) = 34,900$

H: $0\%(8,000) = 0$

CALCULATED: Number of persons in each target group who can be treated:

A: $100/1 = 100$

B: $2,000/1 = 2,000$

C: $30,000/1 = 30,000$

D: $80,000/2 = 40,000$

E: $50,000/1 = 50,000$

F: $3,000/1 = 3,000$

G: $34,900/1 = 34,900$

H: $0/1 = 0$

Additional Information

See the project web site at <http://www.isr.umd.edu/Labs/CIM/projects/clinic/>

If you have questions or suggestions, please contact Jeffrey Herrmann at the following address:

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