

# 15.871 System Dynamics Recitation#2

## Understanding Epidemics Using **VensimPLE**

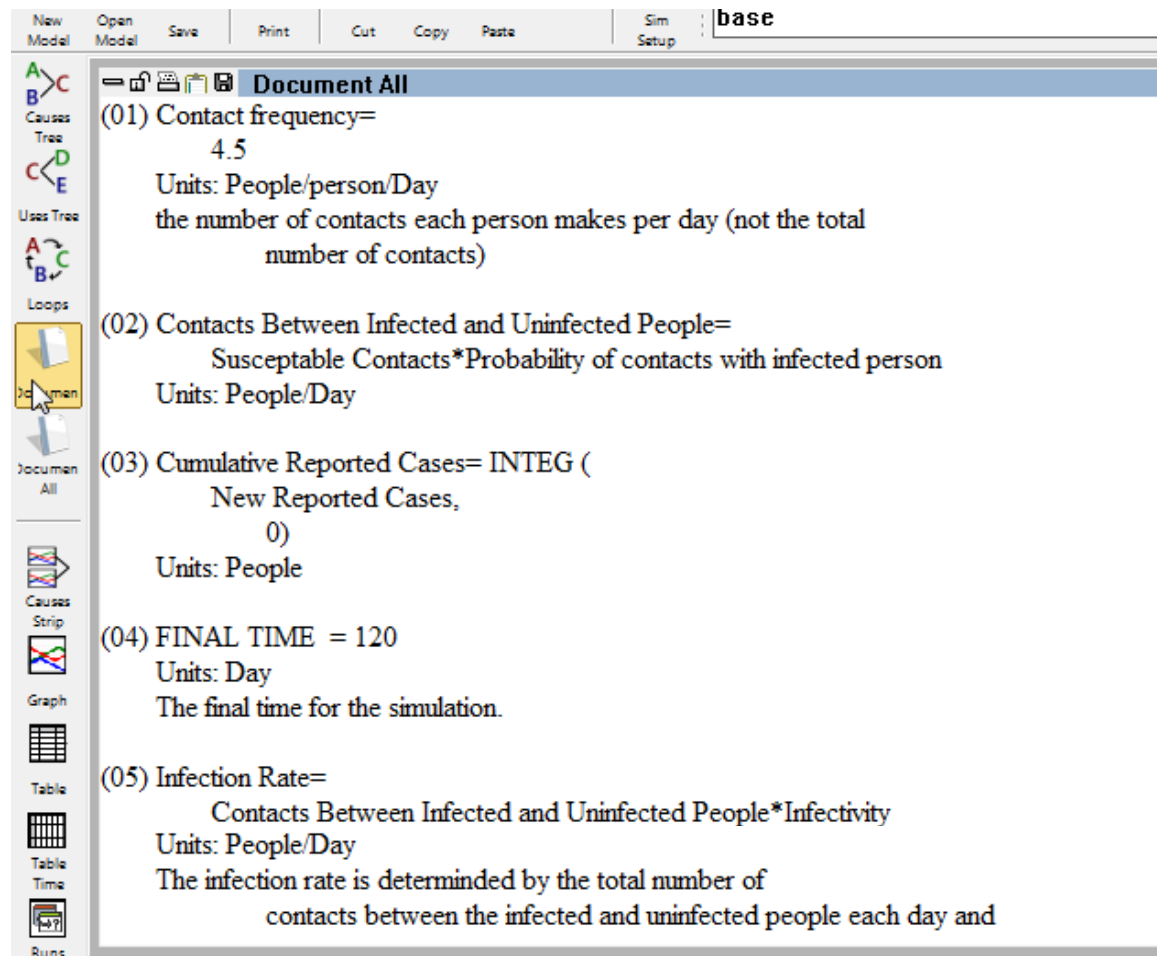
For use with VensimPLE, version 6.0

# Most Popular Mistakes done by SD students

- Students most often do the following mistakes:
  - Insufficient documentation: Listing of model equations \*\*\*\*\* (not required for this assignment)  
Missing polarities\*\*\*
  - Label/name feedback loops\*\*\*
  - Handing in a very long HW, but not addressing some parts of the question\*\*, hoping the TA will forget about it ;)
    - e.g. “How large is the epidemic now?”
    - Brevity is a virtue in HW submission
  - Using very unrealistic values for parameters\*
    - e.g. probabilities are usually defined btw (0.0-1.0)


# How to document “equation listing”

Left hand side of Vensim main screen, click on “DOCUMENT ALL” to copy all Vensim Equations for your model

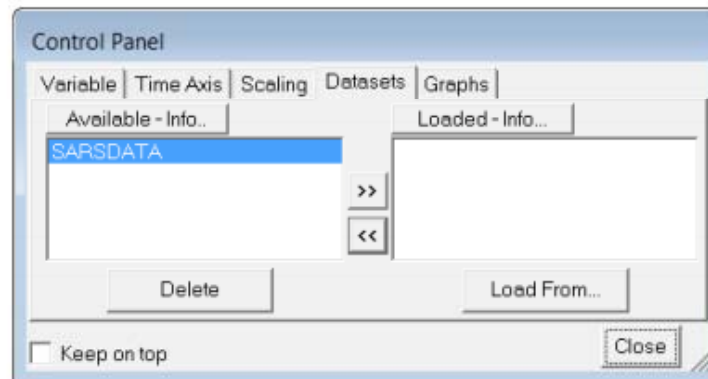


# Most Popular Questions: I can't open the SARS DATA

Before beginning to develop your model, make sure the SARS data are loaded. Download <SARSDATA.vdf> if you haven't already, and place the file in your Vensim directory. Then

load the dataset by clicking on  to get the control panel (which should look like this):

- Vensim saves every simulation run and custom graph you produce as a separate file. It supplies a **.vdf** extension for simulation runs and a **.vgd** extension for custom graphs. These files cannot be opened from outside the Vensim application; they can be opened from inside Vensim through the **Control Panel**.

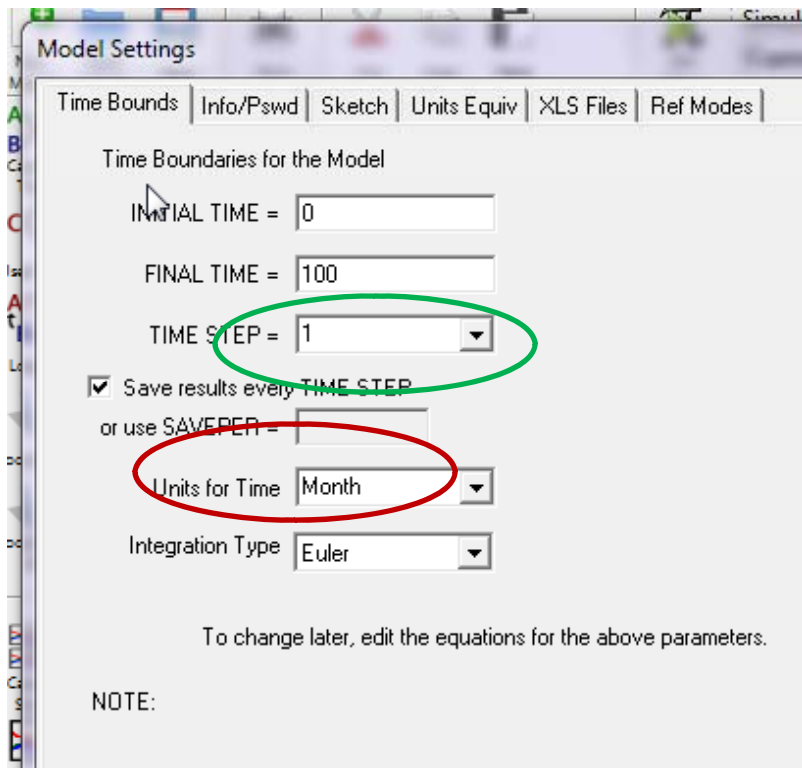


If you see something different, click on the **Datasets** tab. To load the data file, **SARSDATA**, select it by clicking and then hit the >> button which will move it to the **Loaded** column (navigate via the **Load From...** button if you put the data somewhere else on your computer). The data set is now available.

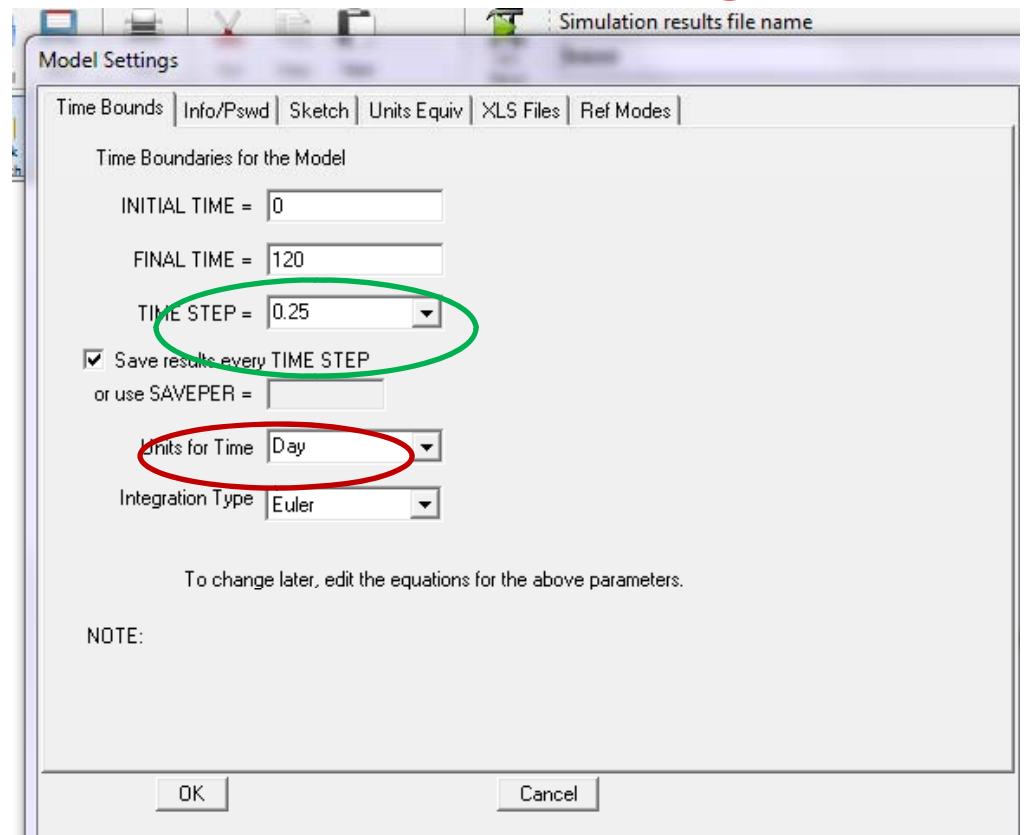
Note: To access the data, you must use variable names exactly as specified in this tutorial.

# Debugging Units Check Errors

## - Default Model Settings



## - Correct Model Settings



# Debugging Units Check Errors

Hello TA

s!



I'm trying to build my model, but when I do my units check I got the error bellow:

Error in units for the following equation:

```
Population Infected with SARS =
  INTEG( Population Infected with SARS
        * Infection Rate ,
        2)
```

Population Infected with SARS --> People  
Infection Rate --> People/Day

Analysis of units error:

Right hand and left hand units do not match

Population Infected with SARS

Has Units: Person

```
INTEG( Population Infected with SARS
      * Infection Rate ,
      2)
```

Has Units: Person\*Person

**Which unit I should use?**

Thanks!

\*\*\*\*\*

Error in units for the following equation:

```
Population Infected with SARS =
  INTEG( Infection Rate ,
        1)
```

Population Infected with SARS --> People  
Infection Rate --> People/Day

Analysis of units error:

Right hand and left hand units do not match

Population Infected with SARS

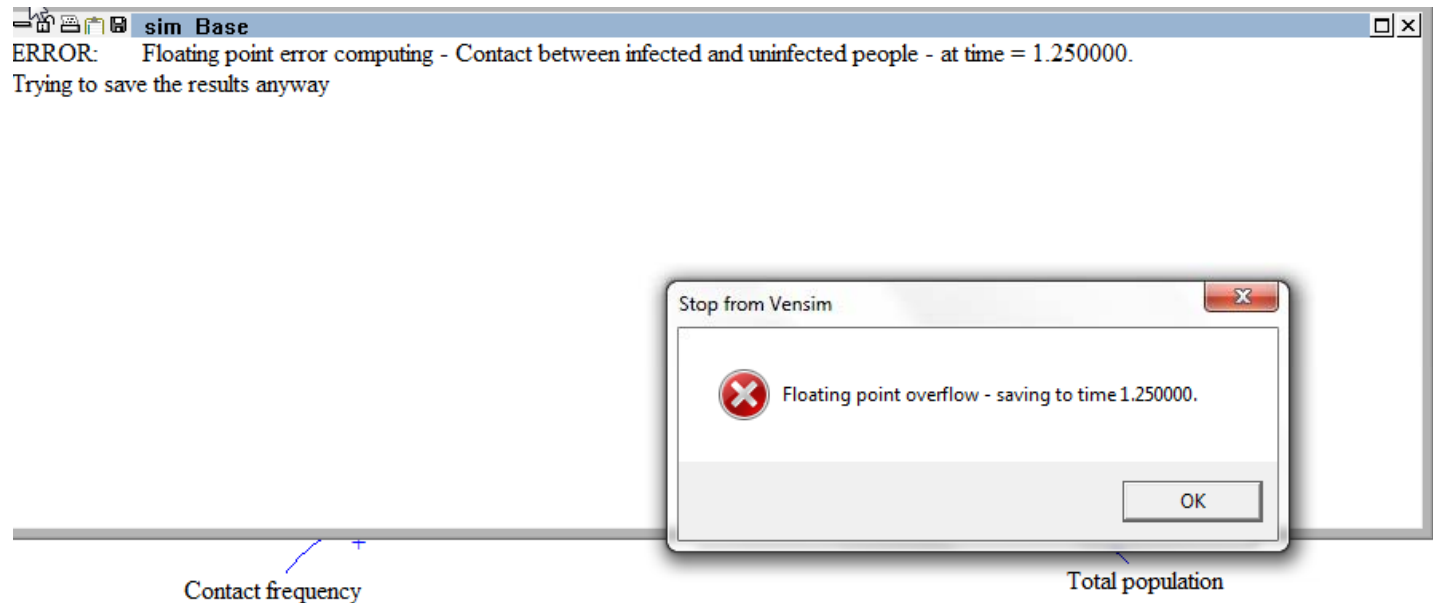
Has Units: Person

```
INTEG( Infection Rate ,
      1)
```

Has Units: Person\*Month/Day

\*\*\*\*\*

# Floating Point Error



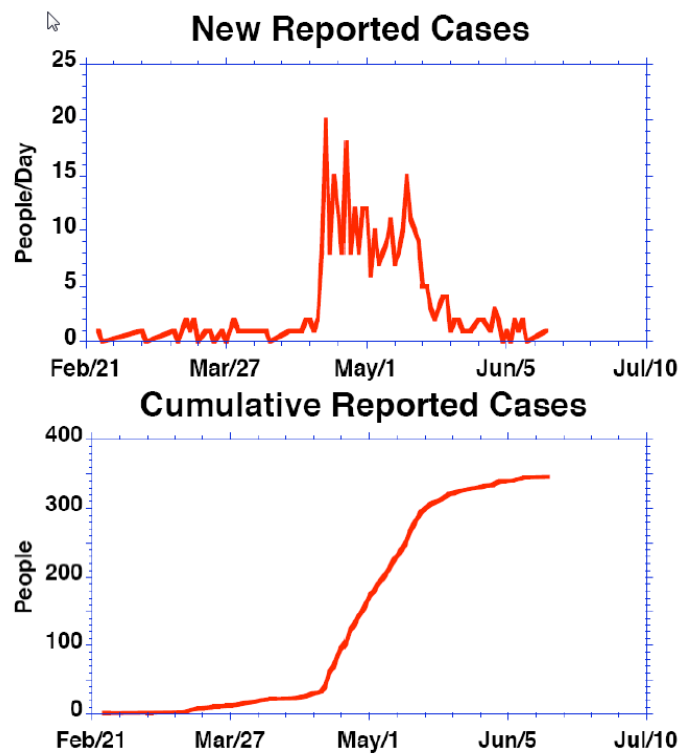
- It may be a couple of things. You may have unrealistic values for some of the parameters, e.g. infectivity. Check your time step,  $dt$ , of the simulation. Make sure value of probabilities are defined btw 0-1.
  - E.g. setting “infectivity” to a start value of 20 (by assuming 20%), instead of 0.2

# Population infected max value

- **Q-** We noticed that when we increase the initial value of “Population infected with SARS”, its final value after simulation is 350 plus the initial value.
  - This appears to be incorrect because the final value should be 350.
- **A-** If the initial value is a small number (e.g. 1-10) it may not be seen as a big problem. However one way to solve it is to define an auxiliary variable as the initial value for the Infected population, e.g. “init infected”, and to reinitialize the Total population to  $(=350 - \text{“init infected”})$



# A simple model that captures the dynamics of an infectious disease- SARS



Historical data: SARSDATA.vdf

- **the incidence** (rate at which new cases were reported, measured in **people/day**)

- **cumulative prevalence** (cumulative number of cases reported, measured in **people**) for SARS in Taiwan

MIT OpenCourseWare

<http://ocw.mit.edu>

15.871 Introduction to System Dynamics

Fall 2013

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.