COMMUNITY FLU

Software to Estimate the Impact of an Influenza Pandemic on a Simulated Community With and Without Interventions

CommunityFlu 1.0 User Manual, Current Edition: August 10, 2009

Updates and revisions will be made as necessary. If you have any comments, please contact the listed authors for further information and/or assistance.

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CONTRIBUTIONS:

This manual describes the use of CommunityFlu software. This software was developed and authored by the CommunityFlu Development Team; it was based on a pandemic simulation model developed by Michael J. Haber.

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DISCLAIMER

This software is a beta version, and the authors encourage the reporting of bugs and suggestions for improvements.

The numbers generated through CommunityFlu cannot be interpreted as predictions of what will occur during an influenza pandemic. Rather, they should be treated as estimates of what might happen, based on the assumptions used in generating these estimates and the modeling strategy used by this software package.

The methodology, findings, and conclusions presented in this manual and in the accompanying software are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention (CDC).

CommunityFlu: Programming Background

CommunityFlu software was developed to help state and local health authorities plan for pandemic influenza outbreaks. This program randomly generates a sample population of a thousand households. The purpose of the program is to use the model population to estimate the potential impact of the next influenza pandemic on a particular community for a baseline situation, in which no pandemic interventions are introduced, or after the user has selected one or more potential interventions. The program also allows the user to take the results from the simulations (with and without interventions) and calculate the economic impacts in terms of days lost from work.

CommunityFlu uses Microsoft Excel Macro* programming functions. The software requires the input of several key data sources, such as population statistics, influenza transmission rates, influenza probabilities for latent and infectious periods, and specific community-related data that pertains to the number and duration of contacts. It also requires the user to input the initial number of people that become infectious.

While this software uses Microsoft Excel Macro* for front-end functionality, the underlying susceptible-exposed-infectious-recovered (SEIR) statistical model is programmed in the C++ programming language and it generates specific outputs based upon the user's inputs. Examples of these outputs include the random generation of a thousand households and a sample population that is similar to specific communities' population statistics; influenza illness, hospitalization, and death probabilities for the different simulations; use of a seed number to start the random generation for identifying transmission outcomes; and graphic displays of baseline, intervention, and non-intervention outcomes.

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System Requirements

The CommunityFlu software program requires the use of the Windows* operating system (Microsoft Windows XP) and the Excel program (Microsoft Office 2003 or higher). We recommend using a computer that has at least a processor with a minimum of 1GB of RAM (operating memory), a 2.5 GHZ speed, and at least 15 MB of free storage memory on the computer's hard drive. CommunityFlu will probably run slower on machine that have slower processors and on machines with older versions of Windows (e.g. Windows 2000).

We have successfully loaded and run CommunityFlu on a variety of desktop and laptop computers using the Windows operating system. CommunityFlu is not designed to run on Apple* or machines that use other operating systems such as Linux*

[*the use of trade named products is for information purposes only. The U.S. Federal Government or its agencies do not endorse any specific computer or operating system]

Before loading and starting CommunityFlu, you must change Excel's security level by following steps listed below:

1). Open a blank Excel spreadsheet.
2). Click Tools, and then click Macro. Choose Security.
3). Set Security Level to Medium.
4). Click OK.
5). Double click the CommunityFlu file to open it.
6). When asked to Disable Macros or Enable Macros, click Enable Macros.

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Essential Command Buttons

These buttons express specific tasks. Some commands describe a task, whereas others provide assistance with understanding the program. Examples of the buttons are listed below.

START	*This button is used to begin the Community Flu software.*
NEXT	*This button takes you to the next screen*.
BACK	*This button takes you to the previous screen.*
CLOSE	*This button closes the current screen, but does not exit the Community Flu software. Before exiting the software, you must save your information by using the save command under the File menu. The updated information must be saved using the Microsoft conventional naming techniques.*
TASKS	*These buttons designate specific tasks that you may perform. Such tasks include generating a population, running a baseline, running the intervention, and displaying graphs.*
HELP	*These buttons are used to help you understand specific functions of the program. These helpful notes provide you with additional information about the program, statistical information, definitions, and background information. Available help includes a description of the population statistics, how the sample population was generated, description of the results, supplemental information about different community populations, and epidemiologic definitions.*

How to Navigate Within the Program, Page Numbering, Entering Data, and Reading Results

Navigation: How to move around the program

The user can navigate, or move from page-to-page, using the "BACK" and "NEXT" buttons found on each page after the title page.

Alternatively, some users may be more comfortable using the page tabs at the bottom of each sheet in the spreadsheet.

Page numbering and type

After the home, or title page, each page has a page number near the top. Each page number also indicates the type of page. For example, "Baseline: DATA INPUT PAGE 1" indicates that the user is at a data entry page where the data is used for the baseline (no interventions) run(s).

Similarly, "Interventions: DATA INPUT PAGE 13" indicates that the user is looking at a data entry page where the data is used in the intervention scenario(s).

There are Results pages, starting with: "Results Menu: RESULTS PAGE 1"

The economic analyses section is accessed from the Results menu page (Results Menu: RESULTS PAGE 1). In the economic analysis, pages have there own page numbering, such as "Economics: DATA ENTRY PAGE 4" and "Economic: INTERMEDIATE RESULTS PAGE 2" and "Economics: FINAL RESULTS PAGE."

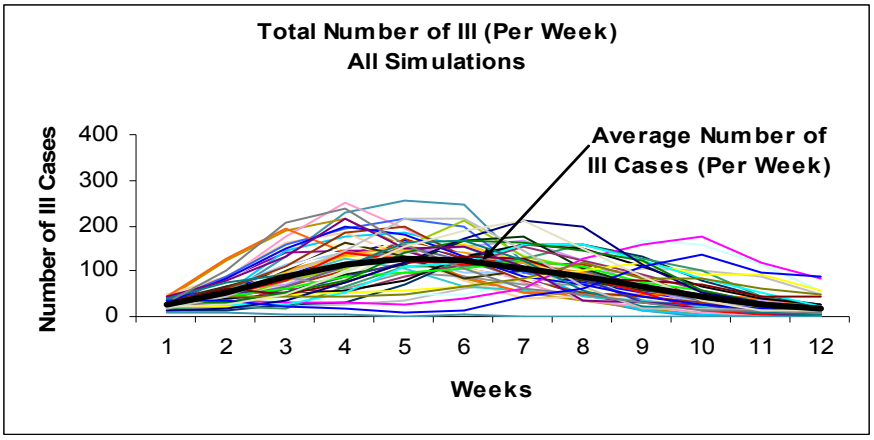
Altering input values

In CommunityFlu, a user can alter any input value that is in a white box or spreadsheet cell.

Reading Results

In CommunityFlu, results are displayed in either tables or graphs. Tables with results have cells that are yellow in color, indicating that the results cannot be overwritten or changed at all. Graphs have a white background.

Results CANNOT be Changed



CommunityFlu Procedures: Page-by-page

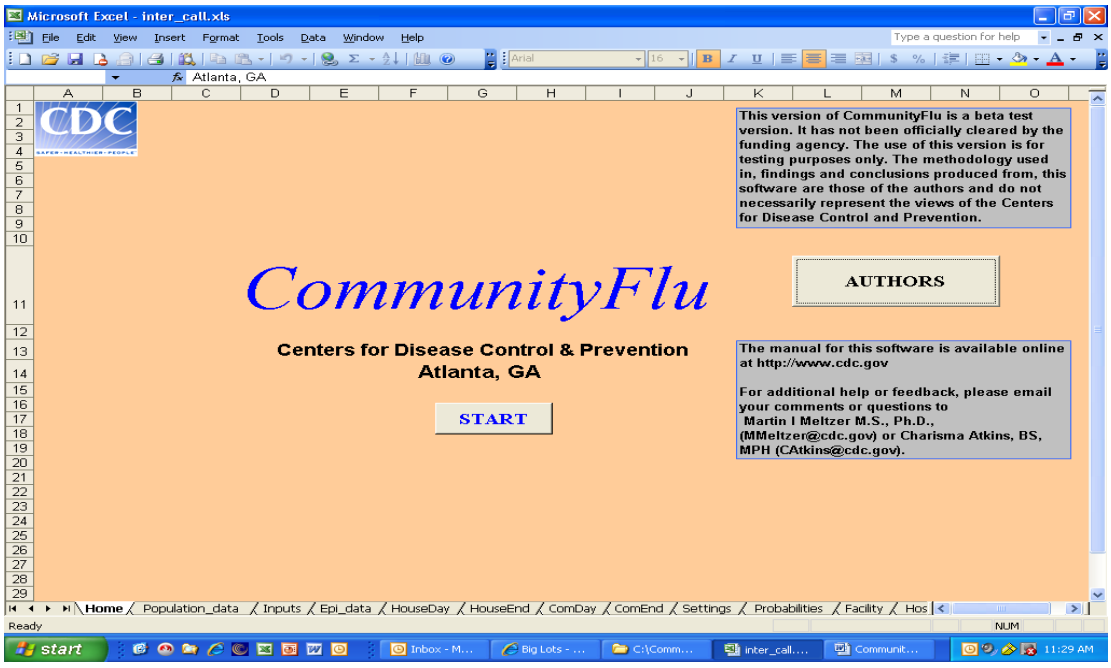
Once the CommunityFlu software has been installed, the program is ready to begin. In this manual, you will find step-by-step instructions that will serve as a guide.

1. You must download the CommunityFlu program onto your computer's hard drive from the CDC website. Once it has been downloaded you must save the program onto your C Drive in a folder labeled "CommunityFlu" with a filename of inter_call.

2. You now must open the inter_call file to begin using the CommunityFlu software.

    a.) Click the "Enable Macros" command button on the Security Warning Page.
    b.) Click "Don't Update" command button on the Microsoft Excel Warning Page.

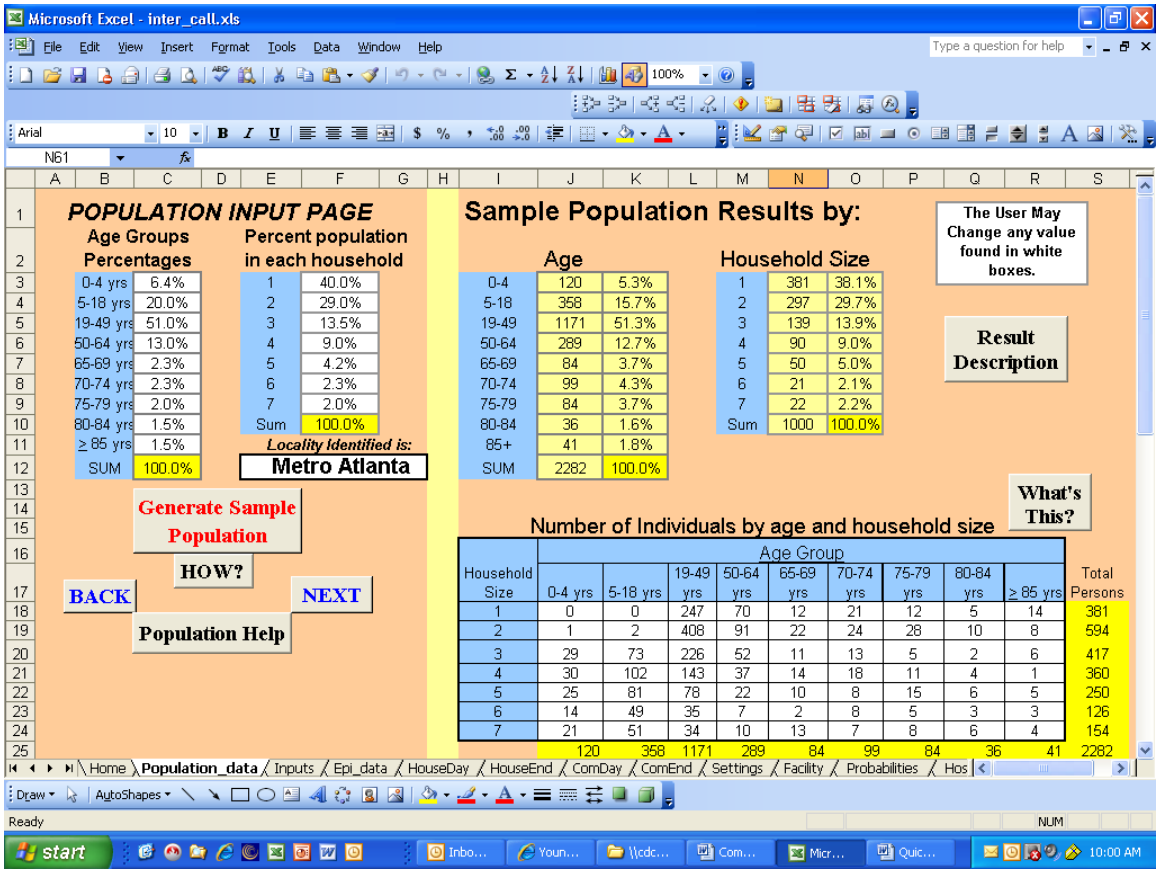
3. The first page to open in the CommunityFlu software is the home, or title page. On this page is the name of the software, a disclaimer, and contact information for help. A button labeled "AUTHORS" and a button labeled "START" are also displayed.



Selecting the "AUTHORS" button causes a text box to appear, in which all those listed were involved in the development of the CommunityFlu software.

Selecting the "START" button loads the first data entry page - Baseline: DATA INPUT PAGE 1.

4. The first set of data parameters to be entered on the POPULATION INPUT PAGE are the age group percentages and percent population in each household. These population statistics will be used to construct a sample population, which will be used in the generation of different simulations .



The population statistics are gathered by using either the U.S. Census Bureau Year 2000 data for specific localities, or by using other vital statistic records for a specific area[1]. For instance, in order to model the potential impact of the next influenza pandemic for the City of Atlanta, GA (Atlanta Metropolitian Area – where CDC's main campus is located), you may use the U.S. Census 2000 data for the Atlanta Metropolitian area or contact the City of Atlanta's Office for Vital Statistics.

Selecting the "Population Help" command button will upload an information box that describes how the percentage age group and percentage household size information may be obtained. The first description shown is that of Age Group Percentage Population Information. Selecting the "NEXT" button will open the Percent Population by Household Size Information. Selecting the "CLOSE" button will close this information box, thus displaying the POPULATION INPUT PAGE.

5. Once the age group percentages and the percent populations for the household size have been entered, you may then generate a sample population by selecting the “Generate Sample Population” command button.

   The “Generate Sample Population” command button uses the entered data to generate a sample population. The population program produces a community that uses the previously entered population data (age group percentages and percent population per household size). In particular CommunityFlu’s population generating program divides the sample population into households based upon the size of the population (1 through 7 persons), and by age of individual (0–4 years, 5–10 years, 11–13 years, 14–18 years, 19–64 years, and 65+ years). In addition, the population program assigns each household to one of four “neighborhoods”. [2]

   The “How?” command button provides information about how the program generates the sample population of one thousand households. Selecting this button will open an information box, which explains how the program generates the sample popultion. Selecting the “CLOSE” button will close this information box, thus displaying the the POPULATION INPUT PAGE again.

A person may fall within nine stratified age groups, but they will be associated with one of six generalized age groups. The stratified age groups analyze the degree of infectious transmission within the various age group populations (i.e., childhood, adult, and seniors).

The neighborhood location is a function by which each household was identified as being a part of one of four neighborhoods.[3] It is generated by multiplying a randomly selected number by four and adding one to the product.

$$\text{Neighbor} = (\text{Random No.} * 4) + 1$$

The neighborhood calculation is used to account for the community involvement of each randomly selected household by analyzing their interaction with the rest of their community. The CommunityFlu software identifies that there are four daycare centers, two elementary schools, two middle schools, and one high school found within each neighborhood. This will be important later on in the program when school closings will be used as an intervention strategy.

6. Once the thousand random households have been generated, then the age group percentages and the percentage household size population are displayed in two seperate charts labeled “Age” and “Household Size”. This information is obtained from the generated sample population and it correlates with the Statistics that were entered during Step 4 of the CommunityFlu Procedures: Page-by Page section of this manual.

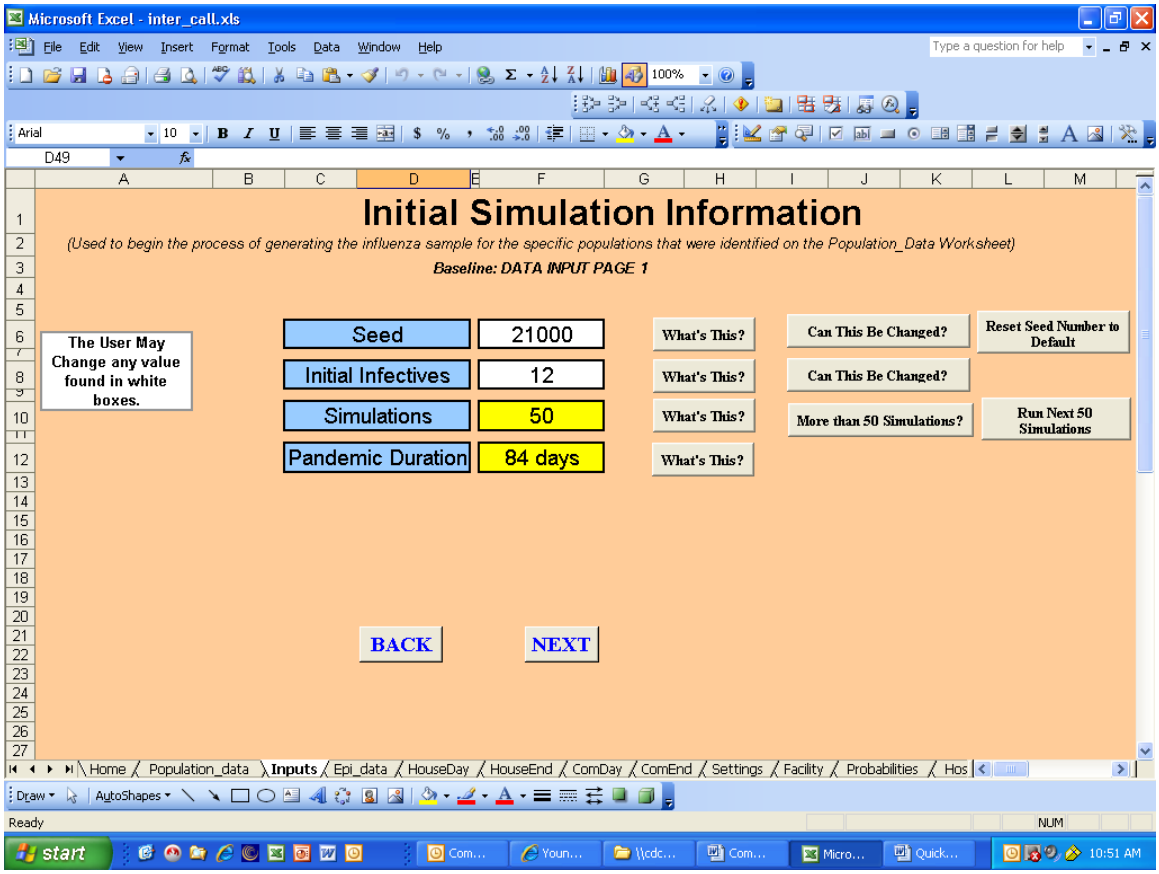
   Selecting the “Result Description” command button opens an information box that describes how the generated sample population is displayed. Selecting the “CLOSE” button will close this information box thus displaying the POPULATION INPUT PAGE again.

7. Once the percentage results have been displayed for the Age Group and Household Size Populations, then the persons identified in the sample population are displayed by their corresponding stratified age groups according to their household size in a chart labeled “Number of Individuals by Age and Household Size”.

   Selecting the “What’s This?” command button will open another information box, which contains an explanation about how the number of individuals for the Age and Household Size Populations can be entered, when this information is available. If this information is not available, the CommunityFlu software gathers this information from the generated sample population (Step 5). Selecting the “CLOSE” button in this information box will close this screen, thus displaying the POPULATION INPUT PAGE yet again.

Selecting “NEXT” will advance the CommunityFlu software to the Baseline: DATA INPUT PAGE 1.

8. The Baseline: DATA INPUT PAGE 1 is used to begin the process of generating the baseline (no interventions) simulation using the sample population identified on the previous Population Input Page. The variables shown are default values, however 2 of the 4 variables should be changed (Seed Number and Initial Infectives) to reflect the influenza patterns seen in a specific community. The fixed variables, those that cannot be changed, are the number of simulations and the duration of the pandemic in days.



The "What's This?" command buttons provide definitions for each of the four variables listed below:

The number of simulations is the number of times the program will generate health outcomes within one run. CommunityFlu has been set to 50 fixed simulations. Thus running the CommunityFlu software one time will result in 50 simulations being displayed with the corresponding health outcomes (No. of Ill, No. of Hospitalizations, and No. of Deaths) for each simulation.

The pandemic duration is the length of time (in days) the pandemic is expected to last. CommunityFlu assumes the pandemic will last 84 days. Thus, the pandemic duration has been set to last a total of 84 days for each run. However, the duration of a pandemic can vary

depending on the community, its prevention techniques, and its public health strategies.

The seed number is used as a starting point to select a position to begin the baseline generation within the randomly generated population (See Step 5 of the communityflu Procedures: Page-by-Page section of this manual).

Initial infectives is defined as being the number of people who are initially infective that enter a community.[4] This number will depend on the community size and the setting for which transmission can occur.

The “Can This Be Changed?” button explains how and why the seed number and number of initial infectives should be changed.

The seed number should be changed to ascertain whether its placement affects the different output graphs (See Results Section of this manual). While the definition of seed number states that it starts the random generation, it actually begins a “pseudo-random” generation because the seed number chooses the starting place based upon the alignment of the randomly generated population obtained during Step 5 of the CommunityFlu Procedures: Page-by-Page Section of this manual. The seed number must be changed when the desired outcome wants to use more than 50 simulations.

The number of initial infectives should be altered to reflect a specific community’s influenza transmission patterns.

The “More than 50 Simulations?” button provides information on how to gather, save, report, and print information for more than 50 simulations. CommunityFlu has fixed the number of simulations to 50; therefore in order to obtain more than 50 simulations, you must run the software in its entirety a number of times to reach your desired number of simulations. However, in between each run, you must change the seed number prior to running a different set of simulations. Without changing the seed number, the output values that are displayed for each of the 50 simulation will be the same values as those from the original simulation run. As a point of clarification, the number of simulations must be a product of 50; therefore, you can only obtain information for 50, 100, 150, 200, etc. simulations.

The “Run Next 50 Simulations” command button automatically adjusts the seed number, so that different output results may be obtained between the different simulation runs. This should not be selected if you do not already have a baseline result using the default seed number. If a baseline result has been obtained, then it is highly recommended that each subsequent run be saved under a different filename in your CommunityFlu folder or that each set of output values be printed. This will ensure that your

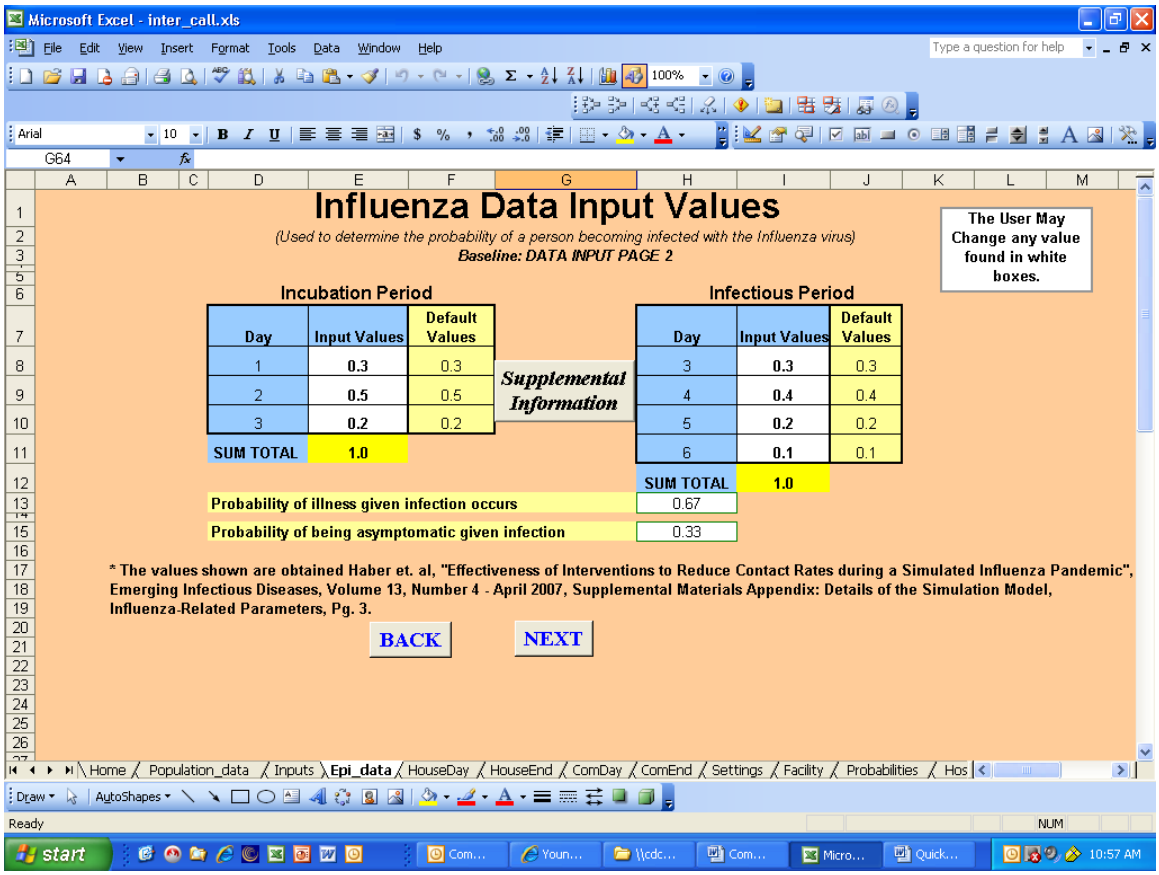
subsequent runs do not write-over each other, thereby causing inaccuracy in your results with more than 50 simulations.

The “Reset Seed Number to Default” command button automatically adjust the seed number back to its original value of 20,000. This must occur after you have obtained the output values associated with different seed numbers.

Selecting the “CLOSE” button at the bottom of each of the explanations pages will close those boxes, thus returning to the Baseline: DATA INPUT PAGE 1.

Selecting the “NEXT” button will advance the Communityflu program to the Baseline: DATA INPUT PAGE 2.

9. The Baseline: DATA INPUT PAGE 2 displays incubation and infectious period probabilities, along with the standard probabilities for being symptomatic if infection does occur. The default fixed values are shown next to the input values[5]. The default values cannot be changed; however, the input values can be changed and they should reflect the community population that is being affected by the spread of influenza[6].



The “Supplemental Information” command button provides definitions and explanations for incubation and infectious periods, along with probability of illness that occurs when a person is symptomatic or when a person is asymptomatic. Each newly infected person enters a incubation period, which is the time frame between being exposed to an infectious person and the presentation of symptoms. At the conclusion of incubation, a person then enters the infectious period, which is when the person becomes infectious to others[7]. At that time the person may also develop influenza symptoms. Selecting the “CLOSE” button will close this information screen, thus displaying the Baseline: DATA INPUT PAGE 2.

We used the predetermined values for both the incubation and infectious periods, which were based on values estimated by Elveback, et al[5].

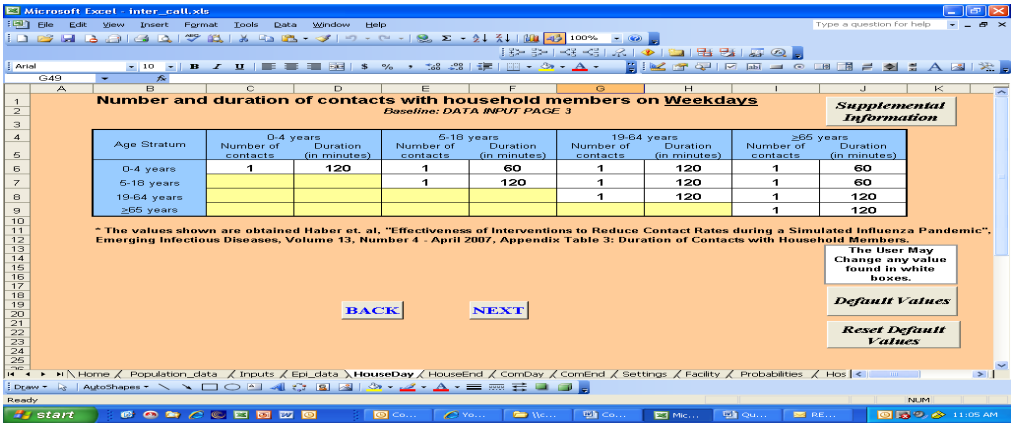
It is assumed that the incubation period lasts for 1–3 days with the infectious period beginning on the last day of latency. The values shown on this data screen are the probabilities of illness being transmitted from one person to another. The program utilizes the default probability of illness occurring given that a person has come into contact with influenza infection is 0.67, while the probability of an infectious person not developing symptoms (asymptomatic) is 0.33. However, these values may be changed to reflect the user's community.

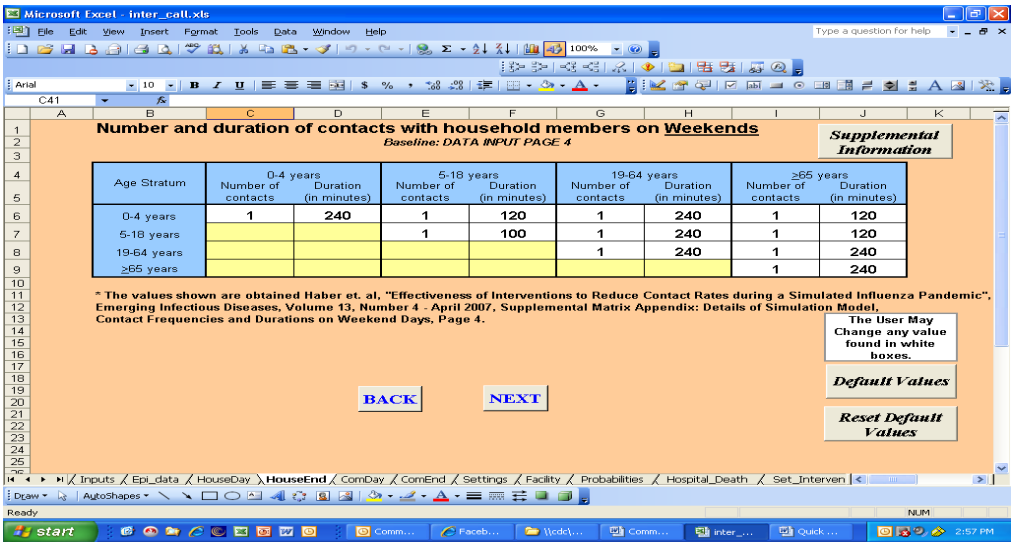
Selecting the "NEXT" button will advance the CommunityFlu software program onto the Number and Duration of Contacts Data Screens (Baseline: DATA INPUT PAGES 3 through 8).

10. The next few screens pertain to the number and duration (in minutes) of a contact for each age group. The values should be changed to reflect the specific community that is being affected by the influenza virus. The types of contacts included in the Communityflu software are: household weekday, household weekend, community members' weekday, community members' weekend, other contacts daily schedule, and long-term care facilities[7]. At the conclusion of each screen, selecting "Next" will advance the software program to the subsequent screens.

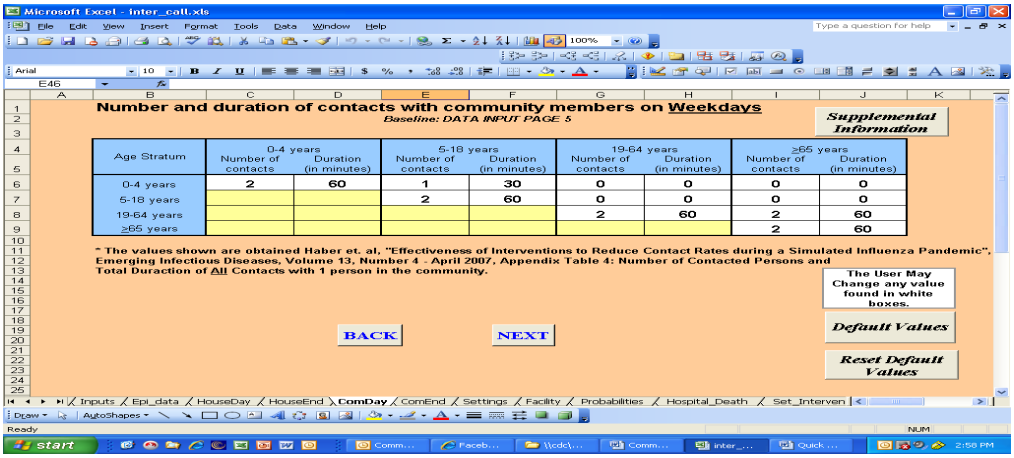
    The "Supplemental Information" command buttons on each screen provides additional information about the type, number, and duration of contacts. Selecting the "CLOSE" button at the end of each screen will close the specific information box, thus displaying the Number and Duration of Contact Data Screens. The types of contacts are listed below:

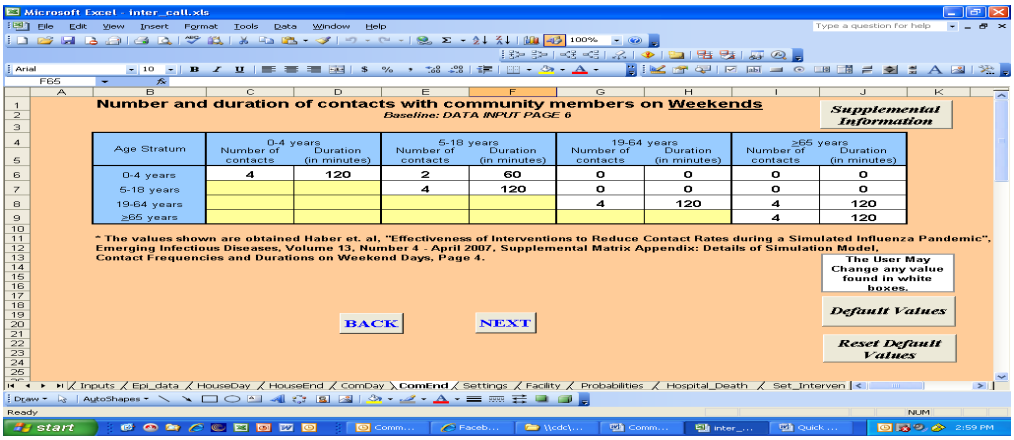
Household member contacts are broken into weekday and weekend interaction. The age groups identified are 0–4 years, 5–18 years, 19–64 years, and over 65 years of age. For the purposes of this program, it is assumed that each member of the household has contact with every other member of the household during the weekdays. Therefore, it is not necessary to input the number of contacts in the household, since every one makes contacts with each other. However, you can and should alter the duration of contact for each household contact. The duration is the total duration of all contacts with the same person. While changing the number of contacts to any value other than 1 would greatly affect the baseline outcomes, you may change these values by simply typing in new contact numbers that correspond with the specific durations. The difference between household weekday and household weekend contacts is that the duration of contact on the weekends is twice the duration of contact on the weekdays. For instance, if an infant child's contact with a school aged sibling during the weekday is 120 minutes, during the weekend the child's contact will be 240 minutes.



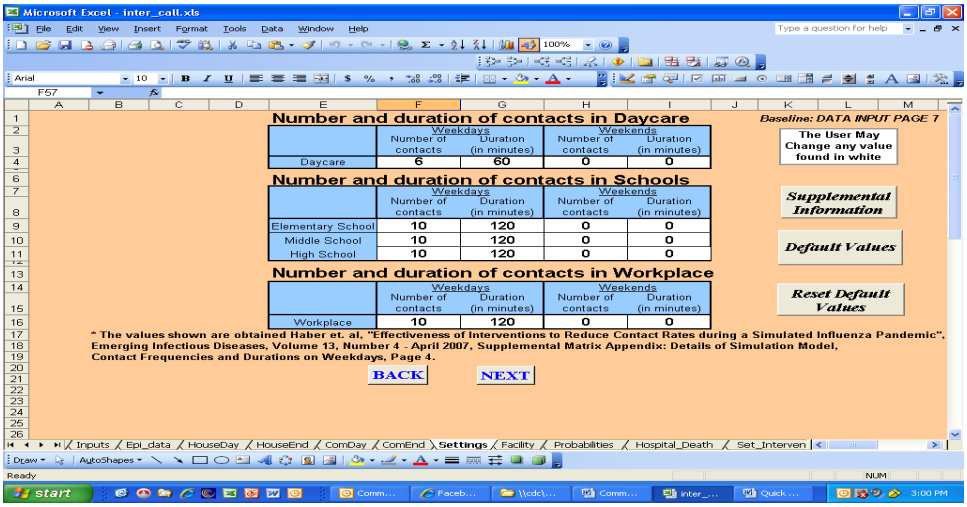


Community member contacts are also broken into weekday and weekend interaction by using the same age groups as those previously mentioned. These tables identify the number of contacted persons and the total duration of all contacts with one person in the community. It is assumed that no contact occurred between children and adults in the community, who were outside of the household. Just as household member contacts have twice the duration of contact on weekends in comparison to weekdays, so does community member contacts. For instance, an infant child's contact with a school aged sibling during the weekday is 120 minutes but during the weekend the child's contact will be 240 minutes.



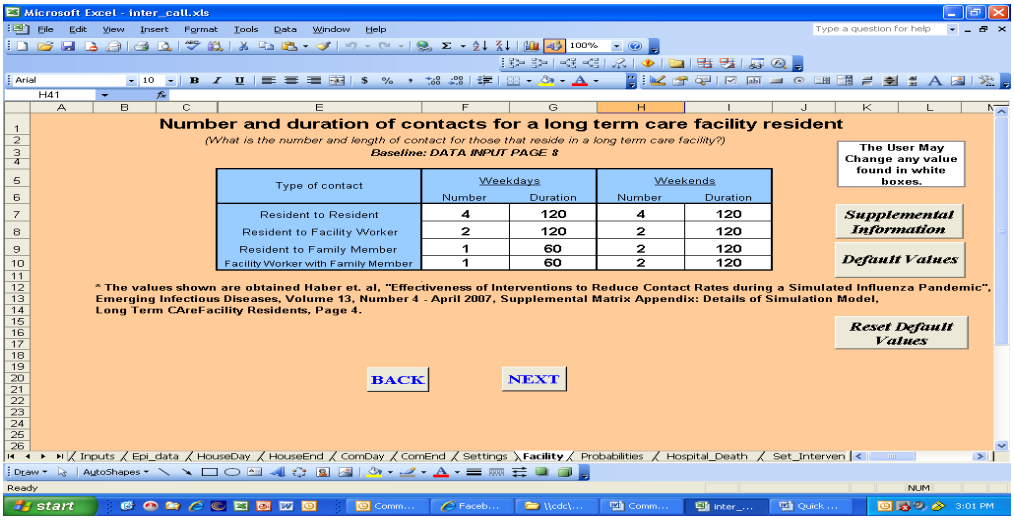


The Number and duration of contact in daycare centers, schools, and workplaces are listed next. It is assumed that contact only occurs in these settings on weekdays, thus the weekend contacts are zero. The types of schools were specified because in each neighborhood there are elementary, middle, and high schools. The number and duration of contacts in these schools depends on the age group identified.



The Long-term care facility contacts table identifies the number and duration of contact for Long-Term Care Facility residents. The time duration for interaction with a Long-Term Care resident is measured per contact. The type of contact listed depends on the type of interaction the resident has with others. It is assumed that residents who reside in the facilities spend more time with other residents. It is also assumed that the duration of contact will remain the same during weekdays as it does on weekends. For instance, a long-term care resident has contact with two other residents for 120 minutes each. Thus the total duration of contact for the residents is 240 minutes. However, the value in the table should reflect the length of time per contact, not the total duration. Contact with staff from the long-term care facilities will also have equal duration of contact during the weekdays as they do on the weekends. However, contact with family members will be reduced because

(in general) visitation is for a specified period of time. Weekday contact with family members will be less than weekend contact simply because there is more time to visit on the weekends.



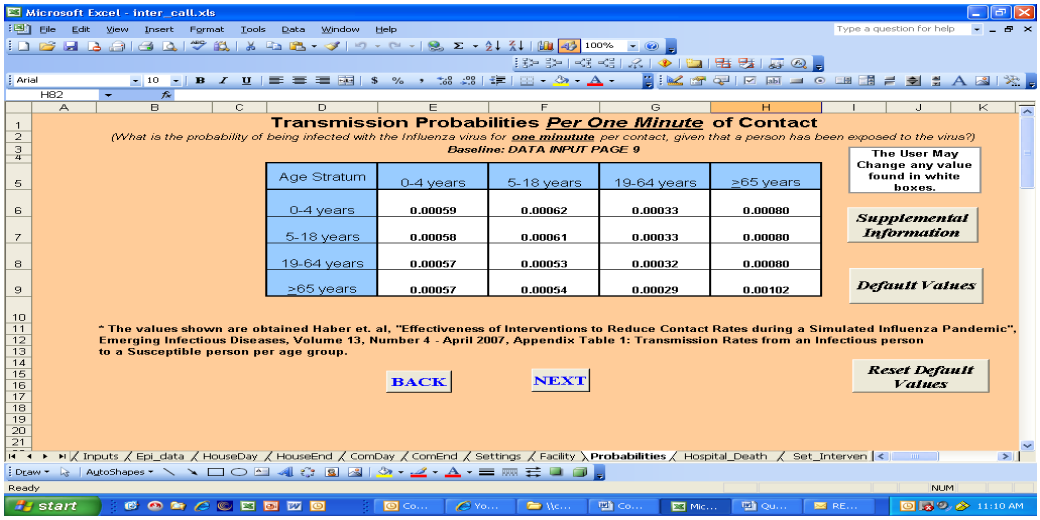
All the values shown on the Type and Duration of Contact data screens are default values.

Selecting the “Default Values” command buttons on each of the screens will open the default charts listing the type and duration of contact values that have been proven to produce results most consistent with the observed patterns[7]. The default values are displayed for each type of contact and are based on the number and duration of contacts for each age group subpopulation.

Selecting the “Reset Default Values” command buttons on each of the screens will return the origianl default values back into the specific charts.

Selecting the “NEXT” button will advance the Community Flu software onto the next Baseline screen.

11. The next screen to upload is the Baseline: DATA INPUT PAGE 9, for which transmission probabilities for one one minute of contact are displayed according to the specific age groups. The age groups identified are 0–4 years, 5–18 years, 19–64 years, and more than 65 years. These probabilities vary depending on the age of the infected and susceptible person. However, they will not depend on the type of setting (i.e., school, workplace, etc.) or by day of the week (i.e., weekday versus weekend). The values can and should be changed to reflect a communities' transmission probabilities in relation to the communities' influenza illness attack rates. Thus if the attack rates are altered, then the transmission probabilities must reflect that change. Changing the probabilities, seen on this page, to reflect a specific community will provide a more reasonable representation of the influenza seen in the identified community population. Four matrices detailing four different sets of transmission probabilities have been configured based upon values used from Vynnycky and Edmunds: Appendix C[8]. (Please refer to Appendix 1 for the four matrices).



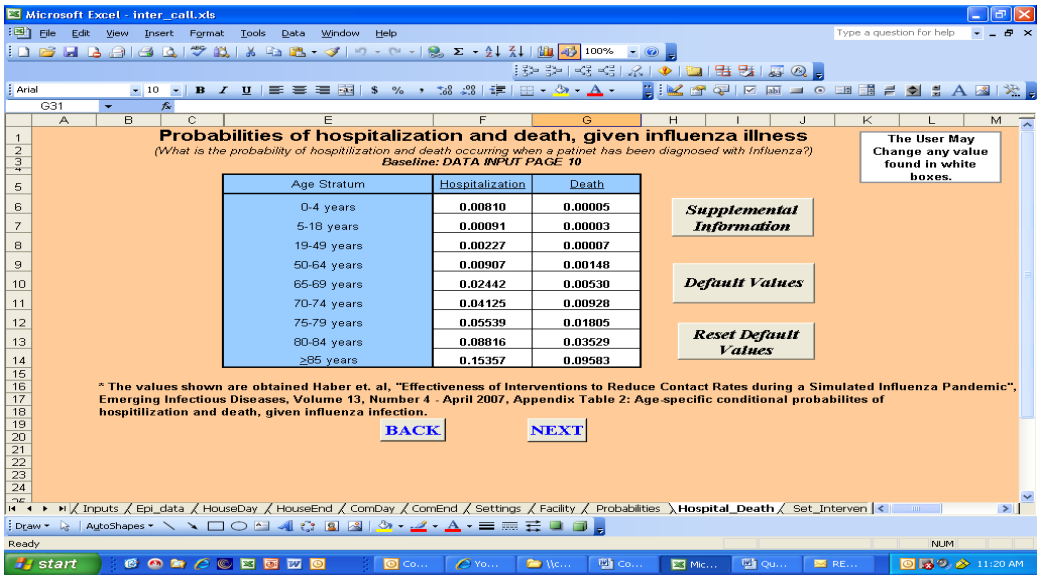
The "Supplemental Information" command button provides information about the transmission probabilities per one minute of contact.[7] These values should correspond to specific influenza illness attack rates for a specific community. Selecting the "CLOSE" button at the bottom of the screen will close this information box thus returning to the Baseline: DATA INPUT PAGE 9 once again.

Selecting the "Default Values" command button will open another screen that displays the tranmission probability values that were proven to produce results that are the most consistent with the observed patterns[7].

Selecting the "Reset Default Values" command button will upload the original default matrix for tranmission probabilities per one minute of contact back onto the Baseline: DATA INPUT PAGE 9.

Selecting the “NEXT” button will advance the CommunityFlu software onto the Baseline: DATA INPUT PAGE 10.

12. The Baseline: DATA INPUT PAGE 10 screen identifies nine age groups and their corresponding probabilities for hospitalization and death, given influenza infection. These rates should be adjusted to reflect the rates of the specific community being affected by the influenza virus.



The “Supplemental Information” command button provides information about how to obtain community influenza-related hospitalization and death rates.

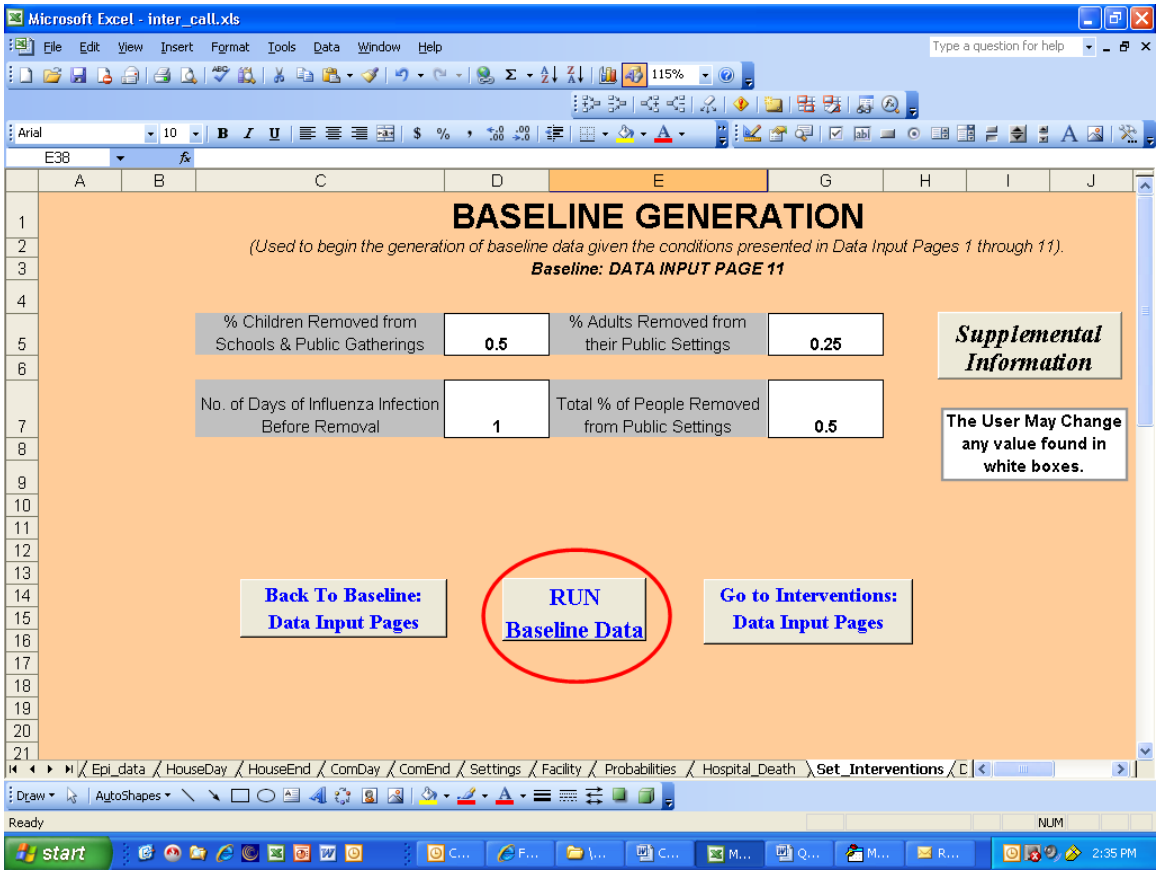
The first step is to gather data on influenza-related hospitalization and death rates for an average influenza season in the community. The next step is to adjust the seasonal influenza rates so that the predicted overall rates for a pandemic can be obtained. The last step is to divide the adjusted rates by the expected illness rates identified in the Transmission Probabilities per One Minute of Contact table (Step 11 of the Communityflu Procedures: Page-by-Page Sectin of this manual).[9] Selecting the “CLOSE” command button will close this information, thus returning to the Baseline: DATA INPUT PAGE 10.

The “Default Values” command button provides a table of hospital and death rates for each group that were proven to produce the best possible results[7].

The “Reset Default Values” command button should be selected to return the default probability rates for hospitalization and deaths per age group, given that influenza illnesshas occurred .

Once all the probabilities have been entered into the data screen, selecting “NEXT” will advance the CommunityFlu software onto the final baseline data input screen.

13. The final baseline data input screen lists four sets of variables that can be changed. These values, along with the other input values from Steps 8 through 12 of the Communityflu Procedures: Page-by-Page Section of this manual, are used to generate the Baseline Results for the specific community and contribute to the results presented on the upcoming data graphs.



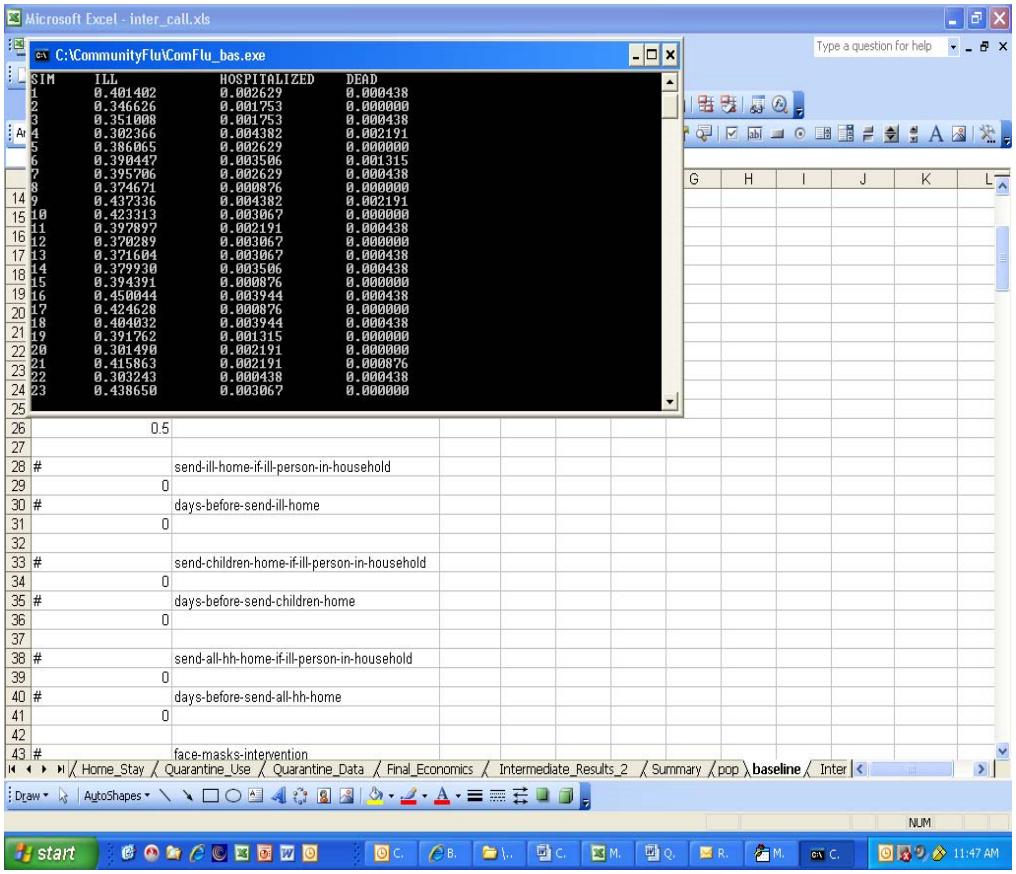
The four variables are % of Children Removed from Schools and their Public Gatherings, % of Adults Removed from their Public Settings, Number of Days of Influenza Infection Before Removal, and Total % of People that were removed from having contact with their household members. The process of removal refers to the voluntary withdrawl of a possibly infected person withdrawn from the general population[10]. A person should be removed from the general population to prevent the further spread of influenza. Therefore, the process of removal should occur throughout the entire illness and not just when a person appears to be infectious or displaying symptoms.

The “Supplemental Information” command button provides information about the probability of infection occurring given the fact that people are removed from their community (i.e., Children and Adults from general population and household contacts). The number of days a person is infectious describes the number of days viral shedding occurs after

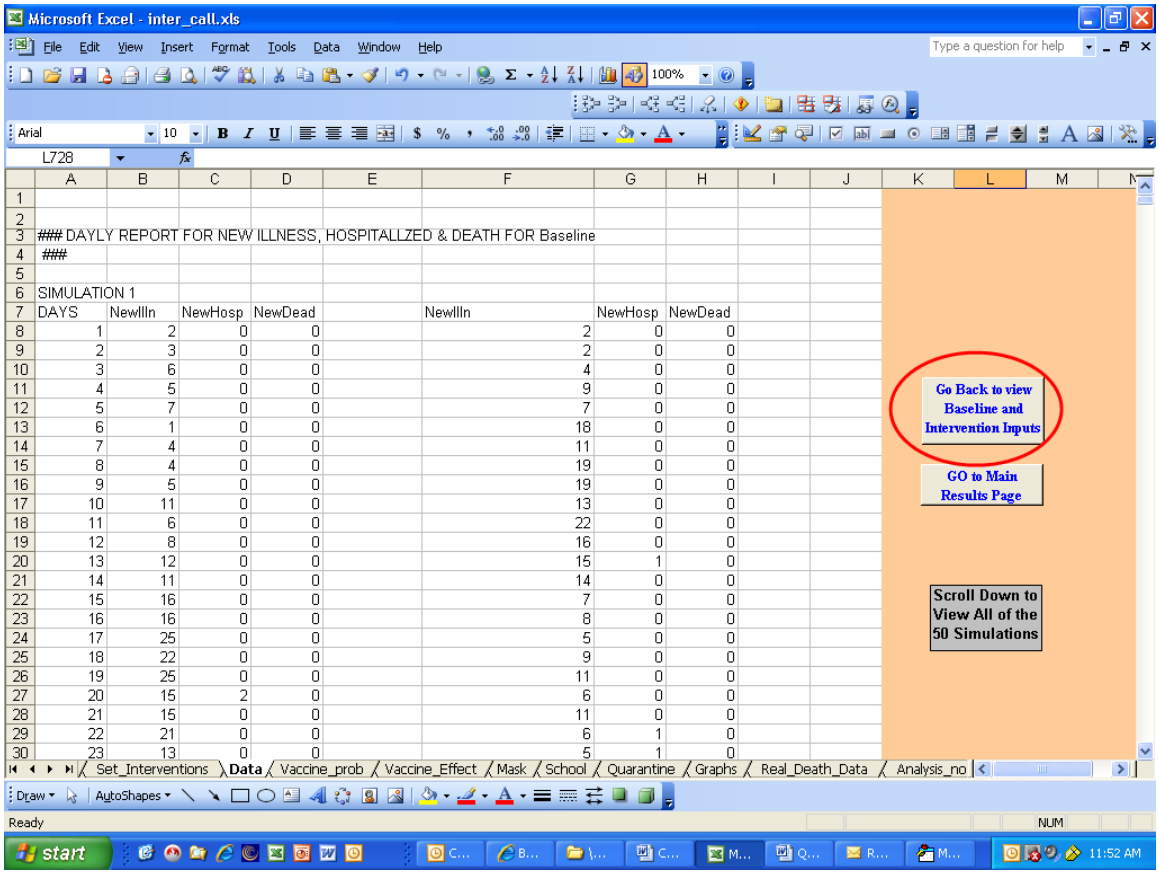
someone has been infected with the pandmeic virus before they were removed from the at-risk population.

14. Select the “RUN Baseline Data” command button to generate baseline results that were obtained by entering all of the information from Step 8 through Step 12. The information is displayed in two formats. The first is in a hidden spreadsheet labeled “Baseline. Result,” in which the number of ill cases is presented per day in each of the 50 simulations. The second format is in a hidden spreadsheet labeled “Baseline,” which lists all of the input measures and their corresponding values. In an effort to preserve download space for smaller computer systems, these spreadsheets are only included in the complete CommunityFlu software package. If you would like these spreadsheets, please contact Charisma Atkins (Catkins@cdc.gov) or Dr. Martin Meltzer (MMeltzer@cdc.gov) at the Centers for Disease Control and Prevention.

    The CommunityFlu software program generates the total baseline probability of illness, hospitalization, and deaths for each of the 50 simulations based upon the information entered in steps 8 through 12 of the CommunityFlu Procedures: Page-by-Page Section of this manual. This information is displayed in a separate program labeled Communityflu_bas.exe, which is viewable in a seperate screen on the CommunityFlu software program, once the “Run Baseline Data” command has been selected.



15. Once the baseline information has been generated, the baseline outcomes results are presented on the worksheet labeled “Data”.

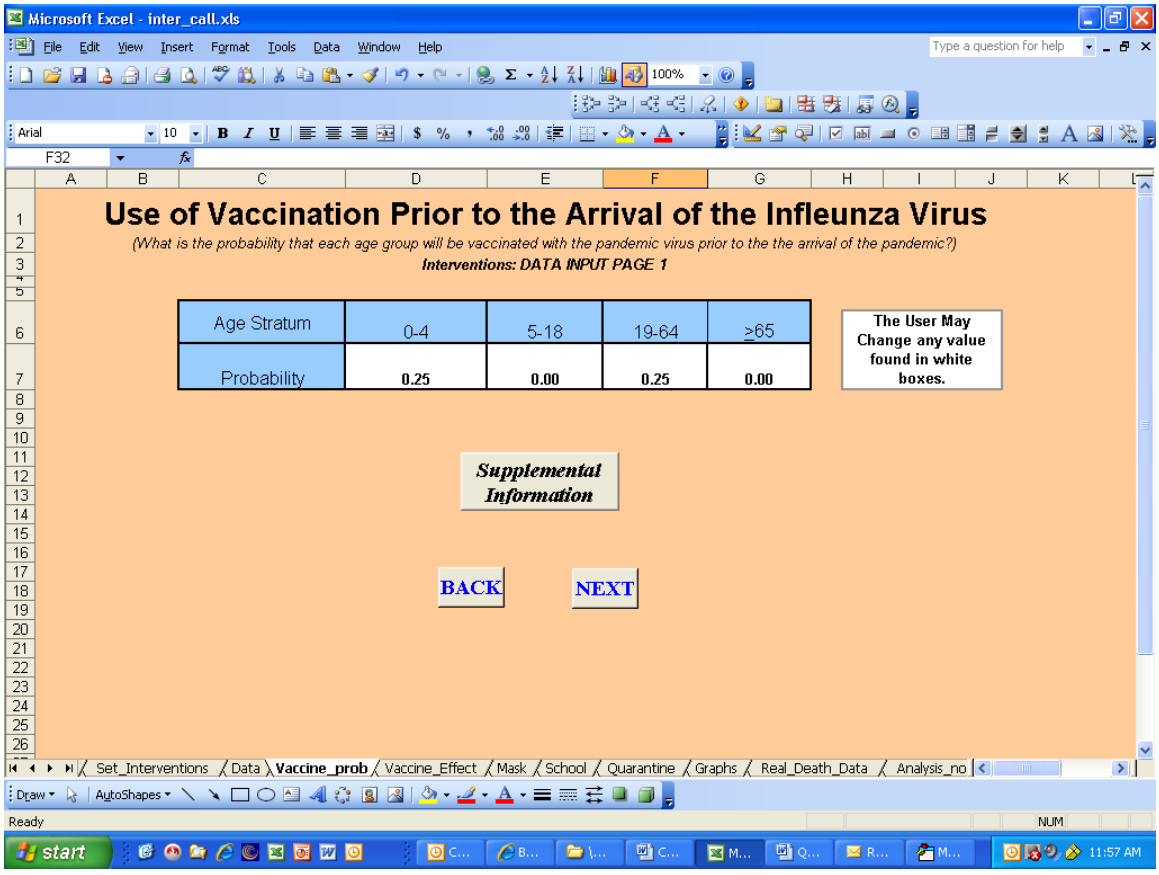


You must slect the “Go Back to View Baseline and Intervention Inputs” to change any of the previously entered baseline information. This command would lead you back to the Baseline: DATA INPUT PAGE 11.

16. Once the Baseline: DATA INPUT PAGE 11 has been uploaded, then you may select the “BACK to Baseline: Data Input Pages” command button to change any values that were entered in the Baseline Input pages 1 through 11. Changing these values will alter the results for the Baseline. Result worksheet, Communityflu_bas.exe file, and the graphic representation that will be displayed later.

17. Selecting the “Go To Interventions: Data Input Pages” command button will advance the CommunityFlu program to the Intervention Data Input Screens, which allow for the input of different intervention measures, such as vaccination probabilities, vaccination effectiveness measures, face mask usage, school closings, and quarantine information.

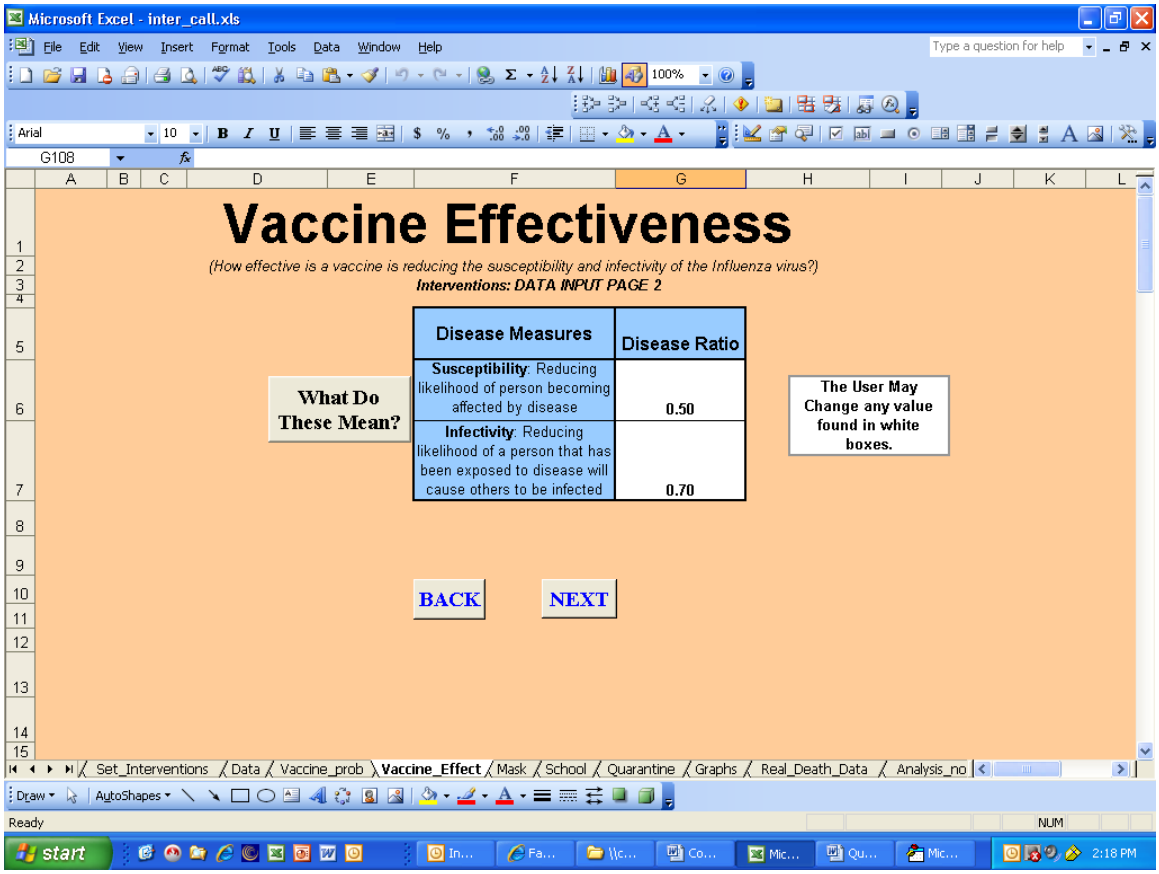
18. The first intervention page to be uploaded will be the Interventions: DATA INPUT PAGE 1. The values shown should be adjusted to reflect how vaccinating can affect a specific age group in the community that has been or will be affected by influenza illness.



The “Supplemental Information” command button provides information about the vaccination probabilities of the four age groups. Presently, vaccinations are the only available measure that has been studied to prevent and control influenza[5]. During the 1957 influenza pandemic, the virus spread rapidly among school-age children, therefore this age group became a vaccination priority[11]. The probability of vaccination per age group is dependent on the community, along with the immunization strategies of that community. Thus, entering the vaccination probabilities for the specific community being affected by influenza is essential in analyzing how well the intervention will work in reducing the effects of pandemic influenza.

Select the “NEXT” command button to advance you onto the Interventions: DATA INPUT PAGE 2.

19. On the Interventions: DATA INPUT PAGE 2, vaccine measures and their corresponding ratio are entered. The measures that are being analyzed are susceptibility and infectivity. The values displayed are default values, thus they can be altered to reflect the specific community that is being evaluated for influenza infection.



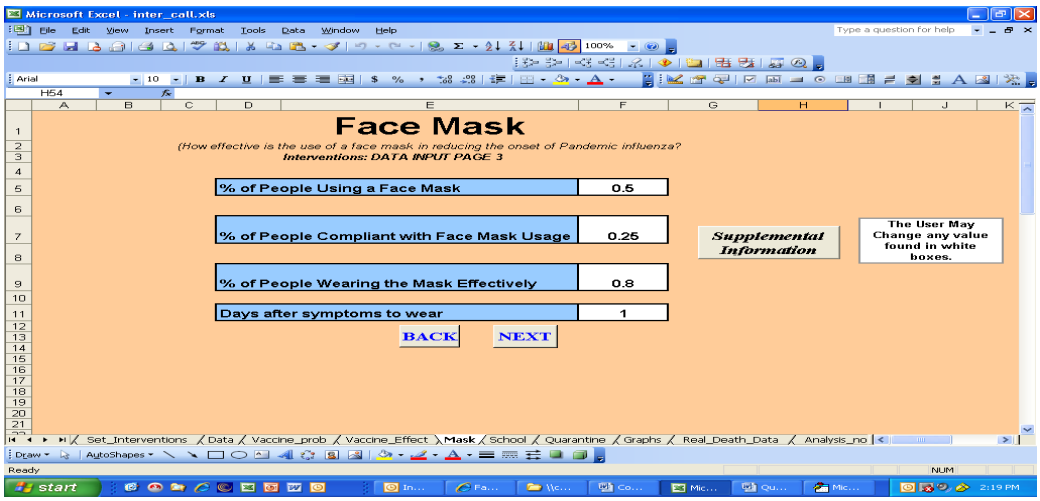
The “What Do These Mean?” command button provides definitions for susceptibility and infectivity.

The susceptibility value, known as Theta, refers to how effective the vaccine is in reducing the likelihood of a person becoming affected by the disease.

The infectivity value, known as Phi, refers to how effective the vaccine is in reducing the likelihood that a person who was been exposed to the disease can infect others.

Select “NEXT” will advance you to the Interventions: DATA INPUT PAGE 3.

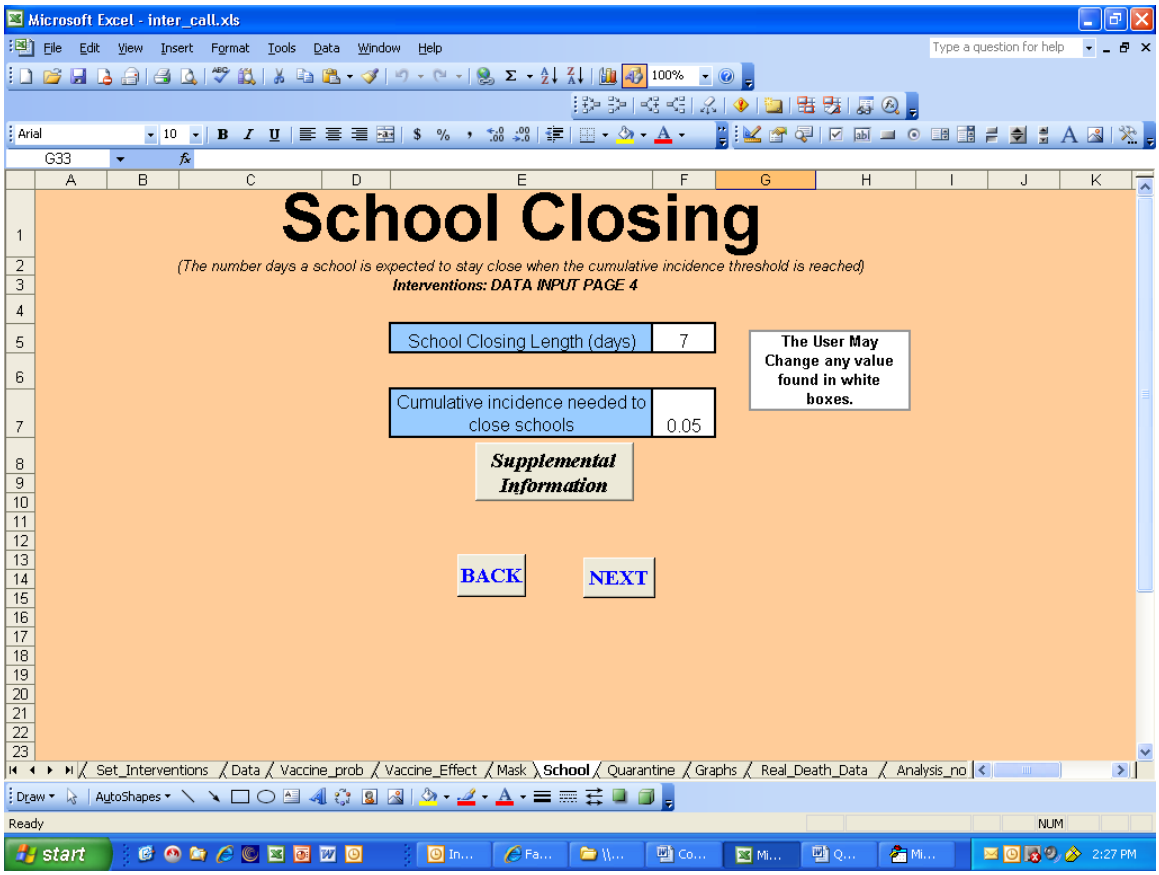
20. On the Interventions: DATA INPUT PAGE 3, the community's specific face mask utilization parameters are entered. The areas that are included in the evaluation of the usefulness of face masks are the probability of using a face mask, being compliant with the strategies of using face masks, using the face mask effectively, and the number of days a face mask is used. The percentage of people using a face mask describes the probability of persons' in a population using a face mask in some form. The percentage of people being compliant with face mask usage is described as being the probability of people that not only use the face mask, but follow the guidelines of how and when to where the face mask. The percentage of people wearing the mask effectively is described as the probability of people that wear the mask as it is intended to be worn, thus following the guidelines on how to wear the mask.



The "Supplemental Information" command button provides information about the effectiveness of face masks. Currently little evidence exists about using face masks as an intervention strategy in preventing the further spread of the influenza virus by reducing influenza transmission in a community[12]. There are two types of face masks that are being investigated to determine how effectively they prevent the spread of influenza: surgical masks and the N95 Respirator mask. Both masks and respirators are only effective if they are worn accurately and appropriately when there is an influenza risk. Users must be compliant with community strategies for wearing and utilizing the masks in order for this interventon to be effective method for preventing the spread of influenza.

Once all the information has been entered on this screen, selecting the "NEXT" command button will advance you to the Interventions: DATA INPUT PAGE 4.

21. On the Interventions: DATA INPUT PAGE 4, information related to the closure of schools caused by influenza is entered. The values can and should be adjusted to reflect the number of days a school is closed because of illness and the number of influenza cases that that cause schools to initiate closure.

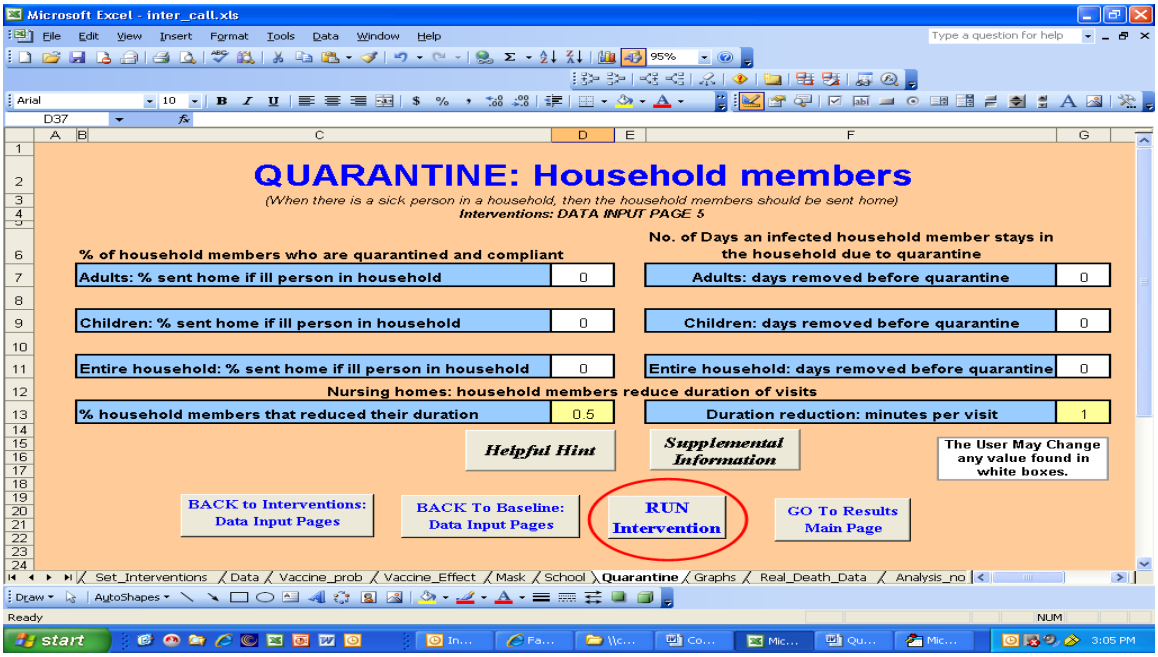


The “Supplemental Information” command button provides information about the effectiveness of closing schools. Recent studies support school closure as an effective method in reducing the overall attack rates within communities[13]. The number of days the school will close is dependent on the population. However, the longer the school is closed, the greater the likelihood that the number of times the school will close will be decreased. The cumulative incidence is defined as a percentage for the number of cases needed to prompt a school to close. The prompt closure of a school may not prevent the onset of influenza, but it may delay the spread of influenza across a community[14].

Once all the information has been entered on this screen, selecting “NEXT” will advance you to the Interventions: DATA INPUT PAGE 5.

22. The Interventions: DATA INPUT PAGE 5 lists variables for quarantine measures and the process for sending a sick person home and having them remain there until they are no longer infectious. This screen applies only to direct household members and does not take into consideration members of the community who may come in contact with the same infected person.

    This page is further divided into three different sections: Percentage of household members that are quarantined and are compliant with the quarantine measures, number of days an ill household member is removed from the home prior to the implementation of quarantine measures, and the reduction in the time for household members to visit nursing home residents.



The “Supplemental Information” command button provides information about the effectiveness of utilizing quarantine measures to control the spread of the influenza virus. While participating in quarantine may be effective, it is not as effective as combining this intervention strategy with another strategy (i.e., vaccinations, face mask usage, and/or school closures). During the 1918 pandemic influenza, the isolation of patients in closed settings (i.e., dormitories and households) did not completely stop virus transmission, but it did appear to decrease the attack rates[14].

The “Helpful Hint” button provides information as to how information should be entered on this page. Adults, children, and entire households should not be entered seperately. You should enter either the entire household information leaving the adult and children information a constant zero or you may enter the adult and children information individually leaving the entire household information a constant zero.

23. You have now entered all of the baseline and intervention data information, and thus have several options. You may select the “BACK to Baseline: DATA INPUT PAGES”, “Back to Interventions: DATA INPUT PAGES”, “Go to Results Main Page”, or “RUN Intervention”

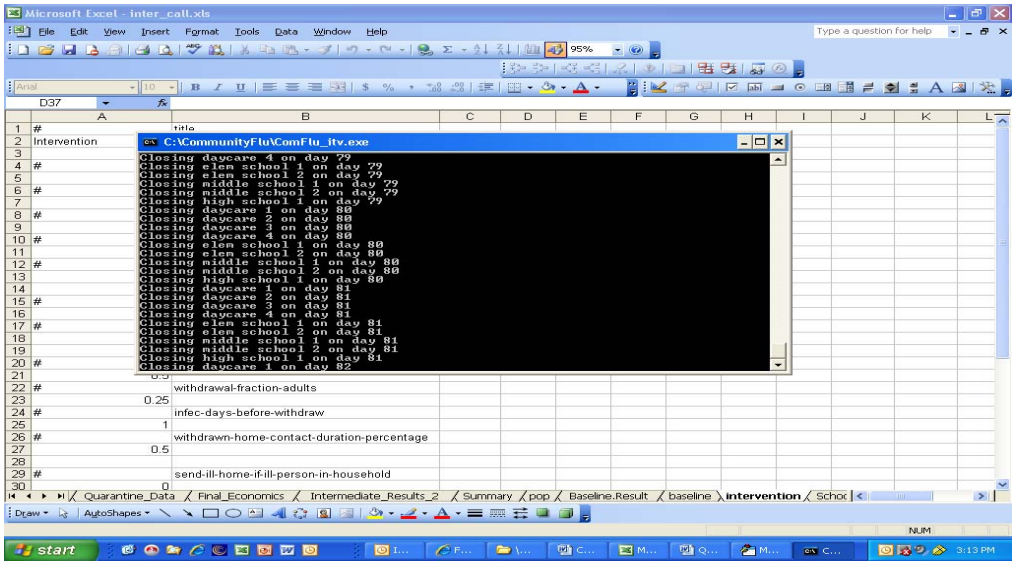
    The “BACK to Baseline: DATA INPUT PAGES” command will direct you back to the start of the baseline input, so that you may change any information you previously entered during Steps 8 through 12 of the CommunityFlu Procedures: Step-by-Step Section of this manual. Altering any of these values may affect the outcome results you previously obtained.

    The “BACK to Interventions: DATA INPUT PAGES” command button will direct you back to the start of the intervention inputs, so that you may change any information you previously entered during Steps 18 through 22 of the CommunityFlu Procedures: Step-by-Step Section of this manual. Altering any of these values may affect the outcome results you previously obtained.

    The “Go to Results Main Page” command button should be selected if you want to advance directly to the Results Menu without generating the Intervention Simulation Data.

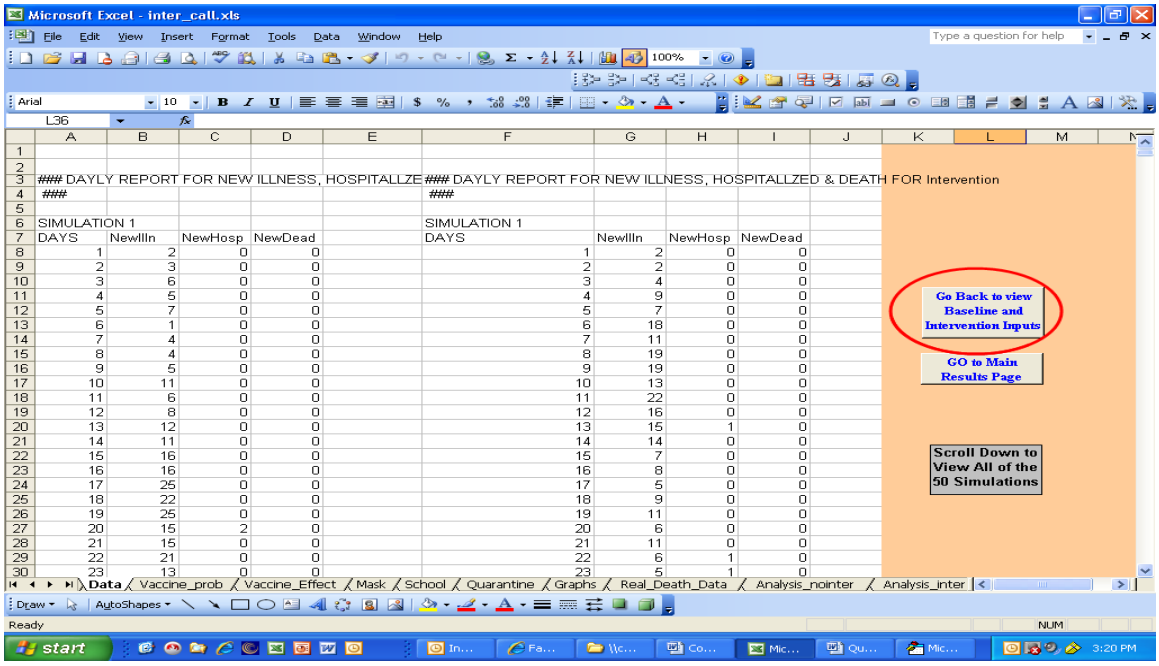
24. The “RUN Intervention” command button command button will generate the intervention results from the information that was entered pertaining to intervention measures in Steps 18 through Step 22 of the CommunityFlu Procedures: Step-by-Step Section of this manual. This information is displayed in three formats. The first is in a hidden spreadsheet labeled “Intervention.Result”, in which the number of ill cases is presented per day in each of the 50 simulations. The second format is in a hidden spreadsheet titled “Intervention”, which lists all of the input measures and their corresponding values. In an effort to preserve download space for smaller computer systems, these spreadsheets are only included in the complete CommunityFlu software package. If you would like these spreadsheets, please contact Charisma Atkins (Catkins@cdc.gov) or Dr. Martin Meltzer (MMeltzer@cdc.gov) at the Centers for Disease Control and Prevention.

    The CommunityFlu software program generates the total intervention probabilities of illness, hospitalization, and deaths for each of the 50 simulations based upon the information entered in steps 18 through 22. It This information is displayed in a separate program, which displays whether a school closure occured in a particular simulation, and is labeled Communityflu_itv.exe. This file is viewable in a seperate screen in the CommunityFlu software program, once the “Run Intervention” command has been selected.



    The information generated from this file is further analyzed in a hidden spreadsheet labeled “School Value”, which lists the simulation number and whether a school closing occurred during that simulation. The value returned is a “1” if no school closing occurred during the particular simulation, and a “2” is returned if a school closing did occur during the particular simulation. These school values will be used later to help analyze the number of school/work days lost due to pandemic influenza (i.e., caring for one’s self or caring for an ill family member).

25. Once the intervention data has been generated, the intervention outcome results will be displayed on the spreadsheet labeled “Data”



You must slect the “Go Back to View Baseline and Intervention Inputs” to change any of the previously entered baseline or intervention information. This command would lead you back to the Baseline: DATA INPUT PAGE 11, by which you would be able to either select “Back to Baseline: DATA INPUT PAGES” or “Go to Interventions: DATA INPUT PAGES.”

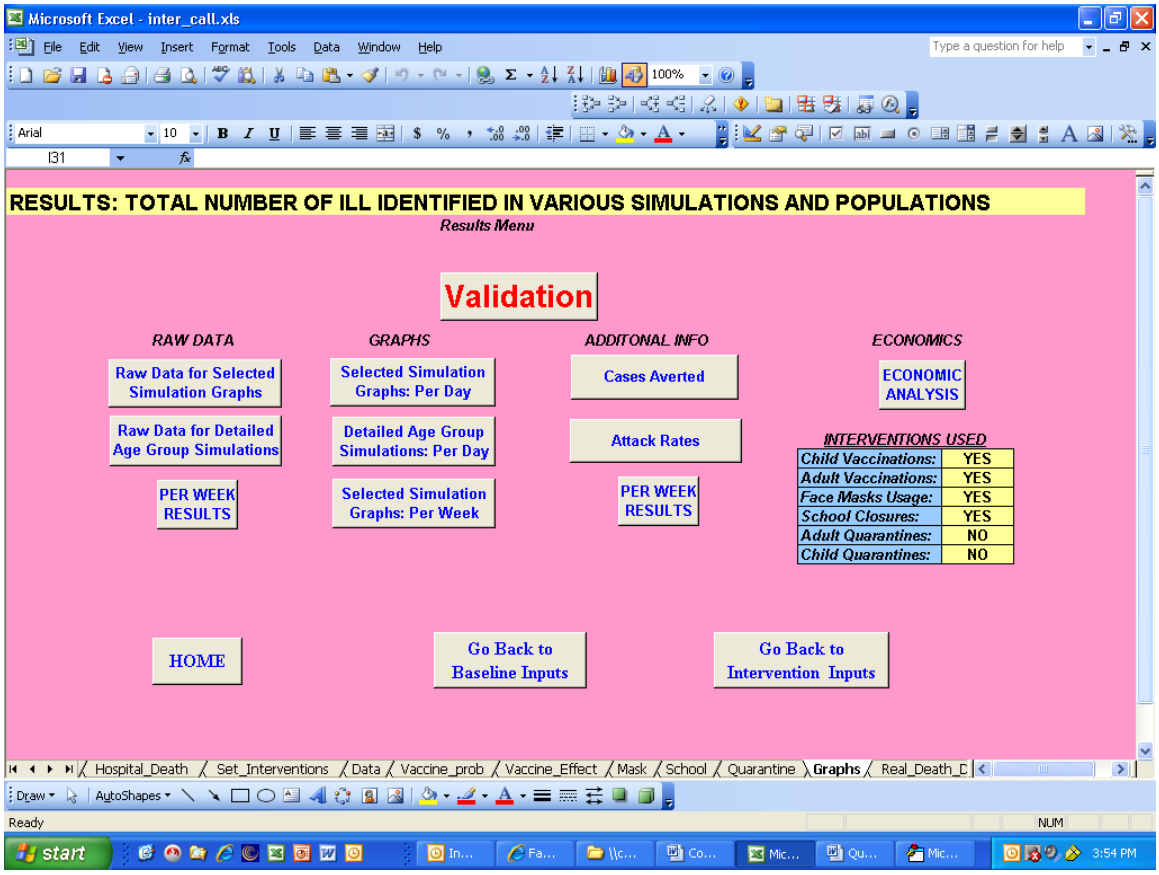
Selecting the “BACK to Baseline: Data Input Pages” command button on the Baseline: DATA INPUT PAGE 11 will direct you to the start of the baseline data inputs (Baseline: DATA INPUT PAGE 1), by which you would be able to change any baseline data that was entered on Baseline Input Pages 1 through 11 (Steps 8 through 12 of the CommunityFlu Procedures: Page-by-Page Section of this manual).

Selecting the “Go to Interventions: Data Input Pages” command button on the Baseline: DATA IPUT PAGE 11 will direct you to the start of the intervention data inputs (Interventiosn: DATA INPUT PAGE 1), by which you would be able to change any intervention variables that were entered on Intervetion Input Pages 1 through 5 (Steps 18 through 22 of the CommunityFlu Proceudres: Page-by-Page Section of this manual).

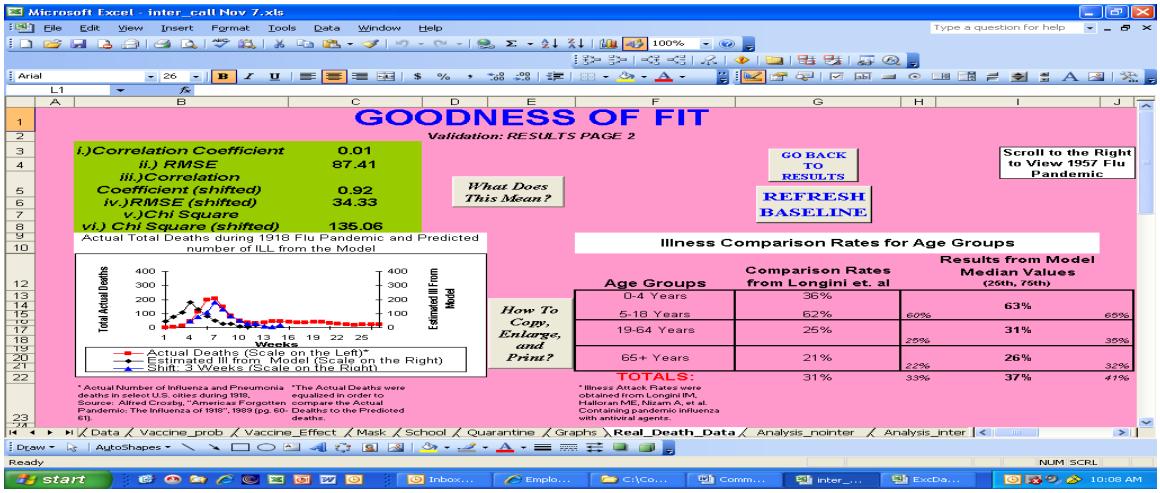
Changing these values may alter the results for Intervention Result and Baseline Result worksheets, Communityflu_bas.exe and Communityflu_itv.exe files and the graphic results that will be displayed later.

Viewing Results

26. Once you are satisfied with the baseline and intervetion data inputs and have generated the baseline and intervention simulation information, you may then select the “GO To Main Results Page” command button on the spreadhsheet labeled “Data” to advance to the Results Menu Page.



27. The first command is “Validation”, which is used to advance to a set of graphs that determine how well the 1918[15] and 1957[16] Pandemic Influenza seasons fit with the Number of Ill that is predicted from the CommunityFlu model. Also a separate chart is presented showing the illness comparison rates for different age groups using Longini et. al, Containing Pandemic Influenza with Antiviral Agents[3].



The box lists the statistical measures that evaluate the relationship between observed (1918 and 1957 Pandemic Influenza) and estimated (CommunityFlu Predicted) values. The 1957 Pandemic Influenza statistical measures are hidden, but may be viewed by scrolling to the right.

Correlation coefficients measure the statistical relationship between estimated and actual values. Ultimately it tracks how closely the estimated values follow the path of the actual values. The values range from -1 to 1 with a higher value indicating a better model. A value of 1 indicates that the model is perfect, whereas a value of 0 indicates that there is absolutely no correlation between the two set of values. The Community Flu software automatically computes a Correlation Coefficient (r) for the observed and shifted values by using the formula listed below.

$$r = \frac{\Sigma(XoXe)}{\sqrt{[\Sigma(XO\text{-}Xe)2]}}$$

o represents points actually observed.
e represents estimated points that were obtained from the model.
Σ represents the sum of the differences between the points actually observed and the points that were estimated from the model.

√ represents the square root of the squared difference between points actually observed and points estimated from the model.

The Mean Square Error (MSE) measures how closely the estimated values follow the pattern of the actual values. It is calculated by taking the difference between each actual and estimated value and multiplying that result by itself (i.e squaring the result). The squared results are then added together to obtain the total sum. The total sum is divided by the total number of data points. The smaller the MSE, the closer the observed data is to the estimated data and the more likely that the actual values follow the same pattern as the estimated values.

The Root Mean Square Error (RMSE) measures the differences between the values estimated by the CommunityFlu model and those actually observed in the CommunityFlu model. It is calculated by taking the square root value of the mean square error. RMSE values range from zero to infinity, with a value of zero indicating that the observed points and estimated points are a perfect fit, thus being an ideal relationship. This calculation is needed when comparing the estimate/model results found within the same data categories (i.e., influenza rates from different years). A small value indicates that the estimated values are following the path of the actual values. Thus the smaller the RMSE, the better the fit of the model. The Community Flu software does compute the value for RMSE, however, you must enter the formula for the MSE (listed below) in order to obtain the RMSE.

$$RMSE = \sqrt{\Sigma [(Xo-Xe)2]/N}$$

o represents the points actually observed.
e represents the points that were estimated from the model.
N represents the total number of points that are plotted on one of the two curves, not the total number of points that exist between both sets of data.
Σ represents the sum of the squared difference between the observed and estimated points.
√ represents the square root sum of the squared differences between the observed and estimated points divided by the total number of points seen on the curve.

The Shifted Values for the Correlation Coefficient and RMSE are used to evaluate the difference between the actual values and the model predicted values when the onset of illness is delayed by three weeks. The curve for the estimated value and the shifted value are the same; however the shifted curve begins 3 weeks after the initial onset of illness. The Shifted Correlation Coefficient and the Shifted RMSE use the observed values

from the 1918 and 1957 pandemic influenza 3 weeks after their initial onset dates.

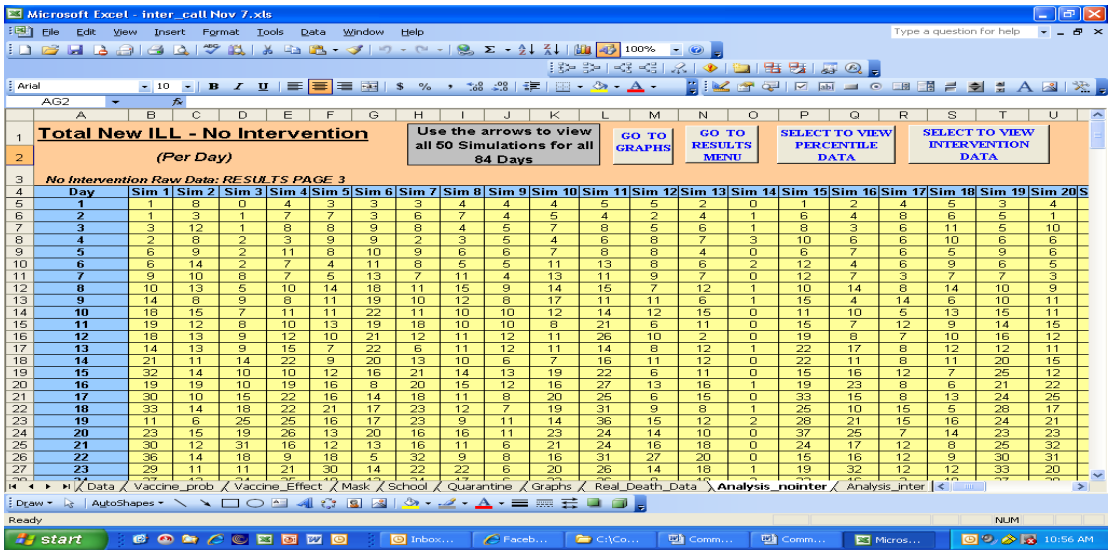
The source of the data (as well as a list of all data) may be seen by scrolling down the page.

Any of this information may be copied, enlarged, and printed for reports and presentations. How these tasks are accomplished are described in the command button labeled “How to Copy, Enlarge, and Print?”

28. When this “Validation” page is open, the Baseline Data spreadsheet labeled “ExcDayAGilln_bas” is automatically opened. The baseline data spreadsheet is needed so that the most recent run of baseline data may be accessed. Without opening the ExcDayAGilln_bas spreadsheet, the baseline data that is used to generate the economic results will be based upon the previously saved set of baseline data, which is inaccurate. The “ExcDayAGilln_bas” worksheet lists the total number of new illness cases observed across all age groups for all 50 simulations.

    Select the “REFRESH BASELINE” command button to close the “ExcDayAGilln_bas spreadsheet. It is assumed that all of the the baseline data that was entered during Step 4 through 8 in the CommunityFlu Procedures: Page-by-Page of this manual has been updated when this spreadsheet has been closed. This command must be selected in order to close the “ExcDayAGilln” worksheet, so that the CommunityFlu software can display subsequent results pertaining to Baseline and Intervention data. Once the data has been updated, the program will automatically return to the Results Menu page.

29. Select the “Raw Data for Selected Simulations” command on the Main Results Page to open the raw data worksheets that list the number of ill per day for 84 days in each of the 50 simulations. The first page to open is the raw data when no intervention is used.



All of the 50 simulations for each of the 84 days is accessed by using the arrows or the mouse to view the complete worksheet.

The “Go To Graphs” command button will open the per day graphs associated with the Selected Simulation when an Intervention was and was not used.

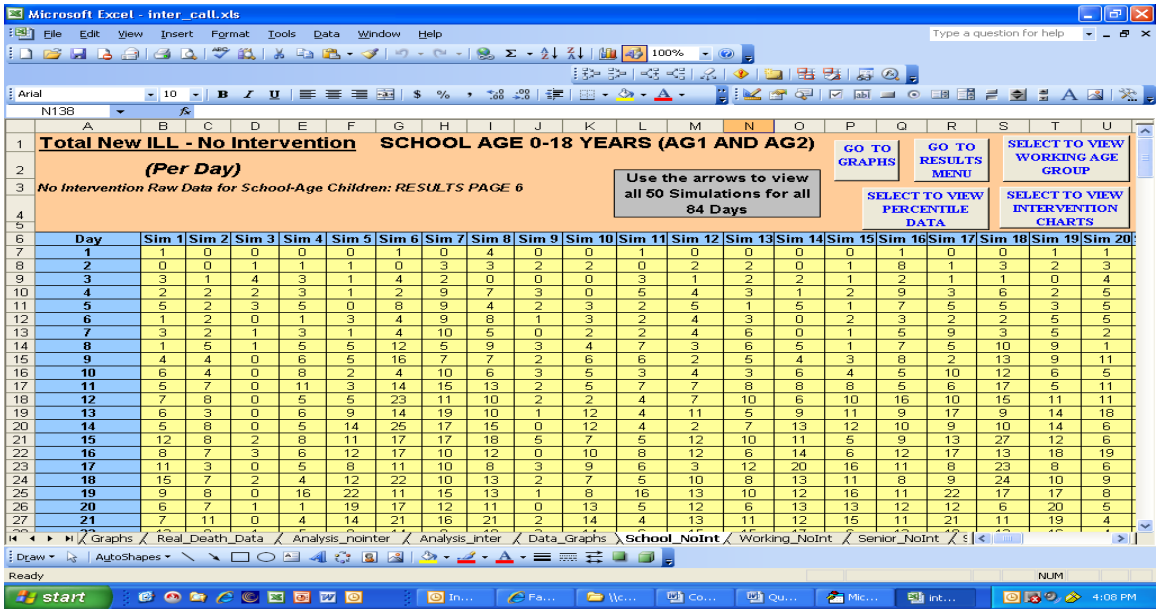
The “Select to View Percentile Data” command button is used to open the percentile (25%, Median, and 75%) rankings that are displayed for the Per Day Selected Simulation Graph (i.e., Total Maximum Number of Cases, Peak Total Number of Ill Cases, and Days to Peak Number of Cases).

The “Select to View Intervention Data” command will upload the raw data for the Total Number of Ill (per day) when an intervention was used.

> The Intervention Charts are displayed in the same manner as the No Intervention Chart, with the same set of command buttons.

Select the “Go to Results Menu” command to return to the Results Menu Page.

30. Select the “Raw Data for Detailed Age Group Simulations” command button to view the actual number of ill cases per day for 50 simulations (With No Intervention) in each age-group subcategory. The first set of raw data displayed is that of School-Age Children (0–18 years), followed by Working-Age Adults (19–64 years), and finally Seniors (65+ years), all of which pertain to simulations with no interventions.



The command “Select to View Intervention Charts” is used to upload the raw data set for the total number of ill when an intervention occurred for each age-group subcategory.

The commands titled “Go Back to No Intervention” allows the Per Day raw data sets to restore the raw data information for the age group simulations when an intervention was not used.

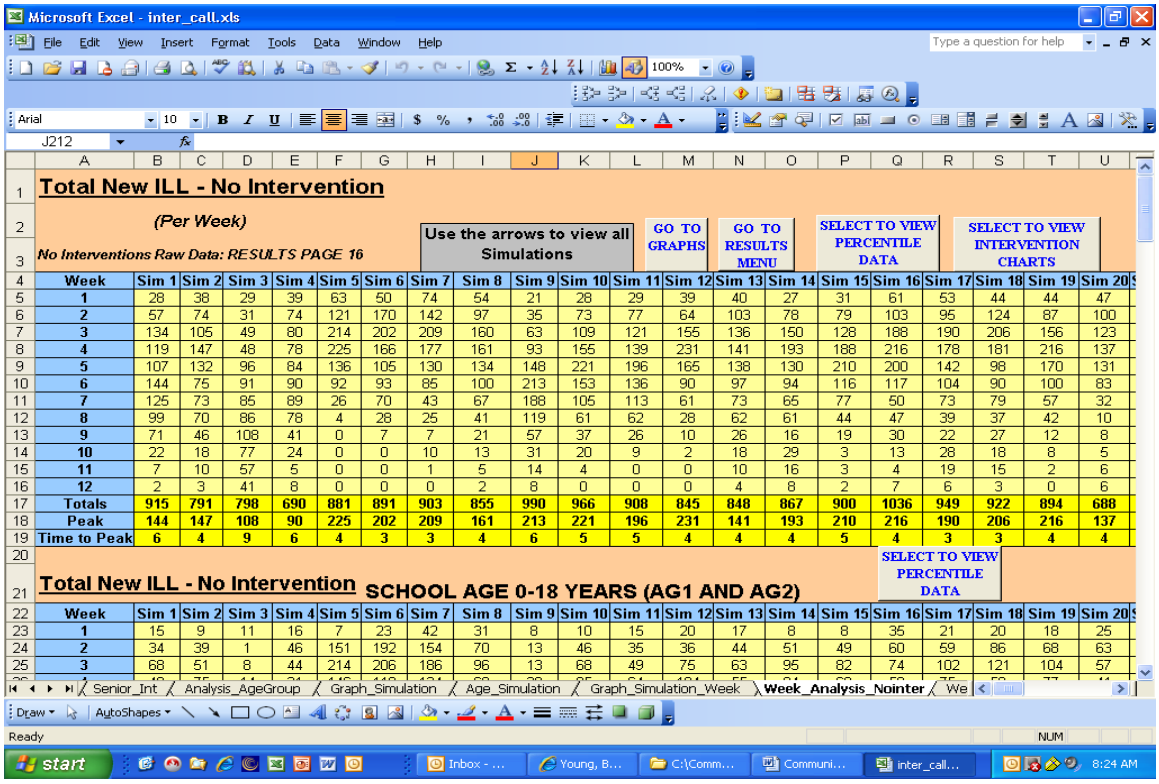
The command “Select To View Percentile Data” opens the Percentile (25%, Median, 75%) rankings for the No Intervention and Intervention Categories for each Age Group identified (School-Age, Working-Age, and Seniors).

The “Go To Graphs” command on each of the Raw Data pages uploads the Detailed Age-Group Simulation Graphs.

There are command buttons on each of the Age Group Raw Data pages that will open the next age group raw data page (i.e., Select to View Working Age Group, Select to View Senior Age Group, Back to School Age Group).

Select the “Go to Results Menu” command on each of the viewable pages to return to the Results Menu Page.

31. Select the “Per Week Results” command button on the Main Results Page to open the Weekly Raw Data Simulation Results without an Intervention (i.e., for all Simulations and for Age-Group Specific Simulations).



The “Select to View Intervention Charts” command uploads the weekly raw data set for the total number of ill when an intervention was used.

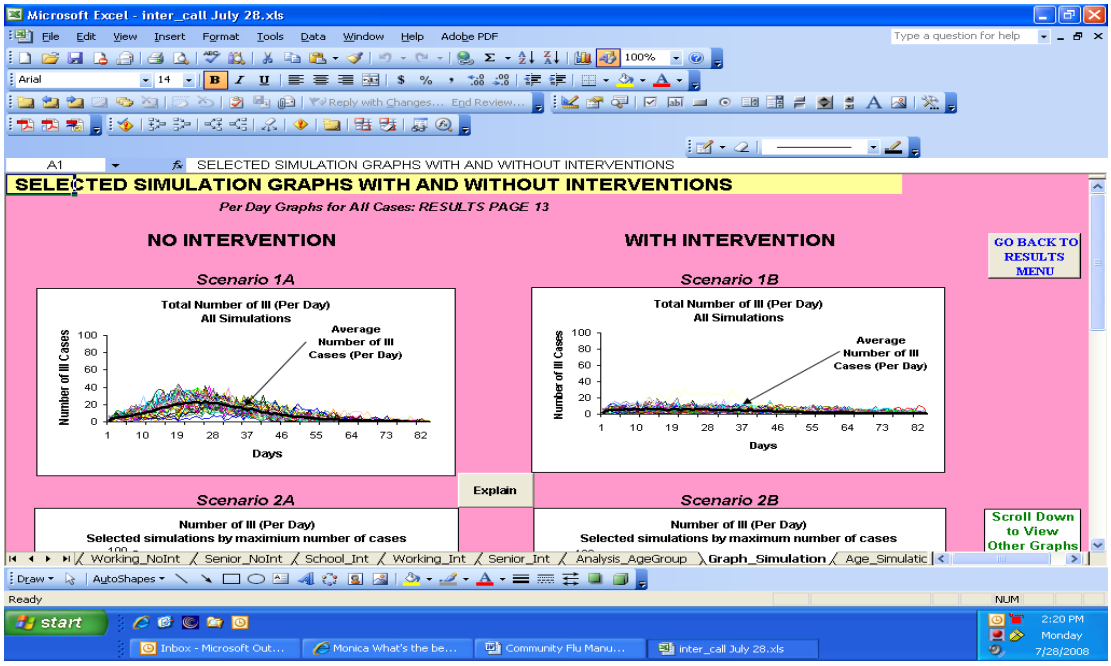
The “Go To Graphs” command on each of the Raw Data pages uploads the Detailed Age-Group Simulation Graph: Per Week Results.

The “Select To View Percentile Data” command on the All Simulations chart uploads the Weekly Percentile (25th, Median, 75th) rankings for the No Intervention and Intervention Categories for Total Maximum Number of Cases, Total Peak Number of Ill Cases, and Days to Peak Number of Cases. The “Select to View Percentile Data” command near the Age Group Raw Data sets uploads the Weekly Percentile (25th, Median, 75th) rankings for the No Intervention and Intervention categories for the School-Age, Working-Age, and Seniors Age groups.

The command button entitled “Go Back to No Intervention” located on the Weekly Raw Data Intervention Chart allows the Weekly Raw Data Sets when no intervention was used to be restored.

Select the “Go to Results Menu” command on any of the weekly raw data pages to return to the Results Menu Page.

32. The next outcome category are Graphs. The first command is the “Selected Simulation Graphs: Per Day” With and Without an Intervention.



There are four sets of scenarios displayed. In order to view each scenario, the mouse or down arrow must be used to scroll down the screen. CommunityFlu runs 50 simulations per day for 84 days for each of the scenarios.

Scenario 1 illustrates the number of ill cases across all 50 simulations without an intervention (1A) and with an intervention (1B). Each color line represents a different simulation. Therefore, there are a total of 50 different simulations. The thicker black line is displayed to illustrate the average number of ill cases across all 50 simulations during the 84 day time period.

Scenario 2 represents the Total Number of Ill for selected simulations by the Maximum Number of Cases without an intervention (2A) and with an intervention (2B) per day for 84 days. These two graphs display the information according to their percentile ranking. The red line represents the 25th percentile, and the black line represents the median percentile. The black line corresponds to the 75th percentile.

Scenario 3 represents the Total Number of Ill for selected simulations by the Days to Peak without an intervention (3A), and with an intervention (3B) per day for 84 days. Peak to Days describes the maximum number of

days someone remains ill. These two graphs also display the information according to their percentile ranking with the red line representing the 25th percentile, the black line representing the median percentile, and the blue line representing the 75th percentile.

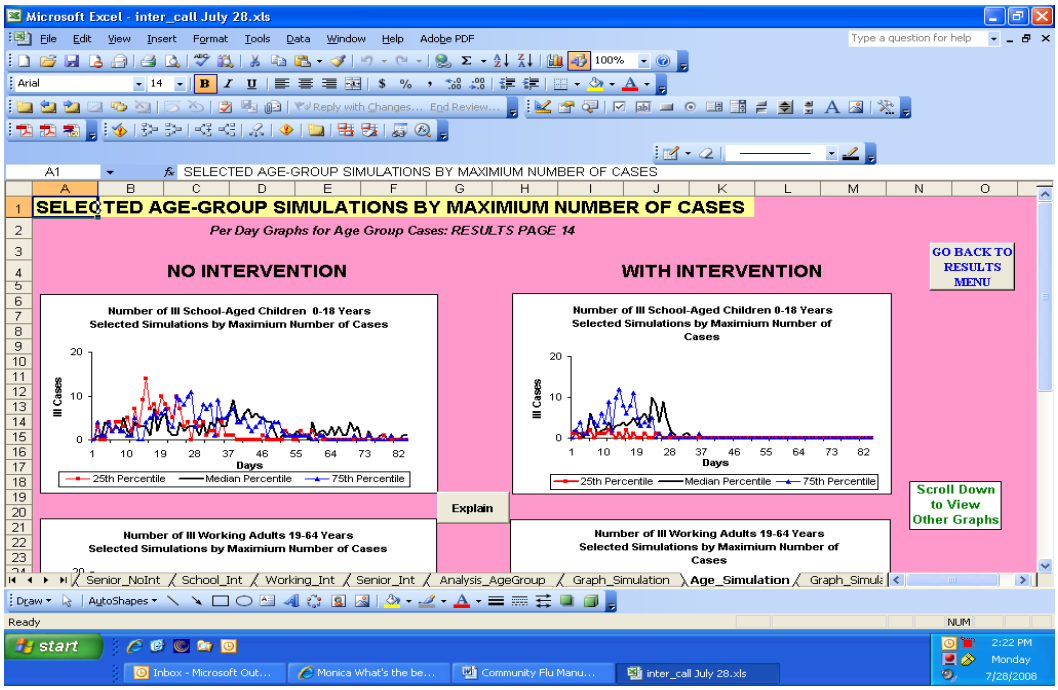
Scenario 4 represents the Total Number of Ill for selected simulations by Maximum Number of Cases at Peak when an intervention was not present (4A) and when an intervention was present (4B). The Maximum Number of Cases across all simulations was identified each day for 84 days. There are four lines represented in this scenario. The gray line represents the maximum number of cases identified throughout all 50 simulations per day for 84 days. The red line represents the 25th percentile, the black line represents the median percentile, and the blue line represents the 75th percentile.

The 25th percentile ranking is described as a set of observations that exceed 25% of the total set. The median percentile is the set of observations that are seen in the middle of the observation set, while the 75th percentile data is a set of observations that exceed 75% of the total set.

Select the “Go Back to Results Menu” command button to upload the Results Menu Page.

33. Select the “Detailed Age Simulations” command to upload the graphs for the Selected Age-Group Simulation for Maximum Number of Cases when an intervention was present, and when an intervention was not present. The Age groups identified are School Age (0–18 Years), Working Age (19–64 Years), and Seniors (65+ Years).

    In an effort to obtain actual statistics for the different age populations, the number of ill from each of the nine Age Groups was identified and added together to obtain the correct sub-population. For instance, School-Age Children were comprised of Age Group 1 (0–4) and Age Group 2 (5–18). Each value seen in Age Group 1 and Age Group 2 were added together to obtain the total School-Age Children Population per day and per week for each simulation. The Working Adults population consisted of Age Group 3 (19–49) and Age Group 4 (50–64), whereas the Senior population comprised of Age Group 5 (65–69), Age Group 6 (70–74), Age Group 7 (75–79) ,Age Group 8 (80–84), and Age Group 9 (85+).



    These graphs display the information according to their percentile ranking. The red line represents the 25th percentile, the black line represents the median percentile, and the blue line corresponds to the 75th percentile. To view the three sets of graphs, use the mouse or down arrow to scroll down the screen.

    Select the “Go Back to Results Menu” command to return to the Results Menu.

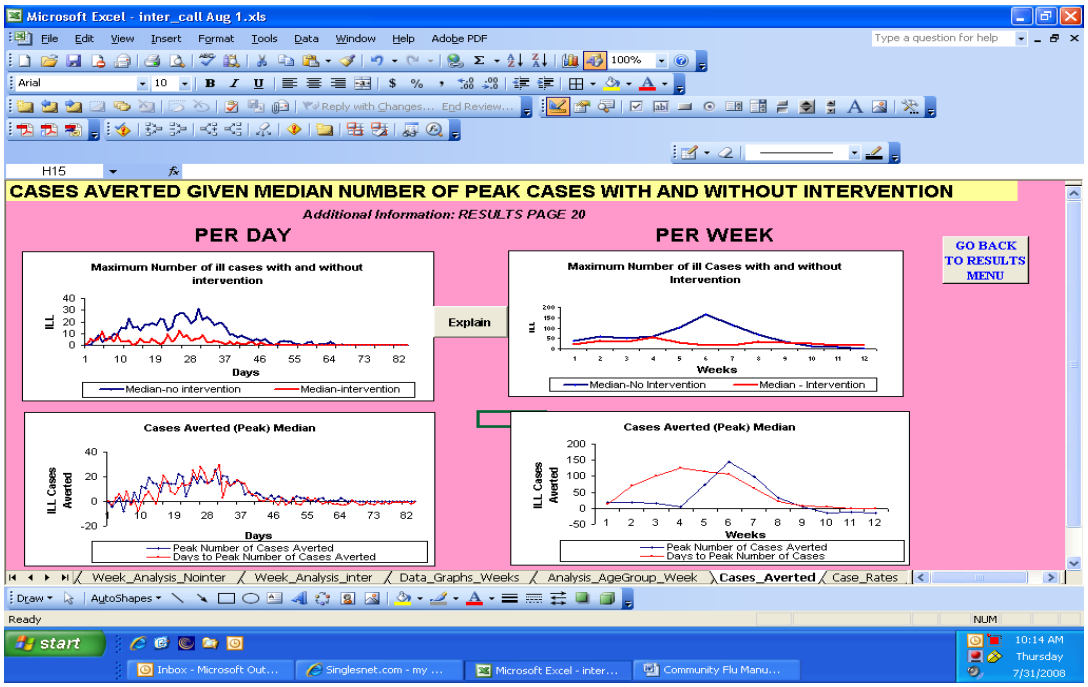
34. The “Selected Simulation Graphs: Per Week” command uploads the Weekly Simulation Graphs when an intervention was and was not used.

    The difference between the two graphs is that one is measured in weeks, while the other is measured in days. Both graphs evaluate the 50 simulations, and both analyze the same percentile (25%, Median, and 75%) rankings. The raw data for the total number of ill that had no intervention and those that had an intervention are viewed on the Weekly Simulation graph page.

    Select the “Go to Per Week Raw Data” to upload the per week raw data for all simulation data and for the detailed age group weekly data.

    Select the “Go Back to Results Menu” command on either the Weekly Graphs or Raw Data worksheets (Interventions and No Intervention pages) to return to the Results Menu Page.

35. The next set of outcomes is labeled Additional Information. The command “Cases Averted” is used to upload two sets of graphs for the number of cases that were averted due to the introduction of an intervention using daily and weekly values for the number of ill.



The first set of graphs displayed represents the Maximum Number of Ill cases with and without an intervention using daily and weekly percentile rankings. These graphs display the median value for the maximum number of ill cases when an intervention was used and when an intervention was not used. The top left graph displays the maximum number of ill cases obtained each day (84 days in total) and for each simulation (50 simulations per day). The top right graph evaluates the maximum number of ill cases each week (12 weeks in total) and for all 50 simulations. The blue line on both graphs represents the median values for the maximum number of ill cases when an intervention was not used, whereas the red line represents the median values for the maximum number of ill cases when an intervention was used.

The second set of graphs displayed evaluates the differences between the median value for the peak number of ill cases and median value for days to peak cases when an intervention was absent and the median value for both the peak number of ill cases and the days to peak number of cases when an intervention was present. The bottom left graph evaluates on a daily basis, whereas the bottom right graph evaluates the information on a weekly basis. The difference seen between the peak number of cases and days to peak number of cases is described as being the cases that were averted due to an intervention being used. The blue line illustrates the maximum number of cases averted, whereas the red line displays the number of cases averted associated with the days to peak number of cases. A negative value indicates

that no case was averted, but a positive value illustrates that cases were averted because of the introduction of an intervention.

Selecting the “Go Back to Results Menu” will upload the Results Menu Page.

36. The “Attack Rates” command uploads a worksheet of Per Day Case Attack Rates when an Intervention was present and when an intervention was not present. The attack rate categories displayed are for the percentile rankings for the Maximum Number of Total Cases, Peak Number of Cases, Days to Peak Number of Cases, Ill School-Aged Children, Ill Working Adults, and Ill Seniors. These attack rate categories were chosen because the graphs from these categories were presented earlier (Refer to Steps 32 and 33 of the Results Section for this manual).

    The weekly attack rates may be viewed by selecting the “Go To Per Week Attack Rates” command. The per week attack rates use the same categories as the per day attack rates.

    Attack Rates are defined as the total number of ill persons within each percentile subcategory divided by the total number of ill persons in the population.

    Selecting the “Go Back to Results Menu” on either of the attack rate worksheets will upload the Results Menu Page.

37. The “Per Week Results” command loacated under the Additonal Information Section uploads the Weekly Case Attack Rates when an Intervention was present and when an intervention was not present. The attack rates categories displayed are for the percentile rankings of the Maximum Number of Total Cases, Peak Number of Cases, Days to Peak Number of Cases, Ill School-Aged Children, Ill Working Adults, and Ill Seniors. These attack rates that are displayed were chosen for these are the same groups for which graphs were presented earlier (Refer to Steps 32 and 33 for the Results Section of this manual).

    The daily attack rates may be viewed by selecting the “Go To Per Day Attack Rates” command. The per day attack rates use the same categories as the per week attack rates.

    Selecting the “Go Back to Results Menu” on either of the attack rate worksheets returns you to the Results Menu Page.

38. The final outcome section is Economics. The “Economic Analysis” command uploads the Economics portion of the CommunityFlu software program. Please refer to the Economics Reporting Section discussed below.

39. Once all of the outcome results have been displayed, three choices are shown.

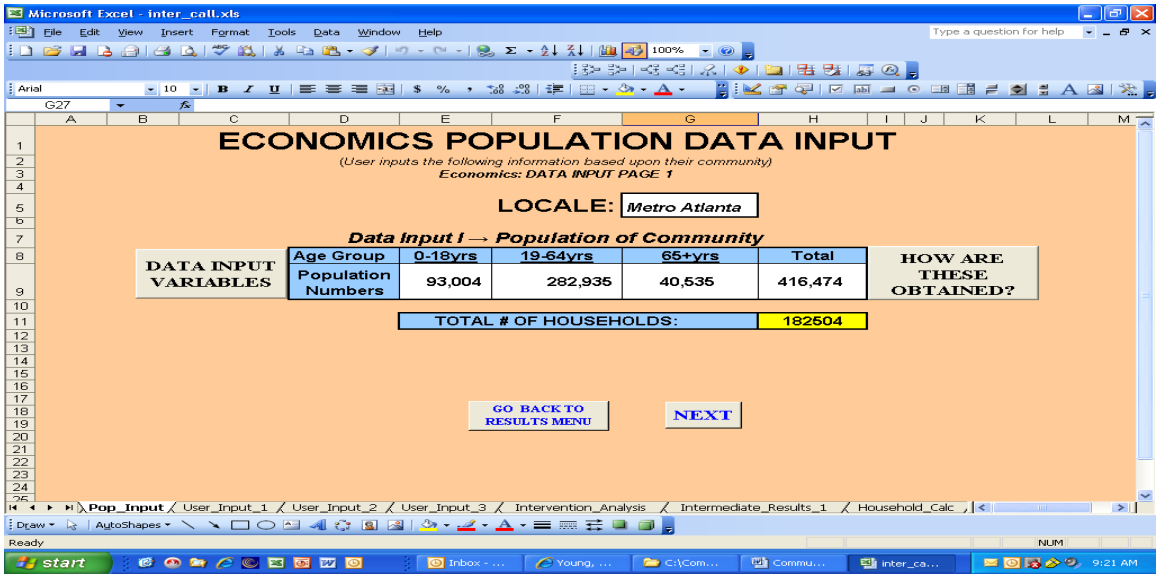
    The first choice is to select the command button “Go Back to Baseline Inputs.” This will upload the first Baseline Input Data Screen labeled Baseline: DATA INPUT PAGE 1. Any of the inputs entered during Steps 4 through 8 of the CommunityFlu Procedures: Step-by-Step Section of this manual can be altered using this command.

    The second option is to select the command button “Go Back to Intervention Inputs.” This will upload the first intervention Input Data Screen labeled Interventions: DATA INPUT PAGE 1. Any of the inputs entered during Steps 18 through 22 of the communityFlu Procedures: Step-by-Step Section of this manual can be altered using this command.

    The “HOME” command upload the Title Page of the CommunityFlu software. It is here where you have the option of either stopping or re-starting the software program by selecting the “START” command button.

Economic Analysis Reporting

40. The “Economic Analysis” button on the Main Reslts page will upload the Economics: DATA INPUT PAGE 1. On this page, the locality and the population of the specific community affected by pandemic influenza is entered.



In the Locale block, enter the name of the community that is planning for the pandemic. You must enter the population information for each age group identified in the Data Input I Population Chart.

The “HOW ARE THESE OBTAINED?” command provides information about how the population for the specific locale is be obtained. The population is derived from the U.S. Census 2000 Data and the U.S. Census Population Estimated Data[1]. For locales that are outside of the U.S. or are unavailable through U.S. Census data, demographic data may also be obtained from other sources such as State and/or Regional Vital Statistic offices and various public health and statistical programs that generate population estimates.

The “DATA INPUT VARIABLES” command describes the information presented in the Data Input I, II, III, and IV charts.

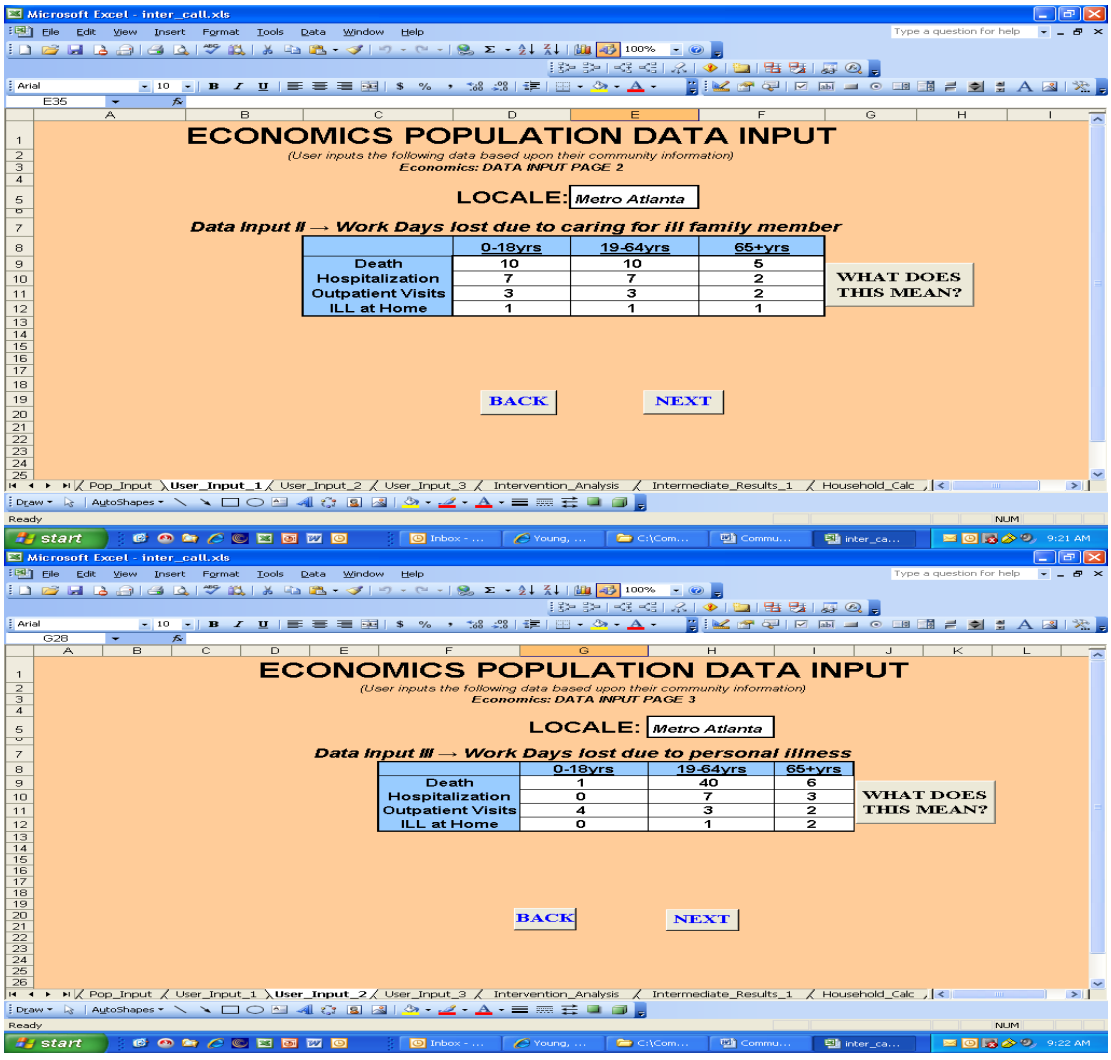
The Total # of households is used to analyze how many households will require adults to remain at home with an ill child. The total number of households is obtained by dividing the total population seen on this page by the total number of people involved in the sample population. This product is then multiplied by the total number of households involved in the sample population. The population results for determining the number of people and number of households identified in the sample population is

obtained from the Population Input Page (Please refer to Step 6 of the CommunityFlu Procedures: Step-by-Step Section of this manual).

Selecting the “Go Back to Results Menu” command button will upload the Results Menu Page.

Select the “NEXT” command button to advance to Economics: DATA INPUT PAGE 2.

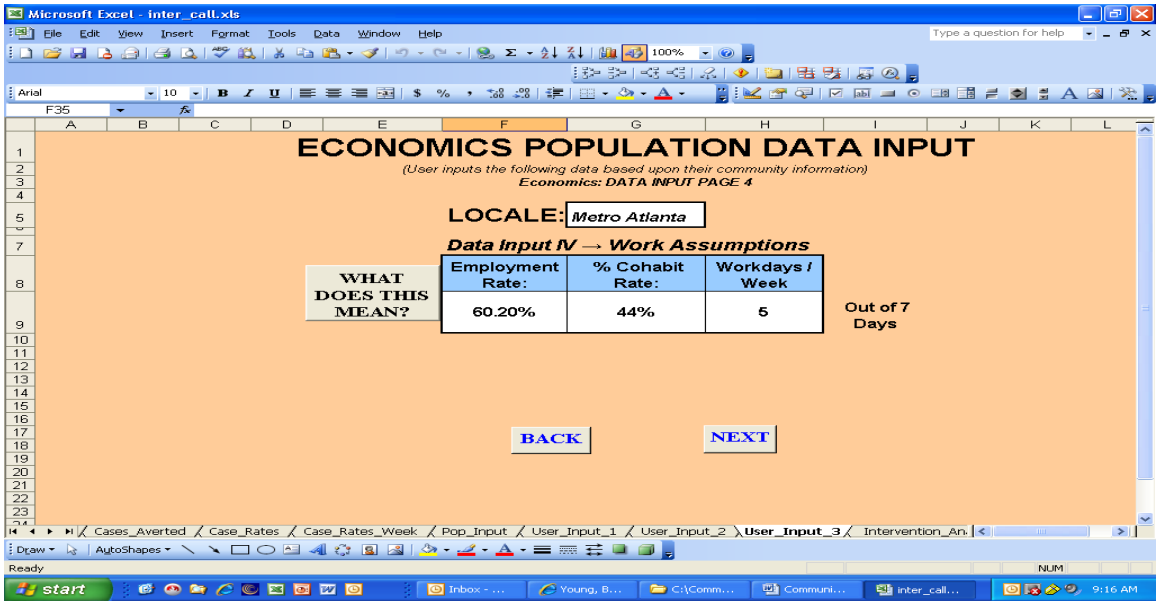
41. The next two screens (Economics: DATA INPUT PAGE 2 and Economics: DATA INPUT 3) look at work days lost. Population Data Input II and Population Data Input III are derived from historical references or may simply be estimates based on pandemic influenza's effect. Population Data Input II is categorized by work days lost due to caring for an ill family member, whereas Population Data Input III corresponds to the number of work days lost due to one's personal illness. Both data inputs are self reported.



The "WHAT DOES THIS MEAN" command buttons provides information about the work days lost due to a person taking care of an ill family member and work days lost due to one's own personal illness. These values were first discussed in the FluWorkLoss software program and should reflect one's specific community. The values shown are default values derived from FluWorkLoss. Therefore, the values may be changed by typing in new values for each type of health outcome (hospitalization, death, outpatient visits, and ill at home) per age group.

Select the “NEXT” command button on each page to advance to the subsequent Economics: DATA INPUT PAGE 4.

42. On the Economics: DATA INPUT PAGE 4, specific work related information is entered in the Data Input IV chart.



The "WHAT DOES THIS MEAN?" command button provides information about the employment rate, cohabitate rate, and the number of workdays per week. This button also provides information on how the values were derived and whether they should be changed to reflect one's specific community.

The Employment Rate is identified through the Flu Work Loss Software Program (See http://www.cdc.gov/flu/excel/FluWorkLoss_073106.xls) and varies among different communities and localities. It is assumed that the employment rate is equal among all household sizes in the community. The employment rates are identified through the U.S. Bureau of Economic Analysis.[19]

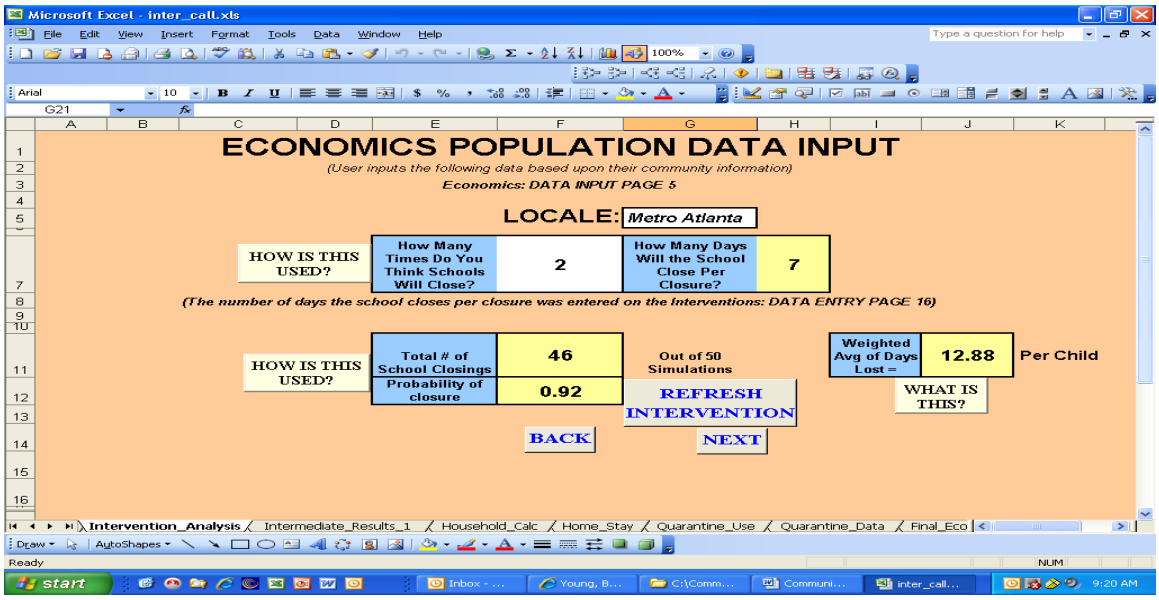
The Cohabitate Percentage is defined as the number of adults that live in a household where there is more than one adult working, thus providing more than one source of income. This rate is also identified through the Flu Work Loss Software Program (http://www.cdc.gov/flu/excel/FluWorkLoss_073106.xls).

The Number of Workdays assumes that 5 working days indicates full-time employment.

Selecting the "BACK" command button will upload the previous Economics: DATA INPUT PAGES.

Selecting the “NEXT” command button will upload the Economics: DATA INPUT PAGE 5 Worksheet.

43. The information on the Economics: DATA INPUT PAGE 5 should be based upon the CommunityFlu simulation runs. The number of times a school is expected to will close throughout the pandemic duration should be entered, but the number of days the school will close per closure is obtained from the Interventions: DATA INPUT PAGE 4 (Refer to Step 21 of the CommunityFlu Procedures: Page-by-Page Section of this manual). Both values are used to calculate the number of days lost, as well as the average number of days lost per child.



The top “How is This Used” command button provides information about how the number of days lost due to an epidemic is determined. The number of days lost is a product of the number of times the school is expected to close and the number of days the school will close per closure (Refer to Interventions: DATA INPUT PAGE 4). This calculation concludes that the longer the school is closed, the more likely that the number of times the school will close will be decreased. This product is also used to determine the average number of days lost per child.

The bottom “How Is This Used” command provides information about the probability of closure. It is defined as being the proportion of the number of times the school closed during one run of the Intervention Simulation to the total number of simulations observed in one run (50 simulations).

The Total Number of School Closings was determined during the Intervention Section of the CommunityFlu Software (Refer to Step 24 under the CommunityFlu Procedures: Step-by-Step section of this manual).

The Weighted Average Number of Days Lost Per Child is the number of days lost due to an Epidemic (Refer to Number of Days Lost described in

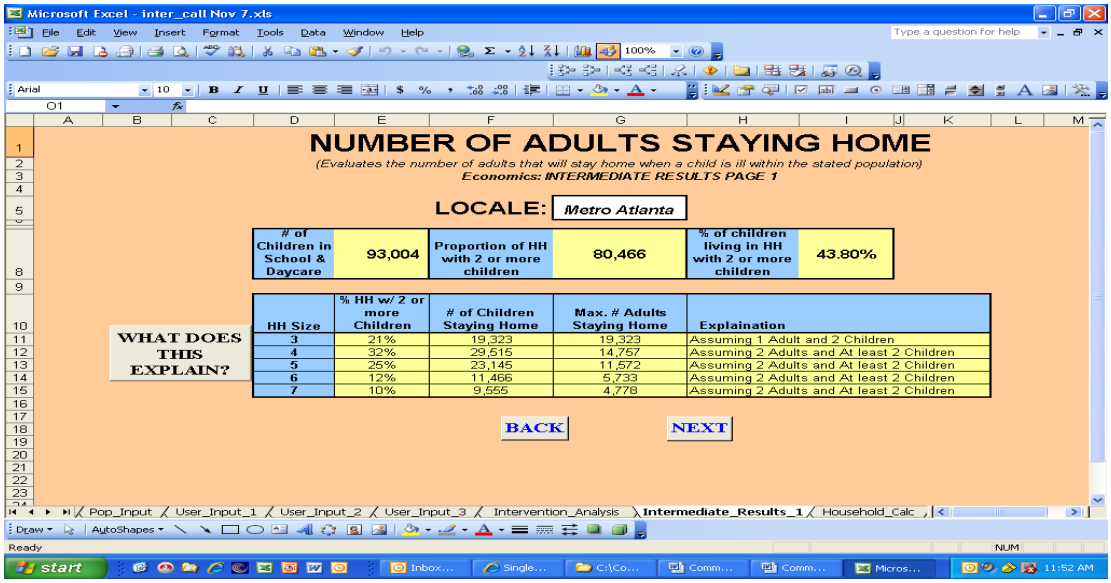
this Step of the Economics Reporting section) multiplied by the probability of school closure (Refer to School Closure described in this Step of the economics Reporting Section).

The command “REFRESH INTERVENTION” is used to update the school closure information that was generated when the Intervention Simulation was run in Step 24 of the CommunityFlu Procedures:Step-by-Step section of this manual. When all of the interventions have been entered and the Intervention has run its own simulation, the CommunityFlu software generates the total probability for each of the 50 simulations and displays this information in a separate program labeled Communityflu_itv.exe. This information is further analyzed in a hidden spreadsheet labeled “School_Value”, which list the simulation and whether a school closing occurred during each simulation. The value returns a “1” if no school closing occurred during the particular simulation, and a “2” is returned if a school closing did occur during the particular simulation. This command must be selected in order to get an adequate count for the number of school closures. Without selecting this command, the economic results will be determined based upon the intervention data that was used in the most recently saved CommunityFlu simulation, which is inaccurate. Selecting the “BACK” command on this “School_Value” worksheet will close the ExcDayAGilln_itv spreadsheet by returning to the Economics: DATA INPUT PAGE 5.

Selecting the “BACK” command button on the Economics: DATA INPUT PAGE 5 will open the Economics: DATA INPUT PAGE 4.

The “NEXT” command button is used to advance to the Economics: INTERMEDIATE RESULTS PAGE 1.

44. The Economics: INTERMEDIATE RESUITS PAGE 1 details the effects school closures could have on whether a parent or guardian is needed to stay home with an ill child.



NUMBER OF ADULTS STAYING HOME

(Evaluates the number of adults that will stay home when a child is ill within the stated population)

Economics: INTERMEDIATE RESULTS PAGE 1

LOCALE: Metro Atlanta

# of Children in School & Daycare	93,004	Proportion of HH with 2 or more children	80,466	% of children living in HH with 2 or more children	43.80%

WHAT DOES THIS EXPLAIN?

HH Size	% HH w/ 2 or more Children	# of Children Staying Home	Max. # Adults Staying Home	Explaination
3	21%	19,323	19,323	Assuming 1 Adult and 2 Children
4	32%	29,515	14,757	Assuming 2 Adults and At least 2 Children
5	25%	23,145	11,572	Assuming 2 Adults and At least 2 Children
6	12%	11,466	5,733	Assuming 2 Adults and At least 2 Children
7	10%	9,555	4,778	Assuming 2 Adults and At least 2 Children

BACK NEXT

The Number of Children in Schools and Daycare Centers is essentially the same number as the childhood population (entered on the Economics: DATA INPUT PAGE 1). This is used because theoretically all children (Ages 0–18) should be enrolled in some form of school until they have been declared an adult.

When calculating the Proportion of HH with 2 or more children, it is assumed that a household size of three or more will contain at least two children and one parent. This value represents the number of children found in the sample population, not in the entire locality population. It is defined as the sum of the number of children observed in a household size of three or more people (Refer to Age and Household Size Data Chart on the Population Input Page – Step 7 of the CommunityFlu Procedures: Step-by-Step Section of this manual) divided by the total number of sample households (Refer to Sample Population Results on the Population Input Page – Step 6 of the CommunityFlu Procedures: Step-by-Step Section of this maual). This value is then multiplied by the total number of households identified in the locality population (Refer to Total Number of Households on the Economics: DATA INPUT PAGE 1 – Step 40 of this Economics Section).

% Children living in a HH with 2 or more children is the proportion of the number of households that have two or more children in the simulation (Refer to the Proportion of HH with two or more children described above) to the total number of households identified in the locality (Refer to Economics: DATA INPUT PAGE 1).

The “WHAT DOES THIS EXPLAIN” command button provides detailed information about how the other values are obtained, as well as explain their importance in analyzing the effects that school closures may have on the number of work days lost seen in a household and for each age group.

The % of HH with 2 or more Children is the proportion of children identified within a particular household size for the sample population to the total number of children identified within the sample population for all household size categories (Refer to the Age and Household Size Chart on the Population Input Page – Step 7 of the CommunityFlu Procedures: Step-by-Step Section of this Manual).

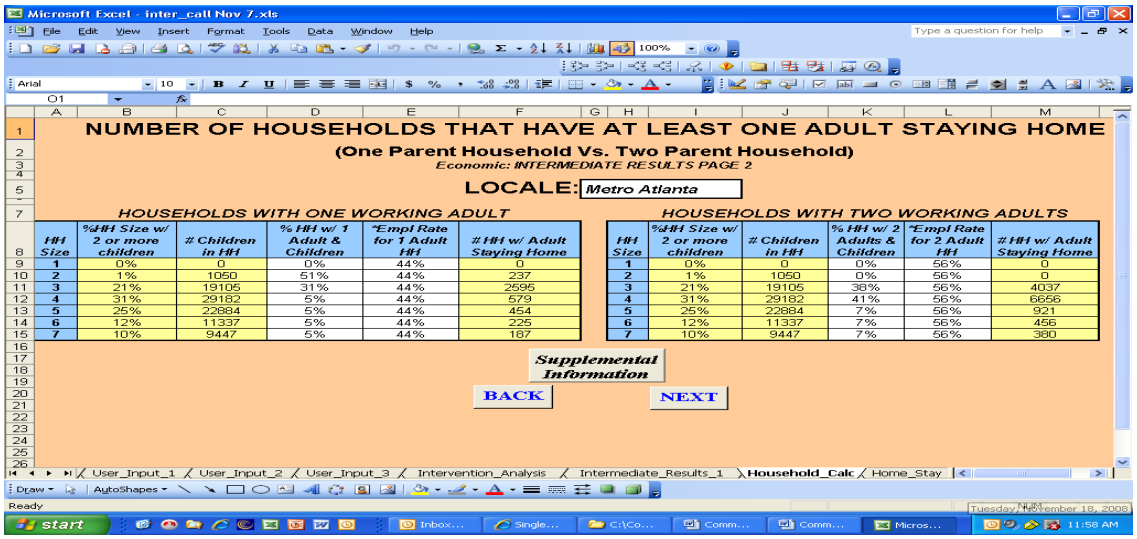
The Number of Children that will Stay Home is the percentage of households with two or more children identified in the sample population multiplied by the total number identified in the locality population (Refer to Economics: DATA INPUT PAGE 1). This is the number for all children (aged 0–18 years) and does not take into consideration their age and whether a parent would send them to another place to be treated.

The Maximum Number of Adults to Stay Home takes into consideration whether the household has one or two parents. If the household has one parent, then it is assumed that the number of adults that must stay home (regardless of the child’s age) is equivalent to the number of children that will stay home. Since the software program analyzes homes with two or more children, we assumed that Household Size 3 will be the only household size with one parent in order to obtain households with two or more children. Therefore, the remaining household sizes will have two parents by which the maximum number of adults staying home is half the number of children that will stay home.

Selecting the “BACK” command button will upload the Economics: DATA ENTRY PAGE 5.

Selecting the “NEXT” command button will advance the software onto the Economics: INTERVENTION RESULTS PAGE 2.

45. The Economics: INTERVENTION RESULTS PAGE 2 displays two different charts that describe households with one and two working adults within a given locality.



NUMBER OF HOUSEHOLDS THAT HAVE AT LEAST ONE ADULT STAYING HOME

(One Parent Household Vs. Two Parent Household)

Economic: INTERMEDIATE RESULTS PAGE 2

LOCALE: Metro Atlanta

HOUSEHOLDS WITH ONE WORKING ADULT

HH Size	%HH Size w/ 2 or more children	# Children in HH	% HH w/ 1 Adult & Children	*Empl Rate for 1 Adult HH	# HH w/ Adult Staying Home
1	0%	0	0%	44%	0
2	1%	1050	51%	44%	237
3	21%	19105	31%	44%	2595
4	31%	29182	5%	44%	579
5	25%	22884	5%	44%	454
6	12%	11337	5%	44%	225
7	10%	9447	5%	44%	187

HOUSEHOLDS WITH TWO WORKING ADULTS

HH Size	%HH Size w/ 2 or more children	# Children in HH	% HH w/ 2 Adults & Children	*Empl Rate for 2 Adult HH	# HH w/ Adult Staying Home
1	0%	0	0%	56%	0
2	1%	1050	0%	56%	0
3	21%	19105	38%	56%	4037
4	31%	29182	41%	56%	6656
5	25%	22884	7%	56%	921
6	12%	11337	7%	56%	456
7	10%	9447	7%	56%	380

Supplemental Information

BACK NEXT

The “Supplemental Information” command button provides information about the various category titles listed.

HH Size is the number of people that reside in a household.

The % of HH with 2 or more Children is the proportion of children identified within a particular household size for the sample population to the total number of children identified within the sample population for all household size categories (Refer to the Number Of Individuals by Age and Household Size Data Chart found on the Population Input Page – Step 7 of the communityFlu Procedures: Step-by-Step Section of this manual). It is assumed that households must contain at least one adult and two children; therefore, the values for Household Sizes 1 and 2 are zero because they cannot meet the minimum requirement of having at least one adult and two children.

The Number of Children per Household is gathered from the Number Of Individuals by Age and Household Size Data Chart found on the Population Input Page. There are no children in HH Size 1 because it is assumed that all children must at least have one adult present in a household. Therefore, the household size must be at least be two people for single parent homes, while for two parent homes the household size must at least be three people. This value is defined as being the product between the % of household with two or more children and the total number of children identified in the locality population (Refer to Economics: DATA INPUT PAGE 1).

The % HH with 1 Adult and % HH with 2 Adults with children was obtained from the U.S. Census Bureau, Current Population Reports: Families by Number of Own Children under 18 Years Old Between 1990 and 2005.[20] This source references households that have one parent with one, two, and three (or more) children and households that have two parents with one, two, and three (or more) children. Single parent households with more than three children (HH 4) are obtained by dividing the percentage of households with one parent and three or more children by the remaining number of household sizes (i.e., HH 4, HH5, HH6, and HH7). Two parent households with three or more children (HH 5) are obtained by dividing the percentage of households with two parents and three or more children by the remaining number of household sizes (i.e., HH 5, HH6, and HH7).

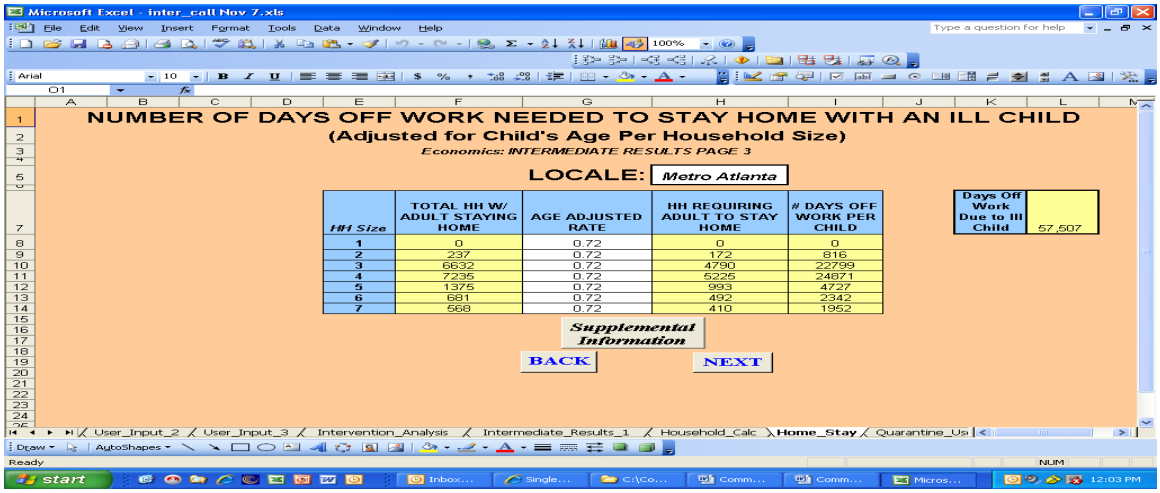
The Employment Rate used was from Year 2007 Bureau of Labor Statistics (http://www.bls.gov/cps/cpsaat22.pdf).[21] It is assumed that the employment rates did not differ within the household sizes as long as the community locality and type of household (i.e., one parent versus two parents) remained the same.

The Number of HH with an Adult Staying Home for a Specific Locality is computed per household size by multiplying the number of children that reside in a household by the % HH with an Adult and Children by the Employment Rate for Each Household Size. The age of the child is not taking into consideration on this chart, but will be addressed on the Economics: INTERMEDIATE RESULTS PAGE 3).

Selecting the “BACK” command will upload the Economics: INTERMEDIATE RESULTS PAGE 1.

Selecting the “NEXT” command button will upload the Economics: INTERMEDIATE RESULTS PAGE 3.

46. The Economics: INTERMEDIATE RESULTS PAGE 3 analyzes the number of days off work a parent needs in order to take care of an ill child. This page does take into consideration the age of the child. It is assumed that children 14 years and older do not require an adult to stay home with them. However, this age-adjusted rate may be changed to reflect specific locality information for adult supervision of a child.



The “Supplemental Information” command button provides information about the Number of Days Off Work a parent needs in order to take care of an Ill child within each Household Size Category, as well as describes the Total Number of Work Days a parent needs to remain at home with ill children.

Total HH with An Adult Staying Home is the summation of the number of households that require an adult to stay home in a one parent and two parent household (Refer to Economics: INTERMEDIATE RESULTS PAGE 2).

Age Adjusted Rate is the proportion of the age groups that must have an adult home (0–13 years) to the total number of child age groups (0–18 years). It is assumed that children 14 years and older do not require an adult to stay home.

HH Requiring an Adult to Stay Home is the product of the Total HH with an Adult Staying Home and the Age Adjusted Rate.

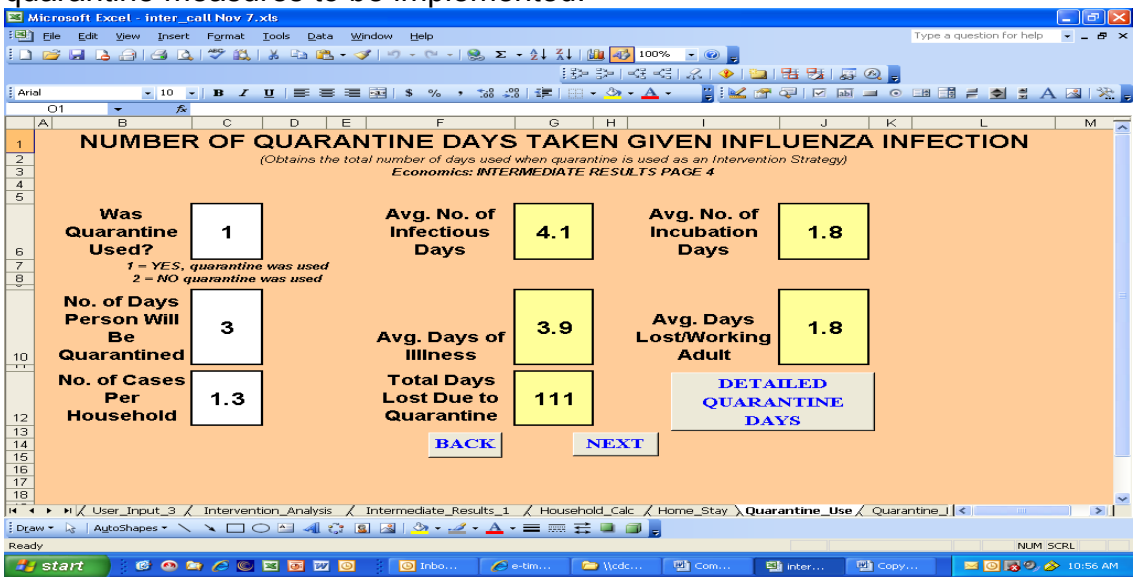
The # of Days of Work per Household Size is the product between the Number of Households Requiring an Adult to stay Home and the previously determined Weighted Average Number of Days Lost calcuated on Economics: DATA INPUT PAGE 5 (Please Refer to Step 43 of this Economics Section).

The Total Number of Days Off Work Due To Ill Child is the total number of days off work for all Household Sizes.

Selecting the “BACK” command button will upload the Economics: INTERMEDIATE RESULTS PAGE 2.

Selecting the “NEXT” command will advance the CommunityFlu software to the Economics: INTERMEDIATE RESULTS PAGE 4.

47. The Economics: INTERMEDIATE RESULTS PAGE 4 describes the number of days taken given that the influenza infection has been serious enough for quarantine measures to be implemented.



Was Quarantine Used is determined from the Interventions: DATA INPUT PAGE 5 (Step 22 of the CommunityFlu Procedures: Step-by-Step Section of this manual). The number 1 indicates that a quarantine measures was used, while the number 2 indicates that no information was entered on the Interventions: DATA INPUT PAGE 5 and therefore no quarantine measures had been implemented.

No. of Days a Person Will Be Quarantined and the No. of Cases Per Household are both self reported. Thus, they are estimates based upon the specific community that is being assessed for quarantine.

Average No. of Infectious Days is a calculation derived from Baseline: DATA INPUT PAGE 2 (Step 9 of the CommunityFlu Procedures: Step-by-Step Section). It is computed by taking the sum of the product between the number of days (Day 3, Day 4, Day 5, and Day 6) and the input value for the specific day.

Average No. of Incubation Days is a calculation derived from the Baseline: DATA INPUT PAGE 2 (Step 9 of the CommunityFlu Procedures: Step-by-Step Section). It is computed by taking the sum of the product between the number of days (Day 1, Day 2, and Day 3) and the input value for the specific day.

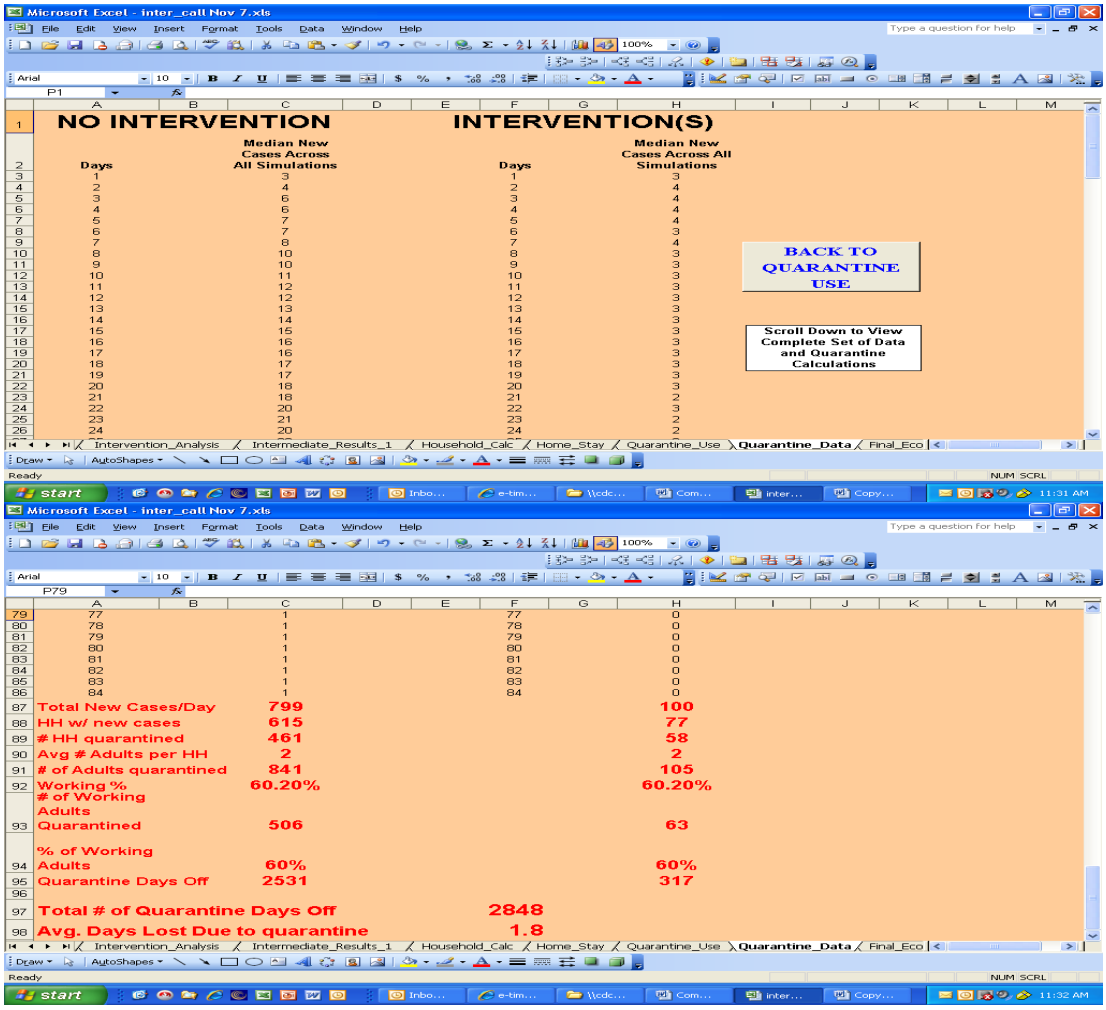
Average Days of Illness is a computed by taking the difference between the number of infectious days and the number of days an entire household remains in the home due to an ill family member being quarantines (obtained from the Interventions: DATA INPUT PAGE 5 – Step 22 of the

CommunityFlu Procedures: Step-by-Step Section). This value is then added to the Average Number of Incubation Days.

Average No. of Days Lost per Working Adult is computed by obtaining the product between the Average Days of Illness, % of Working Adults (Employment Rate obtained from the Economics: DATA INPUT PAGE 4), and the percentage of entire household that remain in the home due to an ill family member being quarantined (Refer to the Interventions: DATA INPUT PAGE 5 – Step 22 of the CommunityFlu Methodology and Procedures Section).

Total Days Lost Due to Quarantine is computed by obtaining the product between the Average Days Lost per Working Adult and the Number of Working Adults that was quarantined when the intervention was used (See Detailed Quarantine Days Spreadsheet labeled “Quarantine_Data”).

48. The command button “DETAILED QUARANTINE DAYS” is used to advance to a spreadsheet that lists the Median New Cases Across All Simulations for each of the 84 days found in the simulation when an Intervention was and was not used.



Total New Cases is the sum of all the median number of cases across all simulations when an Intervention was and was not used.

HH with new cases is computed by dividing the total number of new cases by the No. of Cases per Household (entered on the previous page, Economics: INTERMEDIATE RESULTS PAGE 4).

No. of HH Quarantined is computed by obtaining the product between the number of HH with new cases and the percentage of entire households that are quarantined and compliant because an ill family member was sent home (Refer to the Interventions: DATA INPUT PAGE 5 – Step 22 of the CommunityFlu Methodology and Procedures Section).

Average No. of Adults per HH is calculated by taking the sum of the number of people in the sample population (refer to) and dividing it by the total number of households found in the sample population. Both the number of people and number of households found in the sample population are derived from the Population Data Input Page – Step 6 of the CommunityFlu Procedures: Step-by-Step Section of this manual.

No. of Adults Quarantined is computed by taking the product between the Average No. of Adults per HH and the No. of HH that are quarantined.

% of Working Adults is the Employment Rate obtained from the Economics: DATA INPUT PAGE 4 - Step 42 of this Economics Section.

No. of Working Adults Quarantined is computed by taking the product between the % of Working Adults and the No. of Adults that are quarantined.

No. of Quarantine Days Off is calculated by obtaining the product between the No. of Working Adults Quarantined and the No. of Typical Work Days (obtained from Economics: DATA ENTRY PAGE 4 – Step 42 of the Economics Section found in this manual).

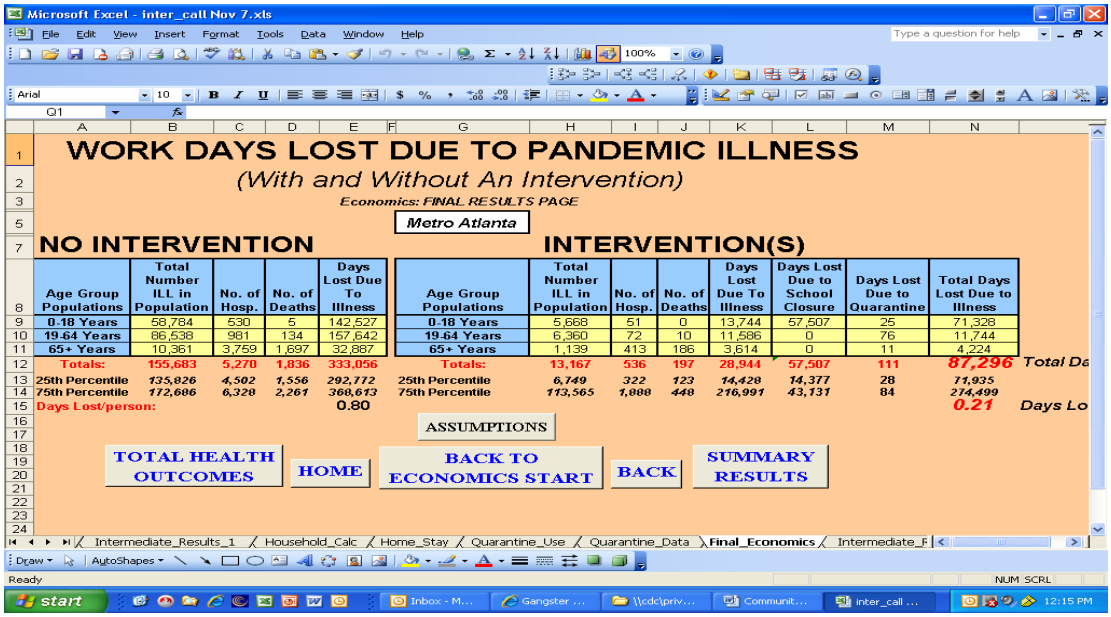
Total No. of Quarantine Days Off is the sum between the No. of Quarantine Days when an Intervention was and was not used.

Select the “BACK TO QUARANTINE USE” command to return to Economics: INTERMEDIATE RESULTS PAGE 4.

Once the Economics: INTERMEDIATE RESULTS PAGE 4 is active again, Selecting the “BACK” command button again will upload the Economics: INTERMEDIATE RESULTS PAGE 3.

Selecting the “NEXT” command button will advance to the CommunityFlu software program to the Economics: FINAL RESULTS PAGE.

49. This final economics page analyzes the number of days lost per age group when an intervention is used and when an intervention is not used.



Microsoft Excel - inter_call Nov 7.xls

WORK DAYS LOST DUE TO PANDEMIC ILLNESS

(With and Without An Intervention)

Economics: FINAL RESULTS PAGE

Metro Atlanta

NO INTERVENTION

Age Group Populations	Total Number ILL in Population	No. of Hosp.	No. of Deaths	Days Lost Due To Illness
0-18 Years	58,784	530	5	142,527
19-64 Years	86,538	981	134	157,642
65+ Years	10,361	3,759	1,697	32,887
Totals:	155,683	5,270	1,836	333,056
25th Percentile	135,826	4,502	1,556	292,772
75th Percentile	172,686	6,328	2,261	368,613
Days Lost/person:				0.80

INTERVENTION(S)

Age Group Populations	Total Number ILL in Population	No. of Hosp.	No. of Deaths	Days Lost Due To Illness	Days Lost Due to School Closure	Days Lost Due to Quarantine	Total Days Lost Due to Illness
0-18 Years	5,668	51	0	13,744	57,507	25	71,328
19-64 Years	6,360	72	10	11,586	0	76	11,744
65+ Years	1,139	413	186	3,614	0	11	4,224
Totals:	13,167	536	197	28,944	57,507	111	87,296
25th Percentile	6,749	322	123	14,428	14,377	28	11,935
75th Percentile	113,565	1,888	448	216,991	43,131	84	274,499
							0.21

Total Da

Days Lo

ASSUMPTIONS

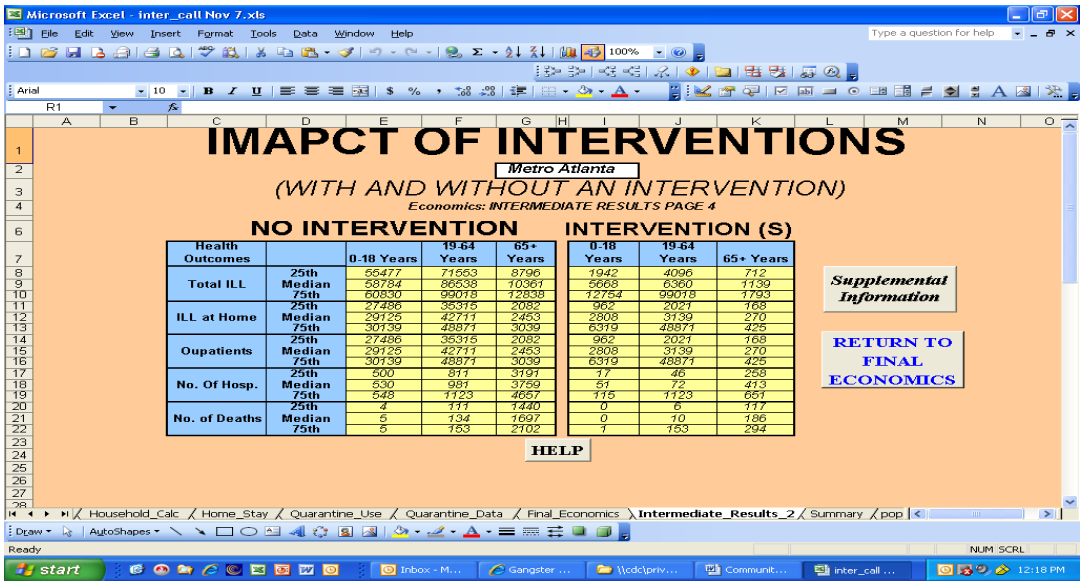
TOTAL HEALTH OUTCOMES | HOME | BACK TO ECONOMICS START | BACK | SUMMARY RESULTS

Intermediate_Results_1 | Household_Calc | Home_Stay | Quarantine_Use | Quarantine_Data | Final_Economics | Intermediate_R

Ready

Both the No Intervention and Intervention Charts provide information about the total health outcomes that were identified in the Population and the Simulation (Total Health Outcomes Command), Number of work days lost because of a pandemic illness, Days Lost Due to School Closures, and Days Lost due to Quarantine for the three different age populations (Children, Working Adults, and Seniors).

50. Selecting the “Total Health Outcomes Command” will upload the Economics: FINAL RESULTS PAGE 2, which provides information about the Number of Ill, Hospitalizations, Deaths, Outpatient Visits, and Those Sick at Home for each age group population.



Health Outcomes		NO INTERVENTION 0-18 Years	19-64 Years	65+ Years	INTERVENTION (S) 0-18 Years	19-64 Years	65+ Years
Total ILL	25th	55477	71553	8796	1942	4096	712
	Median	58784	86538	10361	5668	6380	1139
	75th	60530	99018	12838	12754	99018	1793
ILL at Home	25th	27486	35315	2082	962	2021	168
	Median	29125	42711	2453	2808	3139	270
	75th	30139	48871	3039	6319	48871	425
Oupatients	25th	27486	35315	2082	962	2021	168
	Median	29125	42711	2453	2808	3139	270
	75th	30139	48871	3039	6319	48871	425
No. Of Hosp.	25th	500	811	3191	17	46	258
	Median	530	981	3759	51	72	413
	75th	548	1123	4657	115	1123	651
No. of Deaths	25th	4	111	1440	0	6	117
	Median	5	134	1697	0	10	186
	75th	5	153	2102	1	153	294

The first chart displayed (and the most important for this analysis) is analyzed according to the locality population (Refer to Economics: DATA INPUT PAGE 1) and the Sample Population Information (Refer to POPULATION INPUT PAGE).

The “HELP” button provides information about the Age Groups and explains how each column heading is computed.

The Total No. of Ill is computed by multiplying the Age Group population (Refer to Economics: DATA ENTRY PAGE 1) by the Number of ILL in the Simulation (found on the lower chart, but computed on the Per Day Age Group Percentiles: RESULTS PAGE 12 Worksheet – Step 30 of the Results Section found in this manual) divided by the total sample population (found on the POPULATION INPUT PAGE in the Sample Results Data Chart).

The Number of Hospitalizations is calculated by multiplying the hospitalization rate (per age group) by the Total Number of Ill (per age group). The Number of Deaths is computed in the same manner (use the death rates per age group). The hospitalization and death rates for each age group is found on the Baseline: DATA INPUT PAGE 10 (Step 12 of the CommunityFlu Procedures: Page-by-Page Section of this manual).

The Number of Outpatient Visits is assumed to be half the sum of the number of the hospitalizations, deaths, and the total number of ill for each age group.

The Number of Ill at Home is assumed to be the difference between the total number of ill, number of hospitalizations, number of deaths, and number of outpatient visits.

The second chart is the "# of Ill, Hospitalizations, Outpatients, and Deaths," which is composed of information gathered during the CommunityFlu simulation process on the Per Day Age Group Percentiles: RESULTS PAGE 12 – Step 30 of the Results Sections found in the manual. The column headings remain the same from the top chart; however, the major difference is that the Total Number of Ill is computed on the Per Day Age Group Percentiles: RESULTS PAGE 12 Worksheet, and is described as being the total percentile (25th, Median, and 75th) for each day of the simulation.

The "Supplemental Information" button provides a description on how the information is gathered and displayed on each of the charts that are presented on this page.

Selecting the "RETURN TO FINAL ECONOMICS" command button will upload the Economics: FINAL RESULTS PAGE.

51. Once the Economics: FINAL RESULTS PAGE is reopened, the information regarding Days Off Work when an intervention was used and when an intervention was not used is shown.

    The TOTAL NUMBER OF ILL IN POPULATION is the Median Value for the Total Number of Ill (Refer to Economics: FINAL RESULTS PAGE 2). It is the proportion of the number of ill found in the simulation versus the age population identified in the sample multiplied by the total age population for the specific locality.

    No. of HOSPITALIZATIONS and No. of DEATHS is derived from the Economics: FINAL RESULTS PAGE 2.

    DAYS LOST DUE TO ILLNESS was identified on the Flu_WorkLoss_3 Hidden Sheet, which details the number of days lost per age group for each type of health outcome (i.e., Hospitalizations, Deaths, Outpatient Visits, and Ill at Home) given an intervention(s) was or was not used. The Flu_WorkLoss Hidden Sheets are available by request from Dr. Martin Meltzer (Mmeltzer@cdc.gov) or Charisma Atkins (Catkins@cdc.gov).

    DAYS LOST DUE TO SCHOOL CLOSURE is derived from the total number of days of work lost due to caring for an ill child (Refer to Economics: INTERMEDIATE RESULTS PAGE 3 – Step 46 of this Economics Section). Days lost as a result of being out of work for a school closure should reflect only one age group because the number of days a parent is off is the same as the number of days a child would be out of school.

    DAYS LOST DUE TO QUARANTINE is computed by obtaining the product between the number of days lost due to quarantine (Refer to Economics: INTERMEDIATE RESULTS PAGE 4 – Step 47 of this Economics Section) across all age groups and the proportion of the population for each age group.

    TOTAL DAYS LOST DUE TO AN ILLNESS when an intervention is used is the sum of the number of days lost due to illness, school closure, and the use of quarantine measures.

    The Total Values are shown at the bottom of the INTERVENTION and NO INTERVENTION population charts.

    DAYS LOST PER PERSON when an Intervention is absent is computed by obtaining the proportion between the sum of the number of days lost due to an illness (Refer to Flu_WorkLoss Hidden Sheets) and the Total Locality Population (obtained from the Economics: DATA INPUT PAGE 1).

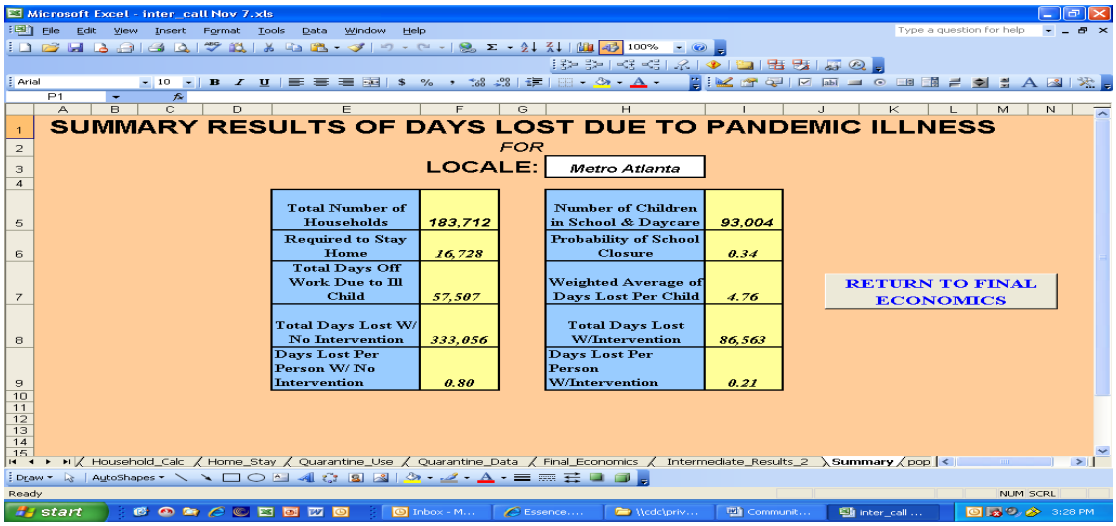
    DAYS LOST PER PERSON when an Intervention was present is computed by obtaining the proportion between the sum of the number of

days lost due to an illness (Refer to Flu_WorkLoss Hidden Sheets), school closure, and implementation of quarantine measures and the Total Locality Population (Refer the Economics: DATA INPUT PAGE 1).

The days lost per person due to an illness when an intervention is used should be smaller than the number of days lost per person when an intervention was not used.

The 25th and 75th Percentile values are shown to illustrate the value ranges for each health outcome column.

52. Selecting the “SUMMARY RESULTS” command button will provides an analysis of the essential health outcomes that were derived throughout the simulation.



The “RETURN TO FINAL ECONOMICS” command button will upload the Economics: FINAL ECONOMICS PAGE.

53. The final command button labeled “ASSUMPTIONS” provides a list of assumptions that were made throughout the Community Flu Software. A complete list of assumptions is available in the following section.

    Selecting the “BACK” command button will upload the Economics: INTERMEDIATE RESULTS PAGE 4.

    The “BACK TO ECONOMICS START” command button will return the CommunityFlu program to the beginning of the Economics section of the CommunityFlu software, starting with Economics: DATA INPUT PAGE 1.

    Selecting the “HOME” command button will return you back to the title page, where you may either stop or re-start the software by selecting the “START” command button on the Homepage.

ASSUMPTIONS

1. It is assumed that each member of the household has contact with every other member of the household during the weekdays and weekends.

2. We assumed, for simplicity purposes, that no contact occurred between children and adults in the community, who were outside of the household during the weekday and weekend community interactions. However, you may change any of the contact and duration information to values that represent your community.

3. It is assumed that contact within day care centers, schools, and workplace only occurs in these settings on weekdays.

4. It is assumed that residents who reside in the long-term care facilities spend more time with other residents and that the duration of contact will remain the same during weekdays as it does on weekends.

5. The number of hospitalization and deaths associated with each age group is derived from the Hospital/Death Rates[7]. We assumed that the relationship between the rates and the age group is singular and that growth in not expected over time. Therefore, the rates for hospitalization and death for the working age and senior age groups is the sum of their individual stratified age groups.

6. The number of children in school is assumed to be the same number as the childhood population because all children (0–18 years) should be enrolled in some form of school.

7. We assume that single parent households with more than one child would be a household size of at least three, while dual parent households with more than one child would be a household size of at least four.

8. Employment rates are assumed to be the same for each HH Size located within the same geographic location.

9. The number of days lost because of personal illness and taking care of someone that was ill will be different values. However, there will be no days lost due to school closures when no intervention was used.

10. We also assumed that children over the age of 14 do not require an adult to stay home with them when they are ill.

Notes to Remember

1. The program will have white, yellow, and deep yellow boxes. The white boxes indicate that the user is able to enter information into the origin. The yellow boxes indicate that these values are set and cannot be changed by the user. The deep yellow boxes indicate that the box contains a formula and thus cannot be changed. The highlighted blue boxes indicate column headings and sub-headings.

2. Whenever you would like to advance to the next screen, select the command "Next."

3. Whenever you would like to return to a previous screen, select the command "Back."

4. For additional information on any topic on any screen, select the command button that describes this topic (i.e., What's This, Supplemental Information, Default Values, Help, Explain).

5. Changing the population statistics and/or the baseline/intervention inputs affects the results outcome.

6. You should try changing different values to see if the result outcomes are affected by a change in the inputs.

REFERENCES

1. U.S Census Bureau. Year 2000 data. Available on the Web at: http://www.census.gov/main/www/cen2000.html

2. Haber MJ, et.al. Effectiveness of Interventions to Reduce Contact Rates during a simulated influenza pandemic. Emerging Infectious Diseases 2007; 13(4):581–589.

3. Longini IM, Halloran ME, Nizam A, Yang Y. Containing Pandemic Influenza with Antiviral Agents. American Journal of Epidemiology 2004; 59:623–633.

4. Longini IM, et.al. Containing Pandemic Influenza at the Source. Science 2005; 309: 083–1087.

5. Elveback LR, et.al. An Influenza Simulation Model for Immunization Studies. American Journal of Epidemiology 1976; 3 (2):152–165.

6. Carrat F, et.al. Time Lines of Infection and Disease in Human Influenza: A Review of Volunteer Challenge Studies. American Journal of Epidemiology 2008; 167:775–785.

7. Haber MJ, et.al. Effectiveness of Interventions to Reduce Contact Rates during a Simulated Influenza Pandemic. Emerging Infectious Diseases 2007; 13(4). Available on the web at: http://www.cdc.gov/eid/content/13/4/581-app.htm.

8. Vynnycky E, Edmunds WJ. Analyses of the 1957 (Asian) influenza pandemic in the United Kingdom and the impact of school closures. Epidemiology Infections 2007; Appendix C: Table C1.

9. Meltzer MI, Cox NJ, Fukada K. The Economic Impact of Pandemic Influenza in the United States: Priorities for Intervention. Emerging Infectious Disease 1999; 5(5):659–671.

10. Aldeort JE, Lurie N, Wasserman J, Bozzette SA. Non-Pharmaceutical Public Health Interventions for Pandemic Influenza: An Evaluation of the Evidence Base BMC Public Health 2007;7:208. Available on the web at: http://www.biomedcentral.com/1471-2458/7/208.

12. Woodall J, Rowson KEK, McDonald JC. Age and Asian Influenza 1957. British Medical Journal; 1958:1316–1319.

13. Cowling BJ, et.al. Preliminary Findings of a Randomized Trial of Non-Pharmaceutical Interventions to Prevent Influenza Transmission in Households. PlosOne; 3(5). Available on the web at: http://www.plosone.org.

14. Jefferson T, et.al. Physical Interventions to interrupt or reduce the spread of Respiratory Viruses: Systemic Review. BMJ Online. Available on the web at: http://www.bmj.com/cgi/content/full/336/7635/77.

15. World Health Organization Writing Group. Nonpharmaceutical Interventions for Pandemic Influenza, National and Community Measures. Emerging Infectious Diseases 2006; 12 (1): 88–91.

16. Crosby A. Actual Number of Influenza and Pneumonia Deaths in select U.S. cities during 1918. Americas Forgotten Pandemic: The Influenza of 1918 (1989): 60–-61.

17. Eickhoff T. Actual Number of Influenza and Pneumonia Deaths in the U.S. for the 1957–1958 Season. The Epidemiology of Asian Influenza 1957–1960, U.S. Department of Health, Education, and Welfare– A Public Health Service Prevention 1960: Figure 15.

18. Trotter, Y. et al. Actual Number of Influenza and Pneumonia Deaths in 108 U.S. Cities during the 1957–1958 Season. Asian Influenza in the United States, U.S. Public Health Service, Communicable Disease Center 1958: 43.

19. U.S. Bureau of Economic Analysis. Available on the Web at: http://bea.gov/regional.

20. U.S. Census Bureau. Current Population Reports: Families by Number of Own Children under 18 Years Old between 1990 and 2005. Available on the web at: http://www.census.gov/population/www/socdemo/hh-fam.

21. Bureau of Labor Statistics. Available on the web at: http://www.ls.gov/cpa/cpsaat22.pdf

APPENDIX

COMMUNITYFLU TRANSMISSION PROBABILITIES

Matrix W1

	0-4 Yrs	5-18 Yrs	19-64 Yrs	65+ Yrs
0-4 Yrs	0.00059	0.00062	0.00033	0.0008
5-18 Yrs	0.00058	0.00061	0.00033	0.0008
19-64 Yrs	0.00057	0.00053	0.00032	0.0008
65+ Yrs	0.00057	0.00054	0.00029	0.00102

Matrix W2

	0-4 Yrs	5-18 Yrs	19-64 Yrs	65+ Yrs
0-4 Yrs	0.00059	0.00063	0.00019	0.00070
5-18 Yrs	0.00059	0.00051	0.00016	0.00068
19-64 Yrs	0.00034	0.00026	0.00034	0.00068
65+ Yrs	0.00050	0.00046	0.00025	0.00087

Matrix W3

	0-4 Yrs	5-18 Yrs	19-64 Yrs	65+ Yrs
0-4 Yrs	0.00032	0.00120	0.00012	0.00040
5-18 Yrs	0.00112	0.00095	0.00008	0.00032
19-64 Yrs	0.00021	0.00012	0.00063	0.00032
65+ Yrs	0.00028	0.00022	0.00012	0.00642

Matrix W4

	0-4 Yrs	5-18 Yrs	19-64 Yrs	65+ Yrs
0-4 Yrs	0.00057	0.00067	0.00030	0.00039
5-18 Yrs	0.00063	0.00063	0.00030	0.00087
19-64 Yrs	0.00052	0.00048	0.00029	0.00146
65+ Yrs	0.00028	0.00059	0.00053	0.00186