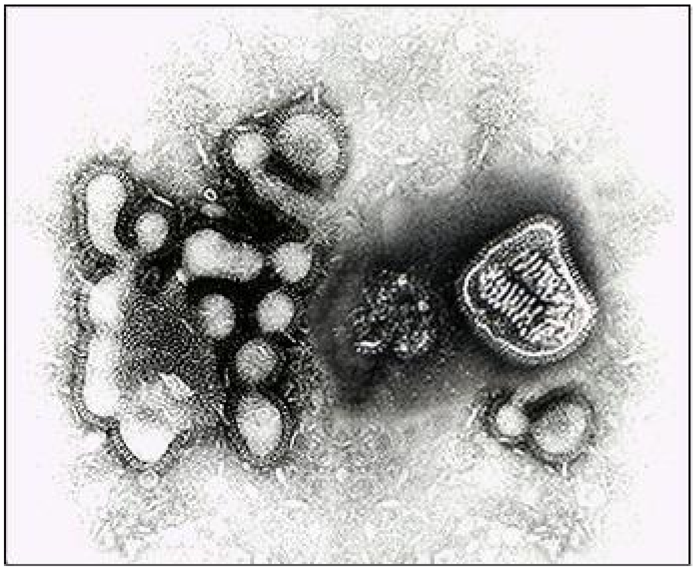

FluWorkLoss

Software to Estimate the Impact of an Influenza Pandemic on Work Day Loss

FluWorkLoss 1.0 Beta Test Version

ACKNOWLEDGMENTS

We would like to thank the Division of Emerging infections and Surveillance Services, NCPDCID, CDC for their tremendous support.

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DISCLAIMER

The numbers generated through FluWorkLoss are not to be considered predictions of what *will* actually occur during an influenza pandemic. Rather, they should be treated as estimates of what *could* happen. Not all potential scenarios in terms of the transmission dynamics of pandemic influenza could be included in this model.

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).

Note: Influenza virus photo on the cover is an electron micrograph magnified 150,000 times over normal size. We thank Dr. Nancy J. Cox for providing this photo.

SYSTEM REQUIREMENTS

FluWorkLoss uses the Windows* operating system (Microsoft Windows 2000 or higher) and Excel (Microsoft Office 2000 or higher). We recommend using a computer with at least a 486 Pentium processor and at least 128MB RAM. FluWorkLoss requires up to 2 megabytes of storage space on the computer's hard drive.

*Microsoft Windows and Office are copyrighted products produced by Microsoft Corporation, WA. Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

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BACKGROUND

Pandemic influenza can overwhelm a community, causing very serious public health, social, and economic problems. Approximately 36,000 deaths and 220,000 hospitalizations per year are related to seasonal influenza in the U.S. (1). The impact of the next influenza pandemic could be several times greater than seasonal influenza. Researchers estimate that during the next influenza pandemic, 15% - 35% of the U.S. population will become clinically ill with the influenza virus (2, 3). Planning ahead in preparation for pandemic influenza, with its potentially very high morbidity and mortality rates, is essential for public health officials and local communities (4A).

Influenza illness is associated with work day loss during annual influenza epidemics and during pandemics. However, because illness rates during a pandemic are likely to be 2-5 times higher than a typical influenza season, special planning for workloss during pandemics is critical to maintain continuity of operations in a severe pandemic. Based on census data and certain assumptions in a given area (e.g., a city, a state, a local community), FluWorkLoss estimates the number of days lost from work due to an influenza pandemic; the length and virulence of the pandemic can be changed in this program so that a range of possible impacts can be estimated.

METHODS

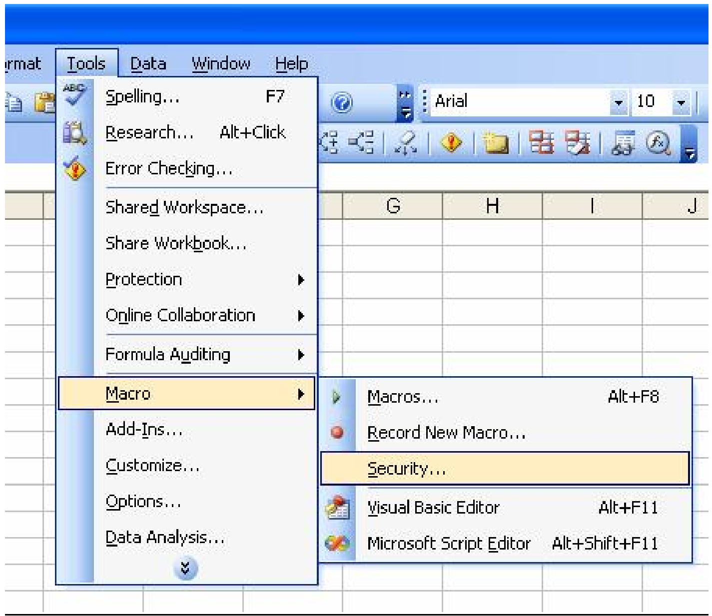
Microsoft Excel/Visual Basic was used to construct FluWorkLoss. Part of FluAid2.0 was built into FluWorkLoss and was used to estimate numbers of deaths and persons hospitalized due to an influenza pandemic (5). You need to provide estimates of your local population in three age groups (0-19, 20-64, and 65+ years) and certain assumptions (work days lost due to influenza illness, work day lost due to caring for family members, employment rate, and percentage of workers cohabiting). You then select the duration of a pandemic (4, 6, 8, or 12 weeks) and the overall clinical illness rate, also called attack rates (15%, 25%, or 35%). Based on these data, FluWorkLoss estimates the number of days lost from work over the course of a theoretical wave of pandemic in theory in a community. In FluWorkLoss, we make some basic assumptions about the "shape" of a pandemic. We assume a single wave of a pandemic with the cases assumed to be distributed over time similar in shape to a normal distribution (i.e. similar to a "bell-shaped" curve). To create a bell-shaped curve, the total number of cases (estimated using FluAid's calculator) was distributed through the chosen time span of a pandemic by assuming that there is a 3% daily increase in the number of cases until the peak number of cases is reached (at the half way point in duration of the pandemic). After the peak, number of cases decrease at a daily rate of 3%. See the section on limitations for further discussion.

LOAD AND START

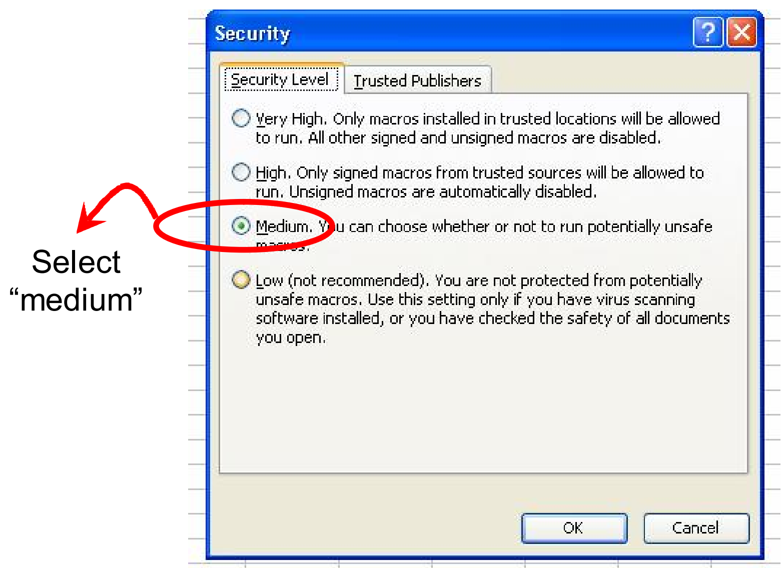
Before loading and starting FluWorkLoss, you must make sure Excel's security level is set appropriately. Because FluWorkLoss uses Excel macro technology, you must first do the following steps:

1). Open a blank Excel spreadsheet. You must open a blank Excel spreadsheet to change the security level. Changing security level with FluWorkLoss open will not allow the software to work.

2). Click Tools and then click Macro, choose Security (as in the diagram below)



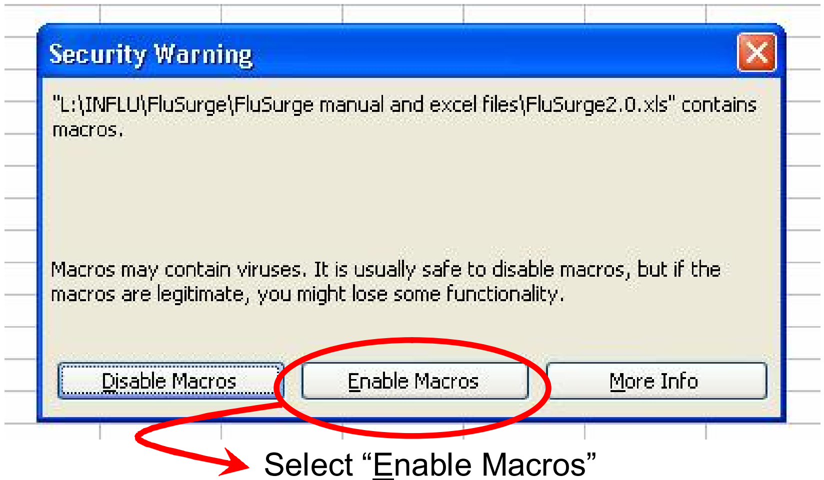
3). Set Security Level to Medium. (see diagram below)



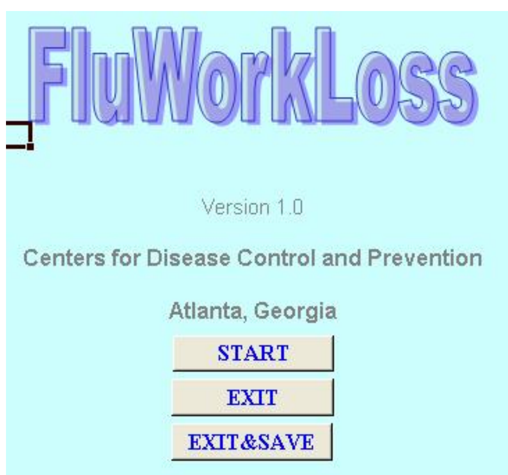
4). Click OK. You are now ready to open FluWorkLoss.

5). Select the "FluWorkLoss" file from the appropriate folder, and double click to open the FluWorkLoss file.

6). When asked to Disable Macros or Enable Macros, click Enable Macros. (see diagram below)



7). Once you have selected "Enable Macros," the software will quickly load and you are ready to click **START** to begin to run FluWorkLoss.



DATA INPUT AND ASSUMPTIONS

1. Enter the population of the area you want FluWorkLoss to work with, broken down into three age groups. For example:

Age Group	0-19yrs	20-64yrs	65+yrs
Population Numbers	80,549,000	166,515,000	35,061,000

The total population of the state or locality being modeled is divided into three age groups: children, typical working adults, and retirees. A set of numbers that you or previous users typed in last time the program was used will automatically appear. All data that you type in will be automatically saved when you click the EXIT&SAVE button, found on the first, opening page of FluWorkLoss (see page 14).

To change any previous values, simply type over them (Default population numbers in the above table are U.S. population by age group in year 2000).

You may wish to consult one of the following sources to get population estimates:

a. State estimates

- U.S. Census Bureau (www.census.gov)

b. Regional estimates

- Vital Statistics office

If the area of interest is outside the United States, contact the regional or national census office for population estimates.

2. Enter the numbers of days lost from work that a worker would miss due to caring for family members who are in the each of the different health outcome and age groups. For example:

	0-19yrs	20-64yrs	65+yrs
Death	**10**	**10**	**5**
Hospitalization	**7**	**7**	**2**
Outpatient	**3**	**3**	**2**
Self-cured	**1**	**1**	**1**

Adverse effects of influenza illness were divided into four categories: death, hospitalizations, outpatient medical visits, self-cured (illness for which no medical care was sought). For the 0-19 age group, assumptions are made by you on how many work days you would expect an adult working parent to take off in order to take care of his/her children who are ≤ 19 years of age with influenza illness. For 20-64 age group, assumptions are made by you on how many work days you would expect a working adult to take off in order to take care of his/her adult partner who has influenza illness. For the 65+ age group, assumptions are also made by you on how many work days you would expect a working adult to take off in order to take care of his/her parent(s) with influenza illness. In the above example, a worker would miss 7 days of work for caring for an ill child hospitalized from influenza.

A set of numbers that you or previous users typed and saved last time will automatically appear. To change previously entered values, simply type over them. All data that you type in will be automatically saved when you click the EXIT&SAVE button, found on the first, opening page of FluWorkLoss (see page 14).

3. Enter numbers of days lost from work due to illness for the ill person by different triages and age groups

	0-19yrs	20-64yrs	65+yrs
Death	0	40	0
Hospitalization	0	7	0
Outpatient	0	3	0
Self-cured	0	1	0

Four categories of triages (death, hospitalizations, outpatient visits, self-cured) are included. For 20-64 age group, assumptions are made by you on how many work days you would expect a working adult to take off because of his/her own influenza illness. We assume for simplicity that there are no work day loss for 0-19 and 65+ age groups. However, you could put in your own assumptions if you wish.

Again, a set of numbers that you or previous users typed in last time will automatically appear. To change previously entered values, simply type over them. . All data that you type in will be automatically saved when you click the EXIT&SAVE button, found on the first, opening page of FluWorkLoss (see page 14).

4. Enter percentage of employment rate, cohabit rate, and number of workdays per week.

% Employment Rate:	60.20%	
% Cohabit Rate:	77%	
Number of Workdays / Week	5	out of 7 days

A set of numbers that you or previous users typed in last time will automatically appear. Cohabit rate is the proportion of households that have 2 or more adults living in the household. As always, you can make your own assumptions of employment rate and cohabit rate in your local community. The default values in the table are national estimates. To change previously entered values, simply type over them. . All data that you type in will be automatically saved when you click the EXIT&SAVE button, found on the first, opening page of FluWorkLoss (see page 14).

The cohabit rate and employment rate are used to calculate the number of work days lost per episode of influenza illness (death, hospitalization, outpatient, and self-cured). For the <u>0-19 and 65+ years age groups</u>, the following equation is used to calculate work days lost:

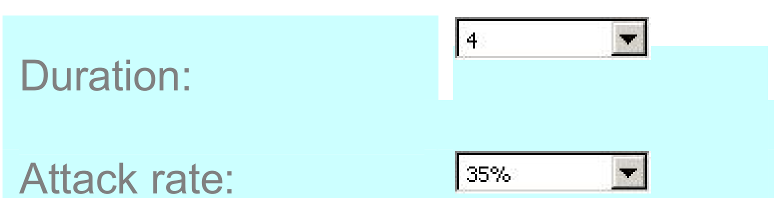
$$\begin{aligned}\text{Work days lost due to illness}_i &= \text{Work days lost caring for family members} \times \text{Employment rate} \\ &+ \text{Workdays lost due to own Illness} \times \text{Employment rate}\end{aligned}$$

We use the following equation for the <u>20-64 age group</u>:

$$\begin{aligned}\text{Work days lost due to illness}_i &= \text{Work days lost caring for family members} \times \text{Employment rate} \times \\ &\text{Cohabit rate} + \text{Workdays lost due to own Illness} \times \text{Employment rate}\end{aligned}$$

Where illness = illness resulting in death, hospitalization, outpatient, or self-cured.

5. Choose the duration and overall clinical attack rate (or illness rate) during the pandemic:



Duration refers to the number of weeks you expect the pandemic to last; you may select 4, 6, 8, or 12 weeks from the drop-down box. Gross clinical attack rate refers to the percentage of the population that becomes clinically ill due to influenza; a clinical case of influenza is one that causes some measurable economic impact, such as one-half day of work lost, or a visit to a physician's office. You may select 15%, 25%, or 35% from the drop-down box.

6. Assumptions of distribution of work day loss

The total number of work days lost is distributed over the duration of the pandemic wave as used in FluSurge2.0 (5). We first assumed an approximate normal distribution for weekly distribution of days lost from work due to an influenza pandemic. Then, within each week, we assumed a 3% daily increase in days lost from work compared to the previous day before the peak and a 3% daily decrease in days lost from work compared to the previous day after the peak. Therefore, you are expected to see some "bumps," or unevenness, in the daily distribution graph. In order to maintain a reasonable size of the FluWorkLoss file to be acceptable to most users, only the 3% rate was used in the program. Changing the rate would result in higher or lower peaks in work loss estimates. later versions of FluWorkLoss may allow the user to change the daily increase and decrease rate (3%).

RESULTS

Click **View Results** to see your final results, which are organized into three parts. The first part provides the total estimated number of days lost from work due to an influenza pandemic. The second and third parts provide a distribution of days lost from work due to an influenza pandemic and distribution of the proportion of work days lost due to an influenza pandemic by different pandemic durations and various gross clinical attack rates.

Results Part I

In the first part of your results, you will see a table, similar to the one below, showing the total estimated number of days lost from work due to an influenza pandemic:

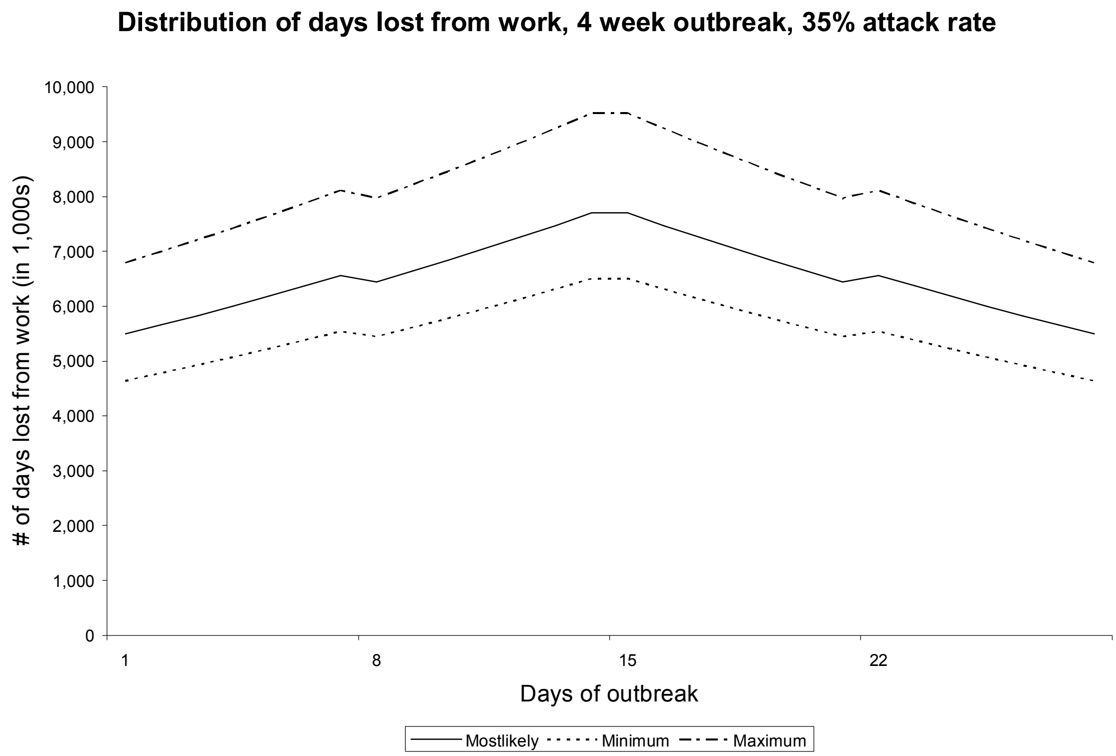
Most Likely Scenario	182,941,477
Minimum Scenario	154,609,320
Maximum Scenario	226,300,719

Results are estimated to create three scenarios of pandemic impact: minimum (the best case scenario), which estimates the fewest possible number of hospitalizations/outpatient visits/deaths (i.e., fewest possible number of days lost from work); mean (the most likely scenario), which estimates the number of hospitalizations/outpatient visits/deaths most likely to occur (i.e., most likely number of days lost from work); and maximum (the worst case scenario), which estimates the largest number of hospitalizations/outpatient visits/deaths (i.e., largest possible number of days lost from work) based on the values that you entered earlier in the program, and assuming 95% confidence intervals.

Here, for example, an influenza pandemic with a 4-week duration and a 35% gross clinical attack rate will most likely result in 182,941,477 (approximately 183 million) days lost from work ranging from 154,609,320 (approximately 155 million) to 226,300,719 (approximately 226 million). The estimates of work days lost will markedly increase as the assumed gross clinical attack rate increases. These estimates of impact may also range widely over the three scenarios. The extensive range between the minimum and maximum estimates is due to the uncertainty of how the next pandemic will spread through society, as well as to the lack of data on lost work due to previous influenza pandemics.

Results Part II

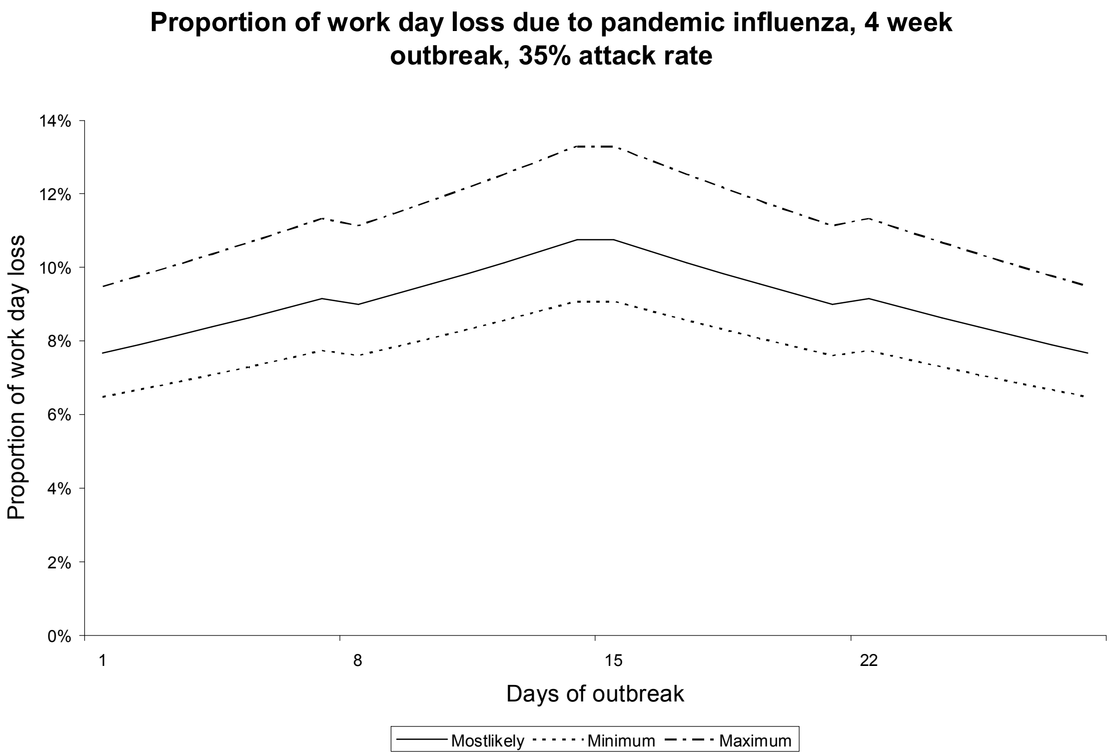
Click **Next** to the second part of the results. In the second part of your results, you will see a graph, similar to the one below, showing the daily distribution of days lost from work due to an influenza pandemic.



This graph shows the daily distribution of numbers of work days lost due to an influenza pandemic with a 4-week duration and a 35% gross clinical attack rate. As this graph demonstrates, FluWorkLoss estimates that the daily work days lost from an influenza pandemic will reach 9,521,485 (approximately 10 million) per day in the peak of the pandemic.

Results Part III

Click **Next** to go to the third part of the results. In the third part of your results, you will see a graph, similar to the one below, showing the daily distribution of proportion of work days lost due to an influenza pandemic.



This graph shows the daily distribution of proportion of work days lost due to an influenza pandemic with a 4-week duration and a 35% gross clinical attack rate. As this graph demonstrates, FluWorkLoss estimates that the proportion of work days lost due to an influenza pandemic will reach 13.3% at the peak of the pandemic.

PRINTING

In order to print your results on a single page, you should change the printing page setup to Landscape format. To do so,

1). Click File and then choose Page Setup.

2). In the Orientation section, change Portrait to Landscape.

3). Click OK.

RESTART / EXIT

Click **RESTART** to go to the Start Page if you want to change any data you typed in, or to select a different pandemic duration and/or gross clinical attack rate. Click **EXIT** to close all programs and exit without saving the changes. Click **EXIT&SAVE** to save input data and results while exiting FluWorkLoss (this may take some time due to the size of the program).

LIMITATIONS AND DISCUSSION

There are certain limitations of using FluWorkLoss. Some of the primary limitations are:

1) There is no data on the number of work days lost due to caring for ill family members or workdays lost due to an illness from pandemic influenza. But many scenarios can be run with FluWorkLoss. The software provides the user with the flexibility to run many scenarios using different estimates for the workdays lost.

2) The software does not include the days lost due to other factors such as staying home because of fear or because of school closing. The user can add an amount (or percentage) to the number of work days lost to account for additional days lost due to other factors besides illness. However, the amount of work days lost to these other factors is unlikely to be static over the entire course of the pandemic. For example, fear might be less at the end of the pandemic than at the beginning. Also workers, particularly those in jobs important to the functioning of society (for example, first responders, power station technicians, health care workers, truck drivers, etc), may feel an obligation to go to work, overcoming fear.

3) The distribution of days lost in FluWorkLoss is assumed to follow an approximate normal distribution (see page 7). However, in the next influenza pandemic the actual shape of the pandemic might be quite different and the peak may be higher. For example, if the pandemic spreads more quickly through a community than estimated in this model, then the peak number of infections will be greater and the peak will occur sooner.

The results from FluWorkLoss are comparable to absenteeism estimates derived in other studies. In a study of the potential economic impact of an influenza pandemic on the Canadian economy, James and Sargent (7), estimated that the next pandemic would cause, at the peak of the outbreak, approximately 6 percent workplace absenteeism. FluWorkLoss estimates around 6 percent excess workplace absenteeism at the peak of the pandemic to a pandemic, assuming an attack rate of 25% and duration of 8 weeks. In a planning guide issued by the Government of New Zealand, it is stated that ". . . in general, employers should make contingency plans to operate for the pandemic period with at most 85% of their normal staff available, and between 50% and 65% available for the peak three weeks of the pandemic." (Appendix 3 in ref. 8). But this estimate also includes an assumed 15 percent workforce absence due to school closure, a gross clinical attack rate of 40% and that workers ill from influenza will loss an average of 7 work shifts. Further, it is assumed that there is a ". . . 100% additional absence rate – that is, for every person in the remaining workforce who gets ill, another does not come to work because of the need to look after a spouse or children, or a disinclination to travel or work."

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Case Study: Estimating the potential impact of pandemic influenza on blood donor supply using FluWorkLoss

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We would like to thank the Division of Emerging infections and Surveillance Services, NCPDCID, CDC for their tremendous support.

DISCLAIMERS
The numbers generated through FluWorkLoss are not to be considered predictions of what *will* actually occur during an influenza pandemic. Rather, they should be treated as estimates of what *could* happen.

The methodology, findings and conclusions presented in this manual, case study 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).

Date of this version: May 10, 2006; Edits added September 19, 2006

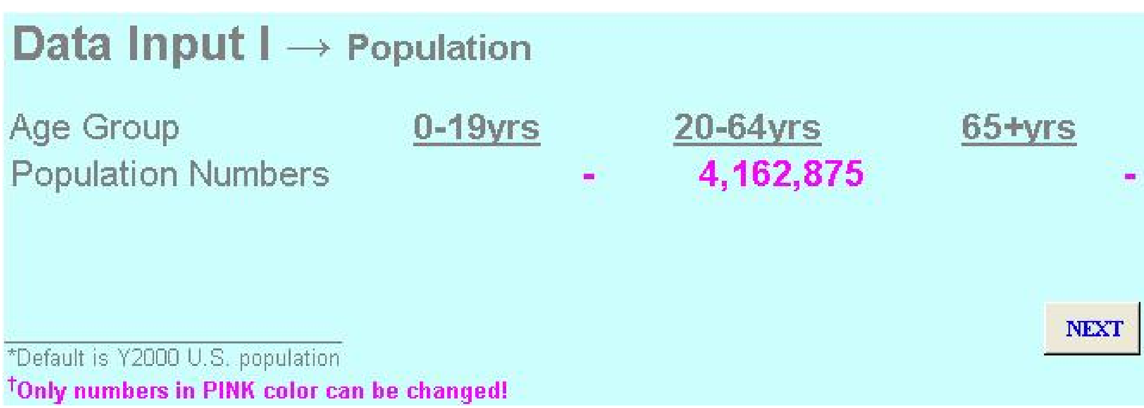
Introduction:

It is estimated that 15 percent to 35 percent of the U.S. population will become clinically ill with influenza virus during the next pandemic (1, 2). This will have a direct impact on many sectors of the economy. In this document we estimate how influenza pandemic may impact the blood donor supply. During the pandemic, clinically ill blood donors and the donors who die from influenza will not be able to donate blood. This may lead to a decrease in the supply of blood. To plan and prepare for the next pandemic, we estimate the possible extent of a decrease in blood supply due to pandemic influenza.
To estimate the decrease in blood supply, we use the FluWorkLoss software provided by the CDC. This document illustrates how FluWorkLoss can be used to estimate the impact of pandemic influenza on the blood donor supply in a region. FluWorkLoss is spreadsheet based software that estimates the number of workdays lost due to pandemic influenza. The blood donor example is one example of possible uses of FluWorkLoss.

Methods:

Before using FluWorkLoss, estimates of the population of interest (in this example, the population of donors) and donor days lost due to influenza illness are needed. With just these two estimates we can use FluWorkLoss to estimate the impact of pandemic influenza on blood donor supply. We can perform the analysis using different duration of the pandemic (4, 6, 8, or 12 weeks) and also different clinical attack rates, or illness rates (15%, 25%, or 35%).

Population and Age groups:
Assuming that the software has been successfully downloaded and installed (see manual for detailed instructions on how to do this), we hit the start button and we go to data input screen number 1 (Data Input I – picture below). On this screen we are required to put in numbers for the population by three age groups. In this case, we have assumed that all the blood donors are aged 20-64 yrs of age, and then set the population of other age groups to zero. Of course, the users can easily readily change this assumption and rerun this case study.



If we have an estimate for the number of donors in our area, we can put in that number in the data input screen under the 20-64 yrs group. If we do not know the number of donors in our area, then we can follow the following steps:

1. We want to estimate the impact of pandemic flu on the blood donor supply for the entire U.S. In this example, we will use the year 2000 population in the 20-64 age group for the entire U.S. (166,515,000 persons, 20-64 years of age).
2. Everyone aged 20-64 is not a blood donor. Here you have to assume the proportion of your population that is a blood donor. For illustration, we will assume 3 percent of the population are blood donors. With the 3 percent assumption, we estimate that in the U.S. there will be 4,995,450 donors available (0.03*166,515,000).

Now that we have an estimate (or assumption) of the total number of donors we have to make an adjustment for the fact that there is a minimum 2 months gap between donations for each donor. Therefore, at any point in time we will have 5/6 of the donor population available. Assuming that blood donors are available at any time of the year (in reality this is probably not true), we have a maximum of 4,162,875 donors available at any given point in time during a pandemic. Once we enter the donor population, we hit the "next" button. (Note: Thgis case study refers only to whole blood donors, not pheresis donors. Almost half of platelets are derived through pheresis, and those donors can give twice/week. So this analysis only applies to whole blood, which is primarily used to produce red blood cells, and to a lesser extent, pooled platelets and fresh frozen plasma.)

Work days and donor days: Equivalency
The goal of FluWorkLoss is to calculate the number of donor days lost due to an influenza pandemic. In this case study we are interested in "donor days." We will assume that in FluWorkLoss the term "donor day" can directly replace the term "work day."

Donor days lost due to caring for a family member:
We will assume that a blood donor will be able to find the few hours needed to donate blood even though they are at home caring for a family member who is sick. Although this is probably not entirely realistic, we can also assume that during the pandemic blood donors will respond positively to calls for blood donations (blood donors have a demonstrated altruistic nature). The resultant loss of the availability of blood donors due to caring for sick family members is thus assumed to be negligible. Therefore, in this example we will input zero in all the cells on the Data Input II screen (picture below). Once we put in zero in all the cells, we hit the "NEXT" button.

Data Input II → **Days lost from work due to caring for family member**

	0-19yrs	20-64yrs	65+yrs
Death			
Hospitalization			
Outpatient			
Self-cured			

†Only numbers in PINK color can be changed!

PREVIOUS NEXT

Donor days lost from work due to illness:
On this screen we need to put in the estimates for the number of donor days lost from an episode of influenza that results in death, hospitalization, outpatient care, or self care for the donor. We assumed that the number of donor days lost due to death was similar to the number of days it takes an employer to find a replacement for a worker who has died from the pandemic. For hospitalization, outpatient care, and self care, the user may want to include recovery time from illness in addition to the time the patient is clinically ill. Some patients may not want to donate blood right after an episode of influenza illness. In the table below (Data Input III), we have put in illustrative estimates of donor days lost due to illness. A user can enter other numbers of donor days lost per health outcome.

Note that donor days could be lost due to blood donor deferral by the Federal Drug Administration (FDA) due to concern over influenza viremia. Such a potential loss of donor days can be specifically accounted for in FluWorkLoss. For example, a user may wish to assume that a donor that becomes ill from pandemic influenza, is “self cured” in 1 day, but due to concerns about viremia is unable to donate blood for 5 days instead of the 1 day lost as assumed in the table below.

Data Input III → **Days lost from work due to illness**

	0-19yrs	20-64yrs	65+yrs
Death	0	40	0
Hospitalization	0	7	0
Outpatient	0	3	0
Self-cured	0	1	0

†Only numbers in PINK color can be changed!

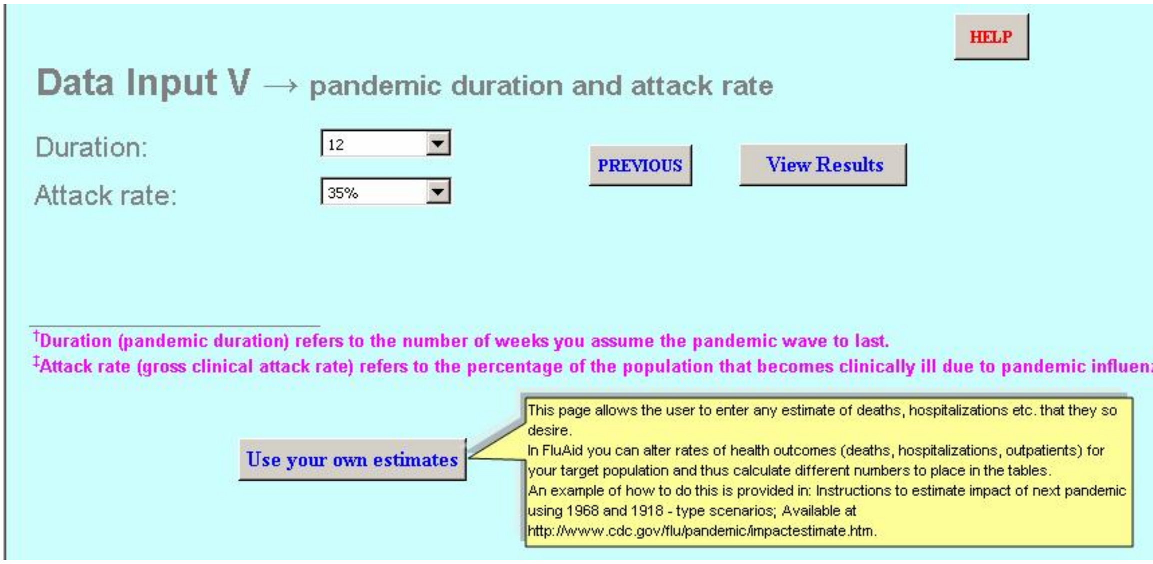
PREVIOUS NEXT

Note that we have put in zero for age groups 0-19 and 65+ since we have assumed that members of these age groups do not contain “significant numbers” of blood donors. Click “next” to go to the next screen.

Other Assumptions:
In the Data Input IV screen we have to input estimates for the percentage of donor who are employed (e.g. the % employment rate), the percentage who live in a household with another adult (% cohabit rate), and number of donor days per week. The percent employment rate is the proportion of the population employed. In the blood donor case we will put 100% for the proportion of employed because even unemployed people can make blood donations. Thus, in this case study, the term "employment" means "employed donating blood." Since we assume no donor days are lost for care of sick family members, we can put any number in the percent cohabit rate and it will make no difference to the result. To make sure that we do not create any confusion, we will put in 0% for cohabit rate. Assuming that blood donors can donate blood any day of the week (even on the weekends), we will put in 7 days as the number of donor days (labeled "work days" in the software) per week cell.

By clicking on the "next" button we go to the Data Input V screen.

Pandemic duration and Clinical Attack rate:
We can select 4, 6, 8, or 12 weeks as the duration of the influenza pandemic. We can also select a 15, 25, or 35 percent clinical attack rate. The attack rate is the proportion of population that becomes clinically ill due to the pandemic such that (in this case study) they will be unable to donate blood. We selected 12 week duration and a 35 percent attack rate.



Altering the number of cases:
The users can also use their own estimates for deaths, hospitalizations, and outpatient visits by clicking on “Use your own estimates” (see picture above). Upon clicking the “Use your own estimates” button, the user will be taken to a page containing the estimates of death, hospitalizations and outpatients, by age group and gross clinical attack rates (see picture below). The default values are for a 1968-type pandemic (1). Detailed instructions on how to produce estimates of deaths, hospitalizations and outpatients for other scenarios (e.g., a 1918-type pandemic) can be found in the online document: Instructions to estimate the potential impact of the next pandemic using 1968 and 1918 - type scenarios (available at http://www.cdc.gov/flu/pandemic/impactestimate.htm).

Deaths	Gross attack rates 15%	25%	35%
0-19 yrs most likely	1,262	2,103	2,944
minimum	731	1,218	1,705
maximum	17,450	29,084	40,718
20-64yrs most like	52,099	86,831	121,564
minimum	7,452	12,419	17,387
maximum	97,815	163,025	228,236
65+ yrs most likely	57,491	95,818	134,145
minimum	55,747	92,912	130,076
maximum	71,303	118,838	166,374

Hospitalizations	Gross attack rates 15%	25%	35%
0-19 yrs most likely	22,563	37,605	52,647
minimum	11,102	18,503	25,905
maximum	94,657	157,761	220,865
20-64yrs most like	307,778	512,963	718,149
minimum	56,948	94,914	132,879
maximum	336,016	560,026	784,037
65+ yrs most likely	153,277	255,461	357,645
minimum	109,566	182,609	255,653
maximum	193,758	322,930	452,102

Outpatient Visits	Gross attack rates 15%	25%	35%
0-19 yrs most likely	7,145,985	11,909,975	16,673,965
minimum	5,969,924	9,949,873	13,929,822
maximum	8,322,047	13,870,078	19,418,109
20-64yrs most like	12,848,044	21,413,407	29,978,769
minimum	9,224,931	15,374,885	21,524,839
maximum	19,610,472	32,684,119	45,757,767
65+ yrs most likely	2,721,610	4,536,017	6,350,424
minimum	2,568,218	4,280,364	5,992,509
maximum	4,224,851	7,041,418	9,857,985

Please use your own estimates for deaths, hospitalizations, and outpatient visits, then click continue to choose pandemic duration and clinical attack rates

Continu

We used the default values (i.e., 1968-type scenario) provided by FluWorkLoss. Once any desired alterations have been made the estimates of cases, the user should click on the "Continue" button, which will return the user to the Data Input V page.

Other implicit assumptions
In this case study, we have implicitly assumed that any donor willing and bale to donate whole blood will be able to do so. That is, we have assumed that that blood centers are fully operational, do not have staff problems due to illness or any other cause related to the pandemic (e.g., staff having to stay home because schools are closed), and are able to collect "standard volumes" of blood.

Explanation of results:

To see the results, click the "View Results" button on the Data Input V page.
The results are presented in three different ways. First, we see a table (shown below) that gives the estimates for total donor days lost from a 12-week influenza pandemic, with a 35% clinical attack rate. The "Most Likely Scenario" provides an estimate of the most likely (mean) number of donor days lost. The "Minimum Scenario" provides an estimate of the fewest possible (given all other assumptions and input values, this is the "best case" scenario) number of donor days lost. The "Maximum Scenario" (the "worst case" scenario) estimates the largest number of donor days lost. From the table we see that, for the blood donor population considered, we will lose an average of 3 million donor days with a range from 2.5 to 4 million donor days lost. If we want to compare results for different scenarios, we can do the same analysis for different attack rates and different pandemic durations, as well as making any changes to the input values in any of the Data Input Sheets.

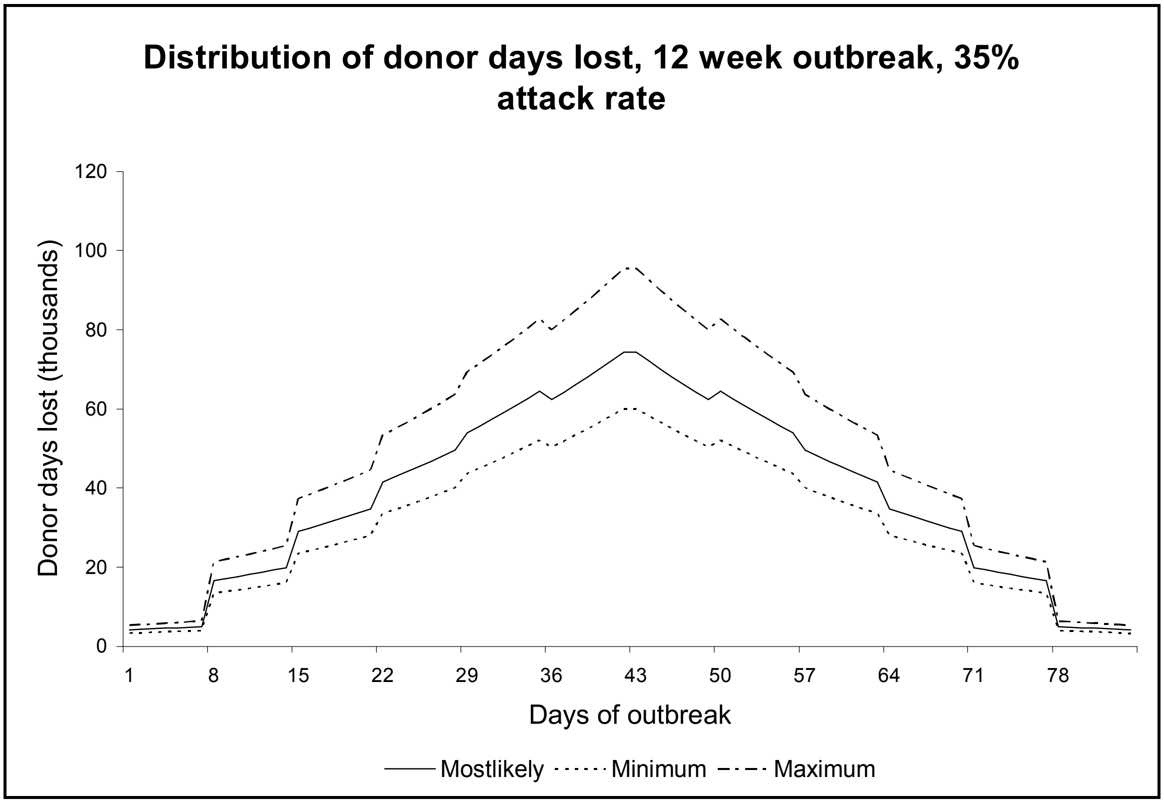
Results → 12 week pandemic duration and 35% clinical attack rate

Most Likely Scenario	3,182,192
Minimum Scenario	2,570,132
Maximum Scenario	4,085,030

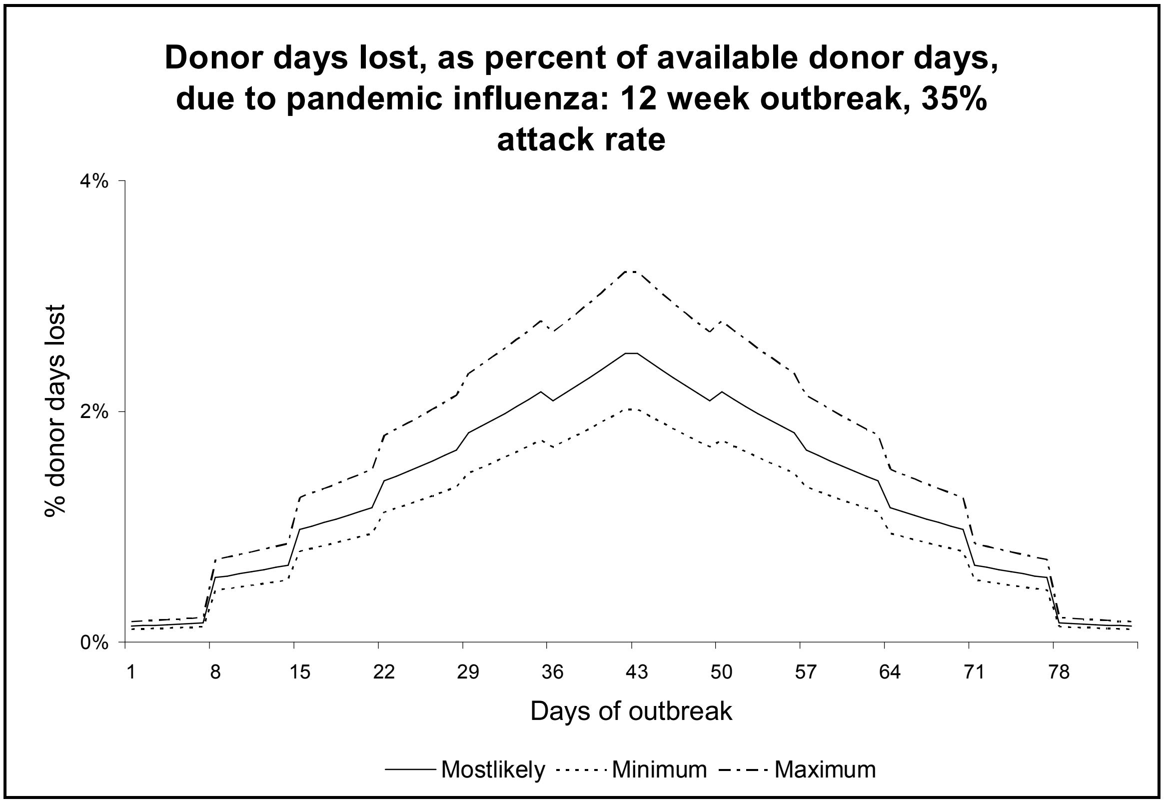
NEXT

We are also interested in estimating how the total lost donor days are distributed over the duration of a pandemic (for the 12-week duration which we selected). The next result gives us information on the spread of donor days lost.

When we hit the "NEXT" button in the "Results" sheet, we are taken to the figure below, showing the daily distribution of donor days lost over the 12 week period (the duration of the pandemic). This graph shows the distribution by "most likely scenario" as well as by "minimum scenario" and "maximum scenario". The bold line is for the "most likely scenario" and the broken lines are for "minimum" and "maximum" scenarios. From this graph we can see that at the peak of the pandemic we lose on average of 75,000 donor days per day with a range of 60,000 to 95,000 donor days lost per day.



When we click "NEXT" button we come to the last part of the results, in which the donor days lost are shown as a percentage of total available donor days (see figure below). This graph also shows the distribution by "most likely scenario" as well as by "minimum scenario" and "maximum scenario". The bold line is for the "most likely scenario" and the broken lines are for "minimum" and "maximum" scenarios. We see that at the peak of influenza pandemic, we lose 1.8% of donor days per day with a range of 1.4% to 2.3% donor days lost per day.



Summary:

In this example, we have estimated the impact of pandemic influenza on the blood donor supply for the U.S. We used FluWorkLoss for this analysis. FluWorkLoss is free software provided by the CDC for estimating the number of work days lost due to an influenza pandemic. To do this analysis, we needed the information on the total donor population and estimates of the donor days lost due to illness from pandemic influenza. With just these two estimates we could begin to estimate the potential impact of pandemic influenza on blood donor supply. This shows the simplicity and power of FluWorkLoss. FluWorkLoss also gives us the flexibility to choose different durations of a pandemic and also different clinical attack rates for the pandemic. We found that for a 12 week duration and 35 percent clinical attack rate, 1.8 percent donor days would be lost per day with a range of 1.4% to 2.3%.

There are some limitations of this analysis. Since we do not know the severity of the next influenza pandemic, we can not predict the impact of pandemic on the blood donor supply. The above numbers illustrate what could happen during a pandemic based on different durations and clinical attack rates, assuming a 1968-type pandemic. A “more severe” pandemic, such as one that might produce deaths and hospitalizations at rates comparable to the 1918 pandemic, would produce a larger number of donor days lost. As described above, FluWorkLoss does allow a user to quickly and easily enter different estimates of potential number of pandemic-related health outcomes which could be used to estimate the impact in a more severe pandemic.

References:

1. Meltzer MI, Cox NJ, Fukuda K. The economic impact of pandemic influenza in the United States: priorities for intervention. Emerg Infect Dis 1999;5:659-71. Available on the Web at: http://www.cdc.gov/ncidod/eid/vol5no5/meltzer.htm
2. Meltzer MI, Cox NJ, Fukuda K. Modeling the economic impact of pandemic influenza in the United States: implications for setting priorities for intervention. Background paper; 1999. Available on the Web at: http://www.cdc.gov/ncidod/eid/vol5no5/melt_back.htm
3. Meltzer MI, Shoemake H, Kownaski M. FluAid 2.0: a manual to aid state and local-level public health officials plan, prepare, and practice for the next influenza pandemic. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services; 2000.
4. Zhang X, Meltzer MI, Wortley P. FluSurge2.0: a manual to assist state and local public health officials and hospital administrators in estimating the impact of an influenza pandemic on hospital surge capacity (Beta test version). Centers for Disease Control and Prevention, U.S. Department of Health and Human Services; 2005.
5. Zhang X, Meltzer MI, Bridges CB. FluWorkLoss 1.0: a manual to assist state and local public health officials in estimating the impact of an influenza pandemic on work day loss (Beta test version). Centers for Disease Control and Prevention, U.S. Department of Health and Human Services; 2005.