

Basic Instructions and Template of Draft Report

Using FluAid and FluSurge to estimate the potential impact of the next influenza pandemic upon Locale Y

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Disclaimers

The numbers contained in this report should be treated as illustrations of what *could* happen (with unknown probability of actual occurrence). The numbers in this report, therefore, are intended solely as a guide to help public health officials and policymakers plan and prepare for the next influenza pandemic.

The findings and conclusions in this report and the accompanying appendices and spreadsheets are those of the author and do not necessarily represent the views of either CDC or DHHS.

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The following is a set of instructions on using the software programs FluAid 2.0 and FluSurge 2.0 to estimate the potential impact of the next influenza pandemic on any given locale (herein referred to as Locale Y), which could, for example, be a country, state, city, or county. The instructions also include a template of a draft report (with a set of Appendices) which a user can fill in with the estimates calculated by following these instructions.

The FluAid 2.0 and FluSurge 2.0 programs were produced by CDC to help public health planners and policymakers plan and prepare for the next influenza pandemic. FluAid provides estimates of the total numbers of deaths, hospitalizations, and outpatient visits (before interventions are applied), and FluSurge models the impact of an influenza pandemic on the demand for hospital-based services. Both software programs can be downloaded free of charge from <http://www.hhs.gov/nvpo/pandemics/>. Details regarding the type of data needed to use these programs are provided below in Step 2 of the step-by-step instructions.

Basic goal of these instructions

The object of these instructions is to demonstrate how to use FluAid 2.0 and FluSurge 2.0 to calculate estimates of impact that can be entered into the following table:

Table 1: Total estimates, by health outcome, from two scenarios of potential impact of the next influenza pandemic in Locale Y: Most likely (minimum, maximum)

Health outcome	Gross attack rate 25%	
	Moderate scenario (1968-type)	Severe scenario (1918-type)
Deaths		
Hospitalizations		
Total hospital beds needed (i.e., hospitalizations + deaths in hospital)§		
Outpatients		
Ill, no medical care		

Such a Table is similar to that found in the DHHS Pandemic Influenza Plan, Part 1, Page 18 (available at <http://www.dhhs.gov/pandemicflu/plan/>).

These instructions will show how to calculate other information that may be of use to public health officials and policymakers, such as the potential surge in demand for hospital-based resources, such as hospital beds.

What is contained in this packet of instructions?

The packet of instructions contains

- a) A set of basic instructions that allow a user to use FluAid 2.0 and FluSurge 2.0 to quickly produce estimates of the potential impact of the next influenza pandemic.
- b) A template of a draft report titled “Estimating the potential impact of the next influenza pandemic upon Locale Y.” The template is a suggested method of presenting a brief report of the estimates of potential impact calculated using this set of instructions.
- c) Three technical Appendices:
 - i) Appendix I—Calculating the potential health outcomes in Locale Y associated with the next influenza pandemic: Methods and results
 - ii) Appendix II—Calculating the demand for hospital resources in Locale Y associated with the next influenza pandemic: Two scenarios
 - iii) Appendix III—Differences between estimates of potential impact [*currently being developed*]

Flexibility of package materials

An analyst can use as much or as little of these materials as he/she needs. For example, an analyst may wish to use the entire draft report as given in the template, or an analyst may only wish to use the first page, which contains Table 1 (as shown above). These materials are meant to suggest means of calculating illustrations of potential impact; they are not intended to be used as absolutely rigid instructions from which a user can not deviate.

Disclaimers

On page 3 of the template of the draft report, there are some suggested disclaimers, including some regarding the accuracy of the estimates provided in the report.

A note on names of scenarios and nomenclature

The DHHS plan refers to the two scenarios of potential impact (Part1, Page 18, table 1) as “Moderate Scenario: 1958/68-like” and “Severe scenario: 1918-like.” For the sake of brevity in this set of instructions, the two scenarios will be referred to as “1968-type” and “1918-type,” respectively.

Step-by-step instructions

Step 1: Getting ready and organizing the recording of data used and assumptions made

Before starting any calculations, users are strongly advised to read through the template of the draft report and appendices that accompany this set of basic instructions. They should then decide what estimates they wish to produce (i.e., decide what information their target audience is likely to need). The appendices contain additional instructions and technical explanations and provide a means for recording data.

As data are collected and estimates are produced, users are advised to carefully record what data were entered into FluAid 2.0 and FluSurge 2.0 (hereafter, simply referred to as FluAid and FluSurge, respectively) and the sources of those data. Appendices I and II have some draft tables that allow a user to easily record all the data used.

Step 2: Collect needed data for basic estimates of impact

Data needed to use FluAid to estimate numbers of deaths, hospitalizations, and outpatient visits

1) Size of population: Population broken down into three age groups: 0–18 years, 19–64 years, and 65+ years. The age groups can be altered to some small degree (e.g., 0–14 years instead of 0–18 years).

2) Other data needs: For an initial estimate, analysts can use FluAid’s current default inputs, such as percentage of age groups with influenza-related high-risk conditions and rates of health outcomes (deaths, hospitalizations, outpatient visits). A user can, of course, readily change any of these input values.

3) Data needs for calculating deaths and hospitalizations for a 1918-type scenario: Step 5 of these instructions will provide guidance as to how a user can alter FluAid’s default death and hospitalization rates so as to produce results for a 1918-type scenario.

Data needed to use FluSurge to estimate demand on hospital resources

(Suggestions follow below for those who do not have all these data readily available—see “What if you don’t have all the data listed.”)

4) Number of hospital beds (excluding intensive care unit [ICU] beds): Can also have another estimate of beds that could be made available (e.g., if additional beds were added to wards and hospital floors).

5) Percentage of beds that are currently fully staffed (*Hint: In an initial run, this can be set at 100%, implying that all beds are fully staffed*).

6) Number of beds in ICUs.

7) Percentage of ICU beds that are currently fully staffed. (*Hint: In an initial run, this can be set at 100%, implying that all beds are fully staffed*).

8) Number of mechanical ventilators.

9) Percentage of mechanical ventilators currently available.

10) Average length, in days, in a hospital (non-ICU) bed for influenza-related illness.

11) Average length, in days, in an ICU bed for influenza-related illness.

What if you don't have all the data listed?

One of the primary reasons to estimate the potential impact of the next influenza pandemic is to better understand the amount of health care resources that would be required and that would be available to deal with patients. Therefore, if a user cannot readily identify accurate data as described above, it is suggested that he/she consider using rough estimates of each of the data needs. The results derived in this manner may bring forth a decision to more accurately inventory available resources.

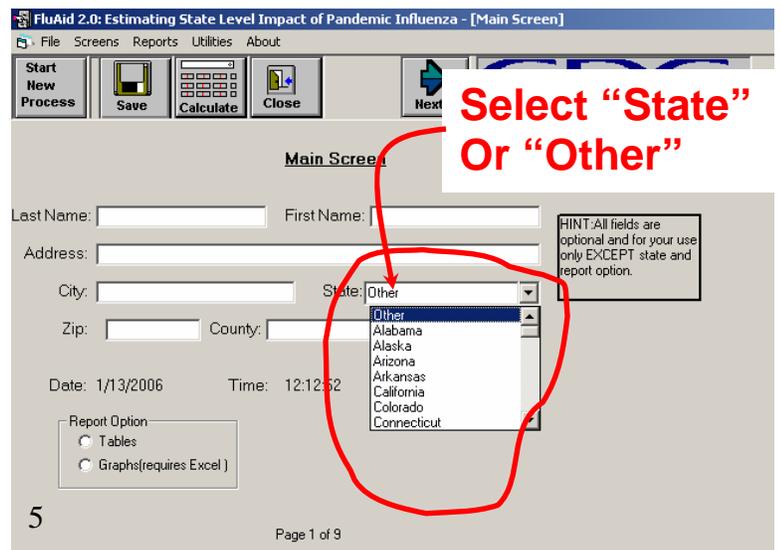
Step 3: Download copies of FluAid and FluSurge

To obtain the FluAid and FluSurge software programs, go to the website at <http://www.hhs.gov/nvpo/pandemics/>, scroll down, and independently select the links to FluAid and FluSurge, and download, in turn, copies of each program. Note that there is an online-only version of FluAid. However, because the online-only version requires a constant internet connection and a user cannot produce graphs or save scenarios, it is recommended that users of these instructions use the downloadable version.

Before downloading these programs, users are urged to carefully read the online instructions regarding the download process. Users are also encouraged to download the manuals from the website of each program and to refer to them for helpful information.

Step 4: Using FluAid to estimate deaths, hospitalizations, and outpatient visits for a 1968-type scenario

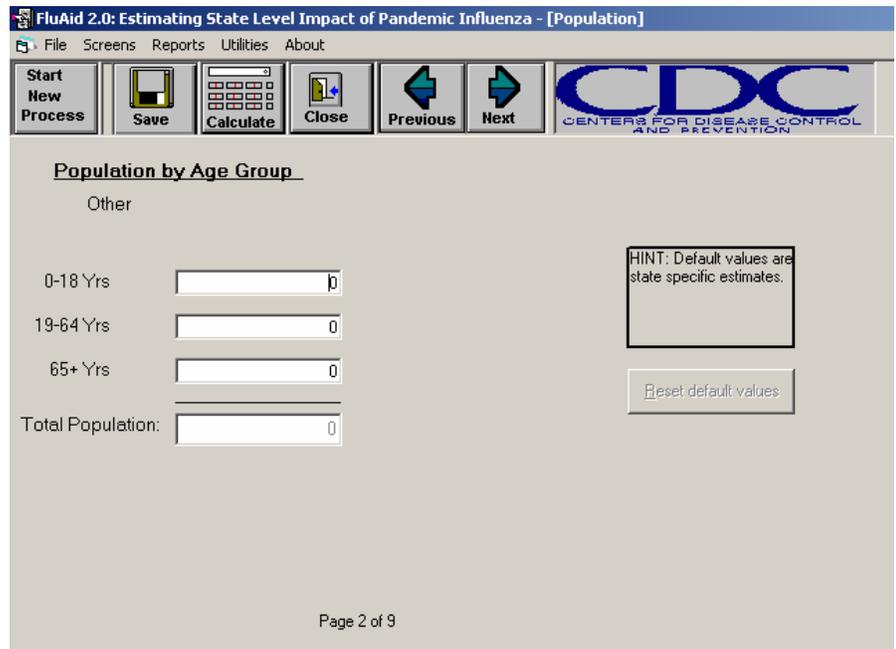
4a) Select locale: In FluAid, on data entry Page 1 of 9 below), select the pull down menu for data entry box marked "State." Users can either select one of the predefined U.S. states, or they can select "Other." The "Other" option is useful for those intending to estimate potential impact on a city or other locale including a country) not listed as a U.S. state.



4b) Population: On Data entry page 2 of 9; check, and alter if necessary, FluAid’s default population estimates for the state selected in Step 4a (see note below for reason to check). If option “Other” was selected, then enter the population by appropriate age groups.

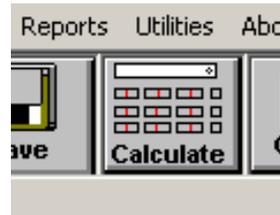
Recall that the user can enter the populations of somewhat different age groups (e.g., enter population of 0–14 years instead of 0–18 years). If different age groups are used, then the user is advised to make a note of that fact and accordingly alter the appropriate tables in the draft report and Appendix I.

If a given U.S. state is selected (see step 4a), the user may wish to check and update FluAid’s default population estimates for the selected state. FluAid’s default populations for the U.S. states are from those published in 1999—see the FluAid manual for further details and default U.S. state population data sources.

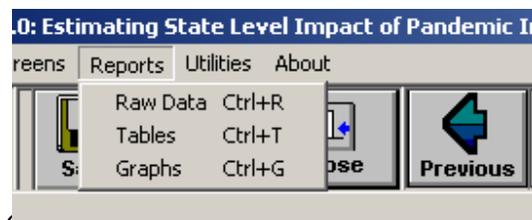


4c) Review Data Entry pages 3 through 7 (of 9). If the user makes any changes to these default values, they should be noted in Appendix I, Table AI.2. The user should be aware that changes in these default values will need to be “carried over” to calculations made with FluSurge (see Steps 6 and 7)

4d) Calculate: The user should then click on the “calculate” button (note: nothing may seem to happen).



4e) Print out data and results: The user should then go to the menu options at the



top of the page and select the item “reports.”

The user can then, in sequence, print out reports of the raw data, results, and graphs (as noted in FluAid’s manual, the later requires that a copy of Excel spreadsheet software be already loaded onto the computer).

The user should then enter the raw data and the results in the appropriate tables in Appendix I and the draft report (see point 4g, below for note on total hospitalizations). Graphs can be cut and pasted into the draft report and/ or Appendix I, as the user sees fit.

4f) Review FluAid’s data entry pages 8 and 9 (of 9): For the exercise covered by these instructions, a user does not need to consider the variables listed in these two data entry pages. FluAid will calculate deaths, hospitalizations, and outpatients without a user altering the default values of “0” set into the items listed in data entry pages 8 and 9. However, a user may wish to consider using FluAid to calculate some of the items listed in these two data entry pages. If this is the case, the user should refer to the FluAid manual.

4g) An explanation of the term “hospitalization”: As used in FluAid, the term “hospitalization” refers to those who are hospitalized due to influenza-related illness but who survive the illness (i.e., their end health outcome is hospitalization). However, a percentage of those who will die from pandemic influenza-related illnesses are likely to die while hospitalized. Thus, the total number of hospital beds required will be the sum of hospitalizations + in-hospital deaths. The estimates of total hospitalizations given in the *HHS Pandemic Influenza Plan* (Part 1, page 18, table 1) were calculated according to the assumption that 70% of influenza-related deaths will occur in hospital. Users may wish to use the same assumption (and thus produce estimates similar in concept to those given in the DHHS plan), or they may wish to alter this percentage.

Step 5: Using FluAid to estimate deaths and hospitalizations for a 1918-type scenario

5a) Select locale: As in Step 4a, select locale (either from the list of U.S. states or select “Other.”)

5b) Population: As in Step 4b, on Data entry page 2 of 9, check FluAid’s default population estimates for the state selected (see note in Step 4a for reason to check this). If option “Other” was selected, then enter the population by appropriate age groups. Unless there is a compelling reason to do otherwise, the population used should be the same as in Step 4a (and recorded in Appendix I, Table AI.1).

5c) Check data entry screen 3 of 9: *High-risk percentages by age group*. If the user makes any changes to these default values, they should be noted in Appendix I, Table AI.2.

5d) Data entry screen 4 of 9: Deaths: Death rates, by age and risk group, per 1,000 general population of each age and risk group. Increase each default death rate in this data entry screen by a factor of 8.22. Table AI.4, Appendix I, provides a list of the increased death rates. In Appendix I, there is a detailed explanation of why a scaling factor of 8.22 is used, and some caveats about using data from 1918 are provided.

5e) Data entry screen 5 of 9: Hospitalizations: Hospitalization rates, by age and risk group, per 1,000 general population of each age and risk group. Increase each default death rate in this data entry screen by a factor of 8.22. Table AI.4, Appendix I, provides a list of the increased hospitalization rates. In Appendix I there is also a detailed explanation of why a scaling factor of 8.22 is used, and some problems related to calculating hospitalizations for a 1918-type scenario are presented.

5f) An explanation of the term “hospitalization”: See Step 4g, above, for an explanation of the term “hospitalization” and how it differs from “total hospitalizations.”

5g) Calculate: To calculate deaths and hospitalizations for a 1918-type scenario, the user should then click on the “Calculate” button (note: nothing may seem to happen). See Step 4d above.

5h) Print out data and results: The user should then go to the menu options at the top of the page and select the item “Reports.” See Step 4e above.

IMPORTANT NOTE: The results produced in this step for the 1918-type scenario refer only to deaths and hospitalizations. For the 1918-type scenario, outpatient visit are calculated separately (see Step 5i below).

5i) Data entry screen 6 of 9: Outpatient visits: As explained in Appendix I, calculating outpatient visits for a 1918-type scenario using a scaling factor of 8.22 (as in Steps 5d and 5e) would result in too many outpatients being calculated (often more outpatients than actual symptomatic case patients). Therefore, when calculating a 1918-type scenario, the user should ignore Data Entry screen 6 of 9 in FluAid as well as any estimates of outpatient visits produced by FluAid for the 1918-type scenario. Instead, a user should employ the methodology detailed below

To calculate outpatient visits for a 1918-type scenario, use the following methodology:

- 1) Calculate the total number of symptomatic cases, by age group: For example, for age group 0–18 years, the Total symptomatic cases = Total population (Table AI.1, Appendix I) \times gross clinical attack rate of 25% \times percent of total population aged 0–18 years. Repeat the calculation for other age groups.

- 2) Calculate the residual total number of outpatients plus those ill, but who seek no medical care as follows: For a given age group, the total number of outpatients + ill, no medical care = total symptomatic cases – deaths – hospitalizations. The number of deaths and hospitalizations are calculated using Steps 5a – 5h.

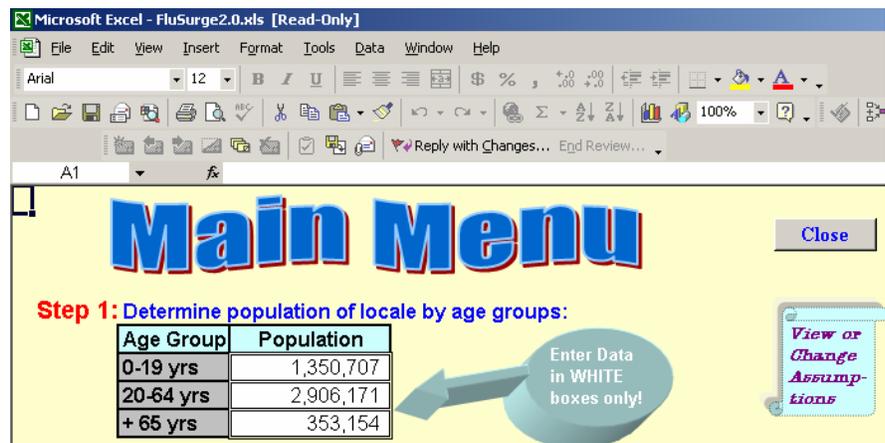
3) Distribute the total residual patients into outpatients and ill, no medical care using proportions from the 1968-type scenario (Table AI.3). For example, assume that for 0–18 year olds, approximately half of outpatients + ill, no medical care were in the “outpatient group.” Then, in the 1918-type scenario, place 50% of residual patients in the outpatient category.

5j) The user should then enter the raw data into the appropriate tables in Appendix I, and the results in the appropriate Tables in Appendix I and the draft report (see point 4g above for note on total hospitalizations). Graphs for deaths and hospitalizations (only) can be cut and pasted into the draft report and/or Appendix I, as the user sees fit.

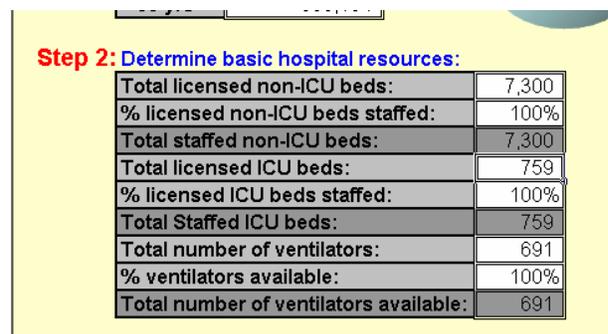
Step 6: Using FluSurge to estimate demand for hospital-based resources during a 1968-type scenario

6a) Population by age groups: In the “Main Menu” page of FluSurge, fill in the population by age group (Step 1 in FluSurge).

The population used should be the same as in Step 4a (and recorded in Appendix I, Table AI.1).



6b) Enter basic hospital resources: Complete Step 2 in FluSurge (see Appendix II and FluSurge’s manual for further details and technical discussion of these items). The user should record in Appendix II, Table AII.1 the values entered in FluSurge’s Step 2.

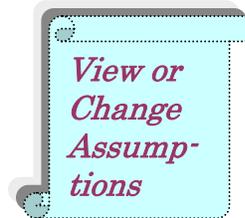


6c) Determine duration and gross clinical attack rate: Complete Step 3 in FluSurge.

Step 3: Determine duration (6, 8, or 12 weeks) and attack rate (15%, 25% or 35%) of the pandemic:

Duration: Attack rate:

6d) Check assumptions: The user should check the assumptions underlying the calculations made by FluSurge. To do so, in the “Main Menu” page, click on the “View or Change Assumptions” button. This will take the user to the “Assumptions” page. The user can then alter any of the 7 assumptions. See Appendix II and the FluSurge manual for further details. If the user changes any of the assumptions, then those changes should be recorded in Appendix II, Table AII.2.



6e) View results: Click on the “View Results” button to view the results on the next two pages in FluSurge.



6f) Record results: The user should then enter the results in the Table 2 and Figure 1 of the Draft Report (or anywhere else that the user deems appropriate).

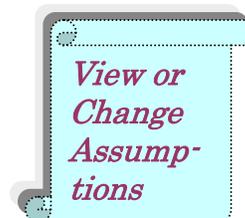
Note: To copy and paste graphs directly from FluSurge, the user must follow directions listed in Appendix II (section titled: “Notes on copying and pasting Graphs and Figures from FluSurge”).

Step 7: Using FluSurge to estimate demand for hospital-based resources during a 1918-type scenario

7a) Record number of deaths, hospitalizations, and total hospitalizations for 1918-type scenario: Because FluSurge calculates, by default, deaths and total hospitalizations for a 1968-type scenario, users will have to enter their own estimates of deaths and total hospitalizations (see Step 4g for definition of the latter) for a 1918-type scenario.

Use the data already recorded in the Draft Report (Table 1) and in Appendix I (Table AI.5) to fill in and complete Table AII.3, Appendix II (“Total hospitalizations used to calculate the impact of 1918-type pandemic on hospital-based resources”).

7b) Enter into FluSurge the number of deaths and total hospitalizations: To enter the number of deaths and total hospitalizations for the 1918-type scenario (Step 7a), click the



“View or Change Assumptions” button on FluSurge’s “Main Menu” page.

Then, on the “assumptions” page, click on the “Use Your Own Estimates” button.

Note: If you want to change total deaths and total hospital admissions by your own estimates, please click this button:

[Use Your Own Estimates](#)

FluSurge will then take you to a page where you can enter your own estimates. For example, you can enter the estimates from Table AII.3.

Once you have entered in the 1918-type scenario estimates of deaths and total hospitalizations, click on the “Return to Main Menu” button.

Note: After you change total deaths and total hospital admissions by your own estimates, please go to Main Menu and continue from Step 3 (choose duration and attack rate). Then, click to view

	Gross Attack Rates		
	15%	25%	35%
Most Likely	1,510	2,516	3,522
Minimum	704	1,173	1,642
Maximum	2,718	4,530	6,342

Enter 1918-type scenario data in these two places

	Gross Attack Rates		
	15%	25%	35%
Most Likely	8,351	13,918	19,485
Minimum	2,776	4,627	6,478
Maximum	11,306	18,843	26,381

[Return to Main Menu](#)

7c) Remaining steps: Repeat Steps 6b–6f (as for the 1968-type scenario). In order to allow direct comparisons (i.e., “apples to apples”), it is strongly recommended that the analyst use the same set of values and assumptions for both scenarios (1918-type and 1968-type). For example, if a user made any changes in FluSurge’s default assumptions for the 1968-type scenario (Step 6d above), then those same set of altered values should be used in the 1918-type scenario.

Step 8: Additional comments and considerations

8a) Estimating different attack rates: What if a user wishes to calculate estimates of impact for gross clinical attack rates other than 25%? In the DHHS Pandemic Influenza Plan, the estimates of potential impact (Table 1, page 18, Part 1) are presented assuming that approximately 30% of the U.S. population experiences clinical illness from the circulating strain of influenza (90 million assumed clinically ill out of a population of approximately 288 million). To change attack rates in FluAid and FluSurge, the user needs to do the following:

- 1) In FluAid, the user completes up to Step 4c for the 1968-type scenario and up to Step 5e for the 1918-type scenario. Then, in each case, the user goes to FluAid's Data Entry screen 7 of 9 (titled "*Gross Attack Rates*") and enters whatever attack rate is desired.
- 2) In FluSurge, there are three default gross attack rates (15%, 25%, 35%). However, a user can follow Steps 7a and 7b to enter any number of deaths and total hospitalizations (see Step 4g for definition of the latter). The deaths and total hospitalizations for different gross attack rates can be generated using FluAid (see 1 above).

8b) How much to write: As mentioned earlier (see section titled "Flexibility of this package"), an analyst can use as much or as little of the materials as they need. Again, the goal of this packet is to provide a set of tools that will help the analyst produce estimates of potential impact that will aid public health officials and policymakers plan and prepare for the next pandemic. Given the multitude of different government and non-government entities that need to plan and prepare for the next pandemic, it is impossible to produce a template of a draft report that would automatically suit all (i.e., one size will not fit all). Thus, the analyst using this packet and FluAid and FluSurge must carefully consider the audience for any estimates calculated.

Further, throughout the template of the draft report and the appendices, there are comments in red, surrounded by square brackets (e.g., [method of displaying technical comments]). The material written in red and contained in the red brackets is meant to be additional technical commentary. The user of this packet could entirely erase these comments, keep them intact in their reports, only keep part of them, or even add to them.

Step 9: Comparing the estimates produced using these instructions to those provided in the DHHS pandemic influenza plan

This set of instructions explains the use of FluAid and FluSurge to produce estimates of the potential impact of the next influenza pandemic. However, the estimates produced from these instructions will not exactly match those shown in Table 1, Page 18, of the

DHHS Pandemic Influenza Plan. However, as demonstrated in Appendix III, the maximum and minimum estimates produced from these set of instructions clearly overlap with the maximum and minimum (previously unpublished) estimates from the DHHS plan. *[Note: Appendix III is currently being developed]*

Step 10: Interpreting the results

The user of this packet of instructions is referred to the disclaimer at the beginning of the instructions (the disclaimer is also replicated in the template draft report).

Estimating the potential impact of the next influenza pandemic upon Locale Y

Draft Report (Template)

[This template is a suggested method of presenting a brief report of the estimates of potential impact calculated using this set of instructions. The template is written in the first person singular (e.g., “I used FluAid to calculate . . .”), with the assumption that the user who produced the estimates of potential impact will also author a report. The user can remove, add or otherwise alter this template as necessary]

Date:

Author:

Author affiliation and contact information:

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Table 2: Results: Demand for hospital-based resources: 1968 - type scenario

Figure 1: Results: Hospital admissions by week: 1968 - type scenario:

Table 3: Results: Demand for hospital-based resources: 1918-type scenario

Figure 2: Results: Hospital admissions by week: 1918-type scenario

3) Appendices

Appendix I: Calculating the potential health outcomes in Locale Y associated with the next influenza pandemic

Appendix II: Calculating the demand for hospital resources in Locale Y associated with the next influenza pandemic

Appendix III: Comparing the estimates produced to those provided in the DHHS pandemic influenza plan [*currently being developed*]

Estimating the potential impact of the next influenza pandemic upon Locale Y

Objective and purpose

The illustrations of the potential impact of the next influenza pandemic contained in this report are intended to help Locale Y's public health officials and policy makers plan, prepare and practice for the next influenza pandemic.

Disclaimers

The numbers contained in this report should be treated as illustrations of what *could* happen (with unknown probability of actual occurrence). The numbers in this report, therefore, are intended solely as a guide to help public health officials and policymakers plan and prepare.

The findings and conclusions in this report and the accompanying appendices and spreadsheets are those of the author and do not necessarily represent the views of. . . .

This report is considered to represent technical help to the Department of Public Health, Government of Locale Y. It is not considered a publication of any form, nor has it been officially cleared by the author's agency.

The mention of any specific, commercially available product is merely to inform the reader of methods used to produce the results presented. Such mention of specific products does not constitute any endorsement.

Summary of results

Estimates of the potential impact of the next influenza pandemic in Locale Y: Two scenarios

Estimates of impact: Cases: Table 1 below contains a range of estimates of the potential impact of the next influenza pandemic in Locale Y. The conservatively low estimates, labeled “1968 - type scenario,” were primarily generated using rates of influenza-related illness measured during the 1960s and 1970s. The estimates labeled “Worst case: 1918 scenario” were generated using rates of influenza-related morbidity and mortality from the influenza pandemic of 1918.

Table 1: Total estimates, per health outcome, from two scenarios of potential impact of next influenza pandemic in Locale Y: Most likely (minimum, maximum)

Health outcome	Gross attack rate 25%*	
	Moderate scenario (1968 - type)†	Severe scenario (1918 - type) †
Deaths		
Hospitalizations§	[user enters estimates in all cells]	[user enters estimates in all cells]
Total hospital beds needed: Hospitalizations + deaths-in-hospital§		
Outpatients		
Ill, no medical care		

*Gross attack rates = % of entire Citizens of Locale Y population which are assumed to become clinically ill with influenza during the next pandemic.

†Source: Calculated using FluAid 2.0 available at: <http://www.dhhs.gov/nvpo/pandemics/> See Appendix I for further details.

§ As a health outcome, the term “hospitalizations” refers to those who are hospitalized due to influenza-related illness but survive (i.e., their end health outcome is hospitalization). However, a percentage of those who will die from influenza-related illnesses are likely to die in hospital. Thus, total hospital beds required will be the sum of hospitalizations + deaths in hospital. We have assumed, for the sake of illustration that 70% of influenza-related deaths will occur in hospital.

Comparison to a “standard” influenza season: The potential severity of the next influenza pandemic, whatever scenario is considered, can be judged by comparing the estimates presented in the table with the impact of influenza during a “typical influenza season.” In the United States during a non-pandemic influenza season, influenza will cause an average of 36,000 excess deaths (1). Similarly, from 1990 through 1995, the annual total number of influenza-related excess hospitalizations in the United States ranged from 114,000 to 200,000 (2). The number of influenza-related outpatient visits during a non-pandemic influenza season is more difficult to measure. The CDC’s annual surveillance of physician visits for influenza-like illnesses records that approximately 2%–3% of all physician visits during the winter months are for influenza-like illnesses.

References:

- 1) Thompson WW, et al. JAMA 2003; 289:179–186.
- 2) Simonsen L, et al. J Infect Dis 2000;181:831–837.

Caveats: Constructing a worst-case scenario using data from the 1918 influenza pandemic means that I used death-rate data that have a unique pattern that has not been

seen since. Specifically, the death rates among men aged 20–44 years of age were about equal to those recorded among children less than 5 years old and adults aged more than 65 years. Typically, death rates among healthy adults aged 20–44 years of age are less than a quarter of the death rates among either the very young or those over 65 years of age or older.

Demand for hospital resources: Tables 2 and 3 and Figures 1 and 2 illustrate the potential impact of the next influenza pandemic on Locale Y's hospital-based resources. Note that the demand for hospital beds is the sum of those hospitalized (but surviving), plus estimated deaths in hospital. For the sake of illustration, I assumed that 70% of influenza-related deaths will occur in hospital.

Essentially, the tables and figures illustrate whether or not Locale Y currently has sufficient hospital-based capacity to absorb all the patients as they become ill and seek hospital admission. Note that the estimates of capacity were calculated assuming that XXX non-Intensive Care Unit beds (ICU) and XX ICU beds would be available. These numbers of beds represent the total current hospital bed capacity. Because some hospital capacity must always be reserved for patients other than those ill from infectious diseases (e.g., maternity, trauma), actual current capacity to absorb pandemic influenza patients will be less than the total of all hospital beds available. Adjustments to current capacity, such as opening up emergency or temporary wards, will obviously alter capacity and thus potential impact. [Note: the authors using this draft may choose to use a different baseline of beds available. Or, they could choose to present a number of estimates, each using a different baseline of beds available, such as "all beds," "all beds available for infectious disease patients," and "beds available after additional capacity has been added."]

The assumptions and methodology used to produce the results shown in the two tables and two graphs are given in Technical Appendix II.

Summary of demand for hospital resources: Overall, even in a 1968 - type scenario, Locale Y's hospital capacity will be severely strained. Although the results predict a maximum of XXX% of hospital beds will be required (Table 2) that is XXX% of total capacity. Since much capacity has to be used for other non-influenza patients (e.g., maternity, trauma) it is an open question as to whether or not Locale Y's hospitals can provide the equivalent of XXX% of current capacity. In a 1918-type scenario, Locale Y's hospital capacity will be completely unable to cope. In a 1918-type scenario, peak demand will be equivalent of XXX% of current total capacity (Table 3). And, at almost any attack rate or scenario, Locale Y's current ICU capacity will be totally overwhelmed (Tables 2 and 3).

Table 2: Results: Demand for hospital-based resources: 1968 – type scenario: 25% attack rate: 8 weeks duration [user enters results]

Pandemic Influenza Impact		Weeks									
		1	2	3	4	5	6	7	8	9	10
Hospital Admission	Weekly admissions										
	Peak admissions/day										
Hospital Capacity	# of influenza patients in hospital										
	% of hospital capacity needed*										
ICU Capacity	# of influenza patients in ICU										
	% of ICU capacity needed*										
Ventilator Capacity	# of influenza patients on ventilators										
	% usage of ventilator										
Deaths	# of deaths from influenza										
	# of influenza deaths in hospital										

* % capacity calculated assuming XXX beds available and XX ICU beds. These numbers of beds represent the total hospital bed capacity. Actual capacity to absorb pandemic influenza patients will be less than that, and thus the estimates of percentage of capacity needed are smaller than what may occur. Source: Calculated using FluSurge 2.0 – see Appendix II for additional details

Figure 1: Results: Hospital admissions by week given a 1968 - type scenario and 25% attack rate (most likely, minimum, maximum weekly admissions); 8 weeks' duration

[Copy and paste appropriate figure from FluSurge. Note: to do this copy-and-paste operation from FluSurge, the user will have to unprotect the worksheets in FluSurge. See appendix II for details]

Source: Calculated using FluSurge 2.0 – see Appendix II for additional details

Table 3: Results: Demand for hospital-based resources: 1918-type scenario: 25% attack rate: 8 weeks duration [user enters results]

Pandemic Influenza Impact		Weeks									
		1	2	3	4	5	6	7	8	9	10
Hospital Admission	Weekly admissions										
	Peak admissions/day										
Hospital Capacity	# of influenza patients in hospital										
	% of hospital capacity needed										
ICU Capacity	# of influenza patients in ICU										
	% of ICU capacity needed										
Ventilator Capacity	# of influenza patients on ventilators										
	% usage of ventilator										
Deaths	# of deaths from influenza										
	# of influenza deaths in hospital										

Source: Calculated using FluSurge 2.0 – see Appendix II for additional details

Figure 2: Results: Hospital admissions by week given a 1918-type scenario and 25% attack rate (most likely, minimum, maximum weekly admissions); 8 weeks' duration

[Copy and paste appropriate figure from FluSurge. Note: to do this copy-and-paste operation from FluSurge, the user will have to unprotect the worksheets in FluSurge. See appendix II for details]

Source: Calculated using FluSurge 2.0 – see Appendix II for additional details

Appendix I
Calculating the potential health outcomes in Locale Y associated with the next influenza pandemic: Methods and results

Moderate Scenario: 1968 - type scenario

Pages 2–6

Methodology

Population and age groups

Risk groups

Table AI.1: Locale Y's population, by age

Rates of health outcomes

Special note: Hospitalizations

Table AI. 2: Input values used to calculate the potential impact on Locale Y of the next influenza pandemic: 1968 - type scenario

Results

Table AI.3: Results: Potential impact on Locale Y of the next influenza pandemic: 1968 - type scenario

Graphs: Potential impact on Locale Y of the next influenza pandemic: 1968 - type scenario: Total deaths, hospitalizations and outpatients

Severe Scenario: 1918-type scenario

Pages 7–12

Caveats in estimating a 1918-type scenario

Methodology

Population and age groups

Risk groups

Rates of health outcomes

Need for a scaling factor

Calculating a scaling factor

Scaling factor to use

Death rates to estimate a 1918-type scenario

Rates of hospitalization to estimate a 1918-type scenario

Table AI. 3: Input values used to calculate the potential impact on Locale Y of the next influenza pandemic: Severe scenario: 1918-type

Rates of outpatient visits

Results

Table AI.5: Results: Potential impact on Locale Y of the next influenza pandemic: 1918-type scenario

Graphs: Potential impact on Locale Y of the next influenza pandemic: 1918-type scenario: Total deaths and hospitalizations

Pages 13–15

Endnote: Calculating a scaling factor to convert 1968-type death rates to those suitable to calculate a 1918-type scenario

**Locale Y: Influenza Pandemic Moderate Scenario: 1968 - type
Calculating health outcomes: Methods and results**

Methodology:

To calculate the potential impact on Locale Y of the next influenza impact, I used the software called FluAid 2.0. This is software designed to aid state and local public health officials plan, prepare and practice for the next influenza pandemic (available at: <http://www.dhhs.gov/nvpo/pandemics/>).

Population and age groups: I used the default age groups set into FluAid, which are 0–18 years, 19–64 years, and 65+ years. [Note: Within “reason,” other age groups can be used in FluAid. For example, a user might set the population distribution to include 0–19 years or even 0–14 years. If the user wishes to use age groups different to FluAid’s default age groups, then the user should keep a note of any such changes and make the appropriate changes in the draft tables in this draft report.]

I entered into FluAid (data entry page 2 of 9) the population of Locale Y as presented in Table AI.1, below.

Table AI.1: Locale Y’s population, by age:

Age group, years	Subtotal
0–18	
19–64	
65+	
	Total

Source: [Place note on source of population data for locale Y here]

Risk groups: A key component in estimating the potential impact of the next influenza pandemic is the proportion of Locale Y’s population that, because of pre-existing medical conditions, are at high risk of influenza-related adverse health outcomes. For this exercise, I used FluAid’s default values, set in data entry page 3 of 9 (see Table AI.2, below). [As with any FluAid input values, a user can change the default values of the percentage of high-risk individuals in each age group.]

Rates of health outcomes: I used the FluAid default rates of health outcomes (deaths, hospitalizations, outpatient visits). These rates come, in most part, from U.S. data from the late 1960s and early 1970s (just after the 1968 influenza pandemic), with some rates from the 1957 influenza pandemic. See Meltzer et al. for additional details (Emerg Infect Dis 1999;5:659–671). See Table AI.2 for rates used.

[Note: In FluAid, the user can change any of the default rates of health outcomes. The default rates reflect a 1968-type influenza pandemic.]

Special note: Hospitalizations: The term “hospitalizations” as used in FluAid refers to final health outcome. That is, in FluAid, the term “hospitalizations” refers to those who are admitted to the hospital due to influenza-related illness but who survive. However, it

is reasonable to assume that some portion of those whose ultimate influenza-related health outcome will be death will die in hospital. Those death-in-hospital cases are in addition to the FluAid calculated hospitalizations. See Appendix II for further details.

Gross clinical attack rate: I used the default gross clinical attack rates of 15%, 25%, and 35%. [In FluAid, a user can change these values as desired. In FluAid, go to data entry page 7 of 9.]

Table AI.2: Input values used to calculate the potential impact on Locale Y of the next influenza pandemic: Moderate scenario: 1968 -type

High Risk percentages by age group				
Age group		%		
0–18 years		6.4%		
19–64 years		14.4%		
65+ years		40.0%		
Deaths: Rates by age and risk groups				
		Rates per 1,000 age and risk population		
High Risk		Minimum	Most likely	Maximum
0–18 years		0.126	0.22	7.65
19–64 years		0.1	2.91	5.72
65+ years		2.76	4.195	5.63
		Rates per 1,000 age and risk population		
Non High Risk		Minimum	Most likely	Maximum
0–18 years		0.014	0.024	0.125
19–64 years		0.025	0.037	0.09
65+ years		0.28	0.42	0.54
Hospitalizations: Rates by age and risk groups				
		Rates per 1,000 age and risk population		
High Risk		Minimum	Most likely	Maximum
0–18 years		2.1	2.9	9
19–64 years		0.83	2.99	5.14
65+ years		4	8.5	13
		Rates per 1,000 age and risk population		
Non High Risk		Minimum	Most likely	Maximum
0–18 years		0.2	0.5	2.9
19–64 years		0.18	1.465	2.75
65+ years		1.5	2.25	3
Outpatient visits: Rates by age and risk groups				
		Rates per 1,000 age and risk population		
High Risk		Minimum	Most likely	Maximum
0–18 years		289	346	403
19–64 years		70	109.5	149

65+ years		79		104.5		130
		Rates per 1,000 age and risk population				
Non High Risk		Minimum		Most likely		Maximum
0–18 years		165		197.5		230
19–64 years		40		62.5		85
65+ years		45		59.5		74

Source: Default values in FluAid 2.0, available at: <http://www.dhhs.gov/nvpo/pandemics/>
[Note: If a user alters any of these rates in FluAid, the alterations should be noted on this Table.]

Results: The complete results produced by FluAid for a 1968-type scenario are presented below in Table AI.3 and in the graphs. [Note: After filling in Table AI.3 below, the user should copy the relevant results into Table 1 in the main draft report. In order to convey a sense of uncertainty and the resultant range in possible outcomes, the user is encouraged to record, both in Table AI.3 below and in Table 1 in the main draft report, the most likely minimum and maximum results.]

Table AI.3: Results: Potential impact on Locale Y of the next influenza pandemic: 1968 - type scenario.

Population: Numbers and distribution by age and risk group									
Risk groups	0-18 yrs	19-64 yrs	65+ yrs	Totals	% total				
Non-high risk*									
High risk*									
Totals									
Note: High risk refers to pre-existing medical conditions (e.g., asthma, diabetes, heart and lung conditions) that increase risk of influenza-related adverse health outcome.									
Deaths: By age group									
Age groups		Gross attack rate				Distribution of deaths by risk group			
		15%		25%		35%		% high risk	% all deaths
0-18 yrs	most likely						0-18 yrs		
	<i>min</i>						19-64 yrs		
	<i>max</i>						65+ yrs		
19-64 yrs	most likely						Totals		
	<i>min</i>								
	<i>max</i>								
65+ yrs	most likely								
	<i>min</i>								
	<i>max</i>								
TOTALS	most likely								

	<i>min</i>								
	<i>max</i>								
Hospitalizations:* By age group							Distribution of hospitalizations by risk group		
		Gross attack rate					group		
Age groups		15%		25%		35%		% high risk	% all hospital
0-18 yrs	most likely						0-18 yrs		
	<i>min</i>						19-64 yrs		
	<i>max</i>						65+ yrs		
19-64 yrs	most likely						Totals		
	<i>min</i>								
	<i>max</i>								
65+ yrs	most likely								
	<i>min</i>								
	<i>max</i>								
TOTAL	most likely								
	<i>min</i>								
	<i>max</i>								
Outpatients: By age group							Distribution of outpatients by risk group		
		Gross attack rate					group		
Age group		15%		25%		35%		% high risk	% all outpatient
0-18 yrs	most likely						0-18 yrs		
	<i>min</i>						19-64 yrs		
	<i>max</i>						65+ yrs		
19-64 yrs	most likely						Totals		
	<i>min</i>								
	<i>max</i>								
65+ yrs	most likely								
	<i>min</i>								
	<i>max</i>								
TOTAL	most likely								
	<i>min</i>								
	<i>max</i>								

*The term “hospitalizations” refers to those who are admitted to hospital due to influenza-related illness, but who survive. However, it is reasonable to assume that some portion of those whose ultimate influenza-

related health outcome will be death will die in hospital. Those death-in-hospital cases are in addition to the FluAid calculated hospitalizations. See Appendix II for further details.

Results: Graphs: Potential impact on Locale Y of the next influenza pandemic: 1968 - type scenario. Total deaths, hospitalizations and outpatients

[Copy and paste the graphs produced in Excel as output from FluAid.]

Locale Y: Influenza Pandemic Severe Scenario: 1918- type scenario Calculating health outcomes: Methods and results

Caveats in estimating a 1918-type scenario

While there are a number of sources recording the death rates due to the 1918 pandemic, such sources typically don't record rates by risk group (risk of adverse health outcomes due to pre-existing health conditions). However, when faced with having to allocate potentially limited resources, such as vaccines, policy makers may well wish to know the death rates and number of deaths by both age and risk group.

Further, any use of 1918-based death rates implicitly assumes that a user is accepting the pattern of deaths experienced in 1918. This pattern includes a notably higher-than-normal death rate among otherwise healthy 20-40 year olds (see review by Taubenberger JK, Morens DM. *Emerg Infect Dis* 2006;12:15–22). Such a death rate among this age group has not been experienced since the 1918 pandemic (either in later pandemics or during non-pandemic years).

Methodology

Population and age groups: To ensure a direct comparison between the calculated illustrations of the impacts of a 1968-type scenario and a 1918-type scenario, the population and age groups used should be the same as in Table AI.1, above. [If the user, when calculating a the potential impact of a 1968-type pandemic, made any alterations to FluAid's default age groups, then those same alterations should be used when calculating a 1918-type scenario.]

Risk groups: For this exercise, I used FluAid's default values, set in FluAid's data entry page 3 of 9 (see Table AI.2, above). [If the user changed the default values when calculating a 1968-type scenario, those same changes in percentages of high risk persons per age group should be made when calculating a 1918-type scenario.]

Health outcomes rates

Need for a scaling factor: The easiest way to produce estimates of potential impact of the next influenza pandemic assuming a 1918-type scenario is to use FluAid (as described in producing 1968-type estimates), but altering FluAid's default rates of health outcomes with a scaling factor. A user would essentially multiply FluAid's default rates of death (which represent a 1968-type scenario—see Table AI.2, above) by a scaling factor to get rates of death for a 1918-type scenario. In FluAid, the rates of death that will be multiplied by the scaling factor to produce an illustration of deaths in a 1918-type scenario are found in FluAid on data entry page 4 of 9 (see FluAid program and manual).

Calculating a scaling factor: To calculate a scaling factor that can be used to scale-up FluAid default death rates from a 1968-type scenario to produce a 1918-type scenario requires first estimating deaths under both scenarios for the same population (e.g., U.S. population as at 2002). Then, by comparing the number of deaths, the scaling factor can

be readily calculated. The endnotes to this appendix contain the details of the calculations made.

Scaling factor to use: From the comparison of estimated deaths from a 1968- type scenario and a 1918-type scenario, the age-weighted average scaling factor is **8.22** (see endnotes for details as to how this was calculated). This is the factor by which to multiply the FluAid default (1968-type scenario) death rates so as to obtain estimates of deaths under a 1918-type scenario.

Death rates to estimate a 1918-type scenario: Table AI.4 presents the results of multiplying FluAid’s 1968-type scenario default death rates (see Table AI.2) by the scaling factor. [The user should enter the calculated death rates for the 1918-type scenario given in Table AI.4 into FluAid’s data entry page 4 of 9.]

Rates of hospitalizations to estimate a 1918- type scenario: There are little or no data from the 1918 influenza pandemic regarding hospitalization rates or rates of outpatient visits. And, even if such data existed, it is questionable if it would be relevant in society today. The context of a hospitalization has changed greatly in the past 100 years. Improved hospital-based technology and better trained hospital-based staff (of all types) has resulted in different set of outcomes and different expectations associated with hospitalizations. Overall, because of the changes in technology, there may be a different set of reasons (or a different “trigger point”) that will cause a patient to go to a hospital seeking admission. Similar problems exist for rates of outpatient visits.

Because there are little or no data regarding rates of hospitalizations during the 1918 influenza pandemic, I assumed (and it is only an assumption) that the same differences in death rates between the 1968-type scenario and the 1918-type scenario (i.e., the scaling factor) would also apply to differences in rates of hospitalizations. That is, if death rates in the 1918-type scenario were approximately 8 times greater, on average, than the death rates in the 1968 - type scenario, then I assumed that the same differences existed in hospitalization rates. Again, this is just an assumption and there are no data to support the idea that such an assumption would be “reasonable.” Table AI.4 presents FluAid’s default rates of hospitalization multiplied by a scaling factor of 8.22 (the same scaling factor used to produce 1918-type rates of death). [The user should enter the hospitalization rates in Table AI.4 into FluAid’s data entry page 5 of 9.]

Gross clinical attack rate: I used the same gross clinical attack rates as used in estimating the 1968-type scenario (see above) [In FluAid, a user can change these values as desired. In FluAid, go to data entry page 7 of 9.]

Table AI.4: Input values used to calculate the potential impact on Locale Y of the next influenza pandemic: Severe scenario: 1918- type

High Risk percentages by age group	
Age group	%

0-18 yrs	6.40%		
19-64 yrs	14.40%		
65+ yrs	40.00%		
Deaths: Rates by age and risk groups			
Rates per 1,000 age and risk population			
High Risk	Minimum	Most likely	Maximum
0-18 yrs	1.036	1.808	62.883
19-64 yrs	0.822	23.920	47.018
65+ yrs	22.687	34.483	46.279
Rates per 1,000 age and risk population			
Non High Risk	Minimum	Most likely	Maximum
0-18 yrs	0.115	0.197	1.028
19-64 yrs	0.206	0.304	0.740
65+ yrs	2.302	3.452	4.439
Hospitalizations: Rates by age and risk groups			
Rates per 1,000 age and risk population			
High Risk	Minimum	Most likely	Maximum
0-18 yrs	17.262	23.838	73.980
19-64 yrs	6.823	24.578	42.251
65+ yrs	32.880	69.870	106.86
Rates per 1,000 age and risk population			
Non High Risk	Minimum	Most likely	Maximum
0-18 yrs	1.644	4.110	23.838
19-64 yrs	1.480	12.042	22.605
65+ yrs	12.330	18.495	24.66
Outpatient visits: Rates by age and risk groups			
When calculating an illustration of a 1918- type pandemic, do not use FluAid to calculate the numbers of outpatients. See text of this Appendix for further details			

Source: These rates were calculated by multiplying FluAid's default rates (see Table AI.2) by a weighted average scaling factor of 8.22. See text in this appendix for further details.

Rates of outpatient visits: There are no data concerning the rates of outpatient visits in 1918. And, similar to the discussion concerning rates of hospitalization for a 1918-type scenario, even if data on rates of outpatient visits in 1918 existed, it is questionable if such data would be relevant in society today (for example, many physicians made house calls in 1918—a practice that all but disappeared by the late 20th century). The context of an outpatient visit has changed greatly in the past 100 years.

However, because of the already high rates of outpatient visits in the 1968-type scenario (see Table AI.2), calculating outpatient visits for a 1918-type scenario using a scaling factor of 8.22 (used to produce the rates of death and hospitalizations in Table AI.4)

would result in too many outpatients being calculated (often more outpatients than actual symptomatic cases). Therefore, I could not use a methodology similar to that used to calculate the hospitalizations for the 1918-type scenario. [Note: because there is no simple way to identify a scaling factor for outpatient visits, output from FluAid for outpatients in a 1918-type scenario will not be relevant and thus should not be reported. The other estimates for deaths and hospitalizations are as reliable as the methodology allows—see caveats at the beginning of this section of the Appendix.]

Therefore, to calculate outpatient visits for a 1918-type scenario, I used the following methodology:

First, I calculated the total number of symptomatic cases, by age group:

For example, for age group 0–18 years: Total symptomatic cases = Total population (Table AI.1 this appendix) × gross clinical attack rate of 25% × percent of total population aged 0–18 years.

Repeat the above calculation for other age groups.

Second, I calculated the total number of outpatients plus those ill but requiring no medical care as follows:

For a given age group: The total number of outpatients + ill no medical care = total symptomatic cases – deaths – hospitalizations.

Third, I distributed the total number of outpatients + ill no medical care patients into outpatients and ill no medical care, using proportions from the 1968-type scenario (Table AI.3).

For example, assume that for 0–18 year olds, approximately half of the total number of outpatients + ill no medical care patients were in the “outpatient group.” Then, in the 1918-type scenario, I placed 50% of the total number of outpatients + ill no medical care patients in the outpatient category.

Results: The complete results produced by FluAid for a 1918-type scenario are presented below in Table AI.5 as well as graphs of deaths and hospitalizations. [Note: After filling in Table AI.5 below, the user should copy the relevant results into Table 1 in the main draft report. In order to convey a sense of uncertainty and the resultant range in possible outcomes, the user is encouraged to record, both in Table AI.5 below and Table 1 in the main draft report, the most likely, minimum and maximum results.]

Table AI.5: Results: Potential impact on Locale Y of the next influenza pandemic: 1918- type scenario.

Population: Numbers and distribution by age and risk group								
Risk groups	0-18	19-64	65+	Totals	%			

		yrs	yrs	yrs		total			
Non-high risk*									
High risk*									
Totals									
Note: High risk refers to pre-existing medical conditions (e.g., asthma, diabetes, heart and lung conditions) that increase risk of influenza-related adverse health outcome									
Deaths: By age group									
		Gross attack rate				Distribution of deaths by risk group			
Age groups		15%		25%		35%		% high risk	% all deaths
0-18 yrs	most likely						0-18 yrs		
	<i>min</i>						19-64 yrs		
	<i>max</i>						65+ yrs		
19-64 yrs	most likely						Totals		
	<i>min</i>								
	<i>max</i>								
65+ yrs	most likely								
	<i>min</i>								
	<i>max</i>								
TOTALS	most likely								
	<i>min</i>								
	<i>max</i>								
Hospitalizations:* By age group							Distribution of hospitalizations by risk group		
		Gross attack rate				Distribution of hospitalizations by risk group			
Age groups		15%		25%		35%		% high risk	% all hospital
0-18 yrs	most likely						0-18 yrs		
	<i>min</i>						19-64 yrs		
	<i>max</i>						65+ yrs		
19-64 yrs	most likely						Totals		
	<i>min</i>								
	<i>max</i>								
65+ yrs	most likely								
	<i>min</i>								
	<i>max</i>								
TOTAL	most likely								

	<i>min</i>									
	<i>max</i>									
Outpatients: By age group†										
		Gross attack rate					Distribution of outpatients by risk group			
Age group		15%		25%		35%		% high risk	% all outpatient	
0-18 yrs	most likely						0-18 yrs			
	<i>min</i>						19-64 yrs			
	<i>max</i>						65+ yrs			
19-64 yrs	most likely						Totals			
	<i>min</i>									
	<i>max</i>									
65+ yrs	most likely									
	<i>min</i>									
	<i>max</i>									
TOTAL	most likely									
	<i>min</i>									
	<i>max</i>									

* The term “hospitalizations” refers to those who are admitted to hospital due to influenza-related illness, but who survive. However, it is reasonable to assume that some portion of those whose ultimate influenza-related health outcome will be death will die in hospital. Those death-in-hospital cases are in addition to the FluAid calculated hospitalizations. See Appendix II for further details.

† Note: outpatients are calculated as a residual, subtracting deaths and hospitalizations from the total symptomatic cases (by attack rate). The resultant residual is then divided between outpatients and ill, no medical care using the same proportions of such patients calculated for the 1968- type scenario.

Results: Graphs: Potential impact on Locale Y of the next influenza pandemic: 1918-type scenario. Total deaths and hospitalizations

[Copy-and-paste the graphs produced in Excel as output from FluAid. Note, because of the method used to calculate outpatient visits for the 1918-type scenario (see text in this Appendix), FluAid will not produce reliable/ usable estimates of outpatient visit for a 1918-type scenario. Therefore, users should not copy and paste the FluAid graph for outpatients.]

Endnote: Calculating a scaling factor to convert 1968-type death rates to those suitable to calculate a 1918-type scenario

These set of endnotes provide an explanation of the calculations used to produce the scaling factor of 8.22. This scaling factor is used to convert the FluAid default, 1968-type death and hospitalization rates, into death and hospitalization rates for a 1918-type scenario. [These notes are provided purely for the purposes of explanation and clarification of methodology. The calculations do not have to be repeated by a user.]

Step 1: Calculating clinical cases by age group for 1918-type scenario

The weighted average scaling factor was calculated by first multiplying the total population (Table E1) by a set gross clinical attack rate (e.g., 15%) and then distributing the total cases by age, using the distributions given in Table E2 (e.g., For 0–18 years; 288.367 million \times 0.15 \times 0.476 = 20.58 million cases). For the entire population, at a 15% gross clinical attack rate, this gives total of approximately 43 million cases (Table E3). Note that the source of distribution of cases by age (Table E2) provides slightly different age categories. It is assumed that using slightly different age categories does not alter the distribution of cases (e.g., using 0–18 years instead of 0–14 years does not alter the 47.6% of all cases accruing in that age group as shown in Table E2).

[Why use 15% gross attack rate for this exercise of calculating a scaling factor? It is assumed that the number of deaths increase in a linear manner with increases in gross clinical attack rates. Thus, when calculating a scaling factor of deaths from a 1968-type to a 1918-type pandemic (really a ratio), the scaling factor remains constant across all gross attack rates. Therefore, the gross clinical attack rate used in these particular scaling factor calculations (only) does not matter, so long as the same gross clinical attack rate is used to generate estimates of death for both the 1968-type and 1918-type scenarios.]

Table E1: U.S. population, by age, 2002

Age group, years	Millions
0–18	81.022
19–64	160.132
65+	47.213
	Total
	288.367

Source: Statistical Abstract of the United States: 2003: Table No. 11 (page 13).

Table E2: Distribution of cases by age for 1918-type scenario

Age group, years	% of cases
0–14	47.6
15–65	48.9
65+	3.5

Source: Figure 3, Frost WH. Public Health Reports 1920;35:584–597.

Table E3: Calculated total number of clinical cases: 15% attack rate

Age group, years	Clinical cases (millions), Gross clinical attack rate 15%
0–18	20.588114
19–64	21.165153
65+	1.501783
	43.255050

Source: Calculated by multiplying the total number of cases in the entire population (Table E1), assuming a 15% gross clinical attack rate.

Step 2: Calculating deaths by age group for 1918-type scenario

The number of cases per age group (Table E3) is then multiplied by average age-specific case fatality rates experienced in the 1918 influenza pandemic in the United States (Table E4). It is assumed that using slightly different age categories does not alter the case fatality rates. For example, for the age group 0–18 years, the following formula is used: 20.59 million clinical cases (Table E3) x average case fatality rate of 0.96% (Table E4) = 197,645 deaths ($20.59 \times 0.0096 = 197,645$).

Table E4: 1918: U.S. case fatality rates

Case fatality rates from 1918 U.S. data			
Gender weighted average case fatality rates			
Locales*	0-14yrs	15-65yrs	65+yrs
Locales 1	1.3%	2.6%	4.4%
Locales 2	0.7%	1.3%	1.9%
Locales 3	0.9%	3.5%	6.4%
Averages	0.96%	2.46%	4.21%

* Locales, all in United States

- 1 New London, Baltimore, Maryland (minor communities)
- 2 Macon, Spartanburg, San Antonio, Augusta, Des Moines, Little Rock, Louisville
- 3 San Francisco

Source: Figure 7, Frost WH. Public Health Reports, 1920; 35:584-597

Step 3: Calculate deaths for 1968-type scenario

The model from Meltzer et al. (Emerg Infect Dis 1999;5:659–671) was then re-run, using the 2002 estimates of the U.S. population (Table E1). Specifically, the model was re-run using the distribution of cases for Scenario B developed by Meltzer et al. (see the online-only Appendix II, available at: http://www.cdc.gov/ncidod/eid/vol5no5/melt_back.htm). For Scenario B in Meltzer et al., the cases were distributed as follows: 0–19 years—46%; 20–64 years—46.7%; 65+ years—7.3% (see Table 2 in Meltzer et al., Appendix II). The reason why Scenario B from Meltzer et al. was used is that, of the two scenarios presented in Meltzer et al., the distribution of cases in Scenario B most closely matches those measured in 1918 (Table E2).

Step 4: Calculate the scaling factor from 1968-type to 1918-type pandemic deaths for 1968-type scenario

With the two sets of estimates of deaths (calculated for a U.S. population as at 2002, assuming a 15% gross clinical attack rate), the scaling factor is then calculated as follows:

For given age group: Scaling factor = (Deaths in 1918-type scenario)/ (deaths in 1968-type scenario).

A global scaling factor is calculated as follows:

Global scaling factor = (All deaths in 1918-type scenario)/ (all deaths in 1968-type scenario).

Results:

Table E5 provides estimates of deaths, for a U.S, population as at 2002, for a 1968-type pandemic and a 1918-type pandemic.

As described in this Appendix, the global scale-up factor (8.22) is used to multiply FluAid’s default (1968-type) death and hospitalization rates. This scaling up allows FluAid to be used to estimate a 1918-type scenario.

Table E5: Calculating a scaling factor using estimated deaths from two influenza pandemic scenarios (assuming a 15% gross clinical attack rate)

Age groups	Deaths: Thousands 15% gross clinical attack rate		Scale-up FACTOR
	1968- type	1918- type	
0–19 yrs	18.95118	226.7852	11.96681
20–60 yrs	72.79716	644.9231	8.859179
60+ yrs	24.06332	80.74335	3.355454
Totals	115.8117	952.4516	8.224143

Source: Estimates of deaths for 1968-tyep scenario calculated using Scenario B of model presented in Meltzer et al. (Emerg Infect Dis 1999;5:659–671). See text in endnote for more. Estimates of death for 1918-type scenario calculated as described in text of this endnote.

Appendix II: Calculating the demand for hospital resources in Locale Y associated with the next influenza pandemic: Two scenarios

Methodology

To calculate the potential impact of the next influenza pandemic upon Locale Y's hospital resources, I used FluSurge 2.0 (available at: <http://www.dhhs.gov/nvpo/pandemics/>). The methodology is similar for both the 1968-type and 1918-type scenarios.

1968-type scenario

Population by age groups: I used the same population as that presented in Appendix I, table AI.1. [Upon loading FluSurge 2.0, and proceeding to the Main menu page, for the 1968-type scenario, the user starts by filling in the population, by age group (should be the same as in Table AI.1, Appendix 1). Once the user has entered the population, FluSurge automatically calculates the number of deaths and hospitalizations for a 1968-type scenario as in FluAid]

Number of total licensed non-ICU beds: The number of beds available is listed in Table AII.1 [Determining the number of licensed non Intensive Care Unit (ICU) hospital beds may not be easy. There may be data recording the total number of non-ICU beds in Locale Y, but such data may not record those beds that can't, realistically, be made available to influenza patients. Some hospital capacity must always be reserved for patients other than those ill from infectious diseases (e.g., maternity, trauma, cancer wards). Thus, actual current capacity to absorb pandemic influenza patients will be less than the total of all hospital beds available. Adjustments to current capacity, such as opening up emergency or temporary wards, will obviously alter capacity and thus potential impact. Authors may choose to use a different baseline of beds available. Or, they could choose to present a number of estimates, each using a different baseline of beds available, such as "all beds," "all beds available for infectious disease patients," and "beds available after additional capacity has been added."]

% licensed non-ICU beds staffed: Listed in Table AII.1 [Not all beds are staffed and currently available to receive patients. Of course, during a pandemic, rules concerning minimum staffing ratios may be relaxed. A user could therefore explore the impact of assuming different levels of staffing.]

Total licensed ICU beds and Total number of ventilators: Listed in Table AII.1 [The same comments regarding availability of sufficient data for non-ICU hospital beds applies to these two categories. Again, a user may run more than one scenario, based on the available data and ranges of that data.]

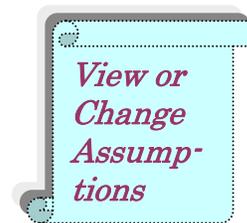
Table AII.1: Assumptions used for both scenarios to calculate demand for hospital-based resources over duration of pandemic

Total licensed non-ICU beds*	
% licensed non-ICU beds staffed:	
Total staffed non-ICU beds:	
Total licensed ICU beds:	
% licensed ICU beds staffed:	
Total staffed ICU beds:	
Total number of ventilators:	
% ventilators available:	
Total number of ventilators available:	

*This number represents the total number of hospital beds in Locale Y. The actual number of beds available for pandemic influenza patients will be some proportion of this.

Duration (select from 6, 8, or 12 weeks) and attack rate (select from 15%, 25%, or 35%) of the pandemic: [FluSurge allows the user to choose from one of three pre-set durations of pandemic (6, 8, or 12 weeks) and one of three gross attack rates (15%, 25%, or 35%).]

[What if I want to use a different gross clinical attack rate? If a user wishes to choose a different gross clinical attack rate (e.g., 30%), then the user needs to first calculate deaths and hospitalizations using FluAid, then click the “View or Change Assumptions” button on the main Menu Page, as shown.



Then, on the “Assumptions” page, click on the “Use Your Own Estimates” button.



Clicking on the “Use Your Own Estimates” button, will take you to a page where you can enter your own estimates. For example, you can enter your own estimates of deaths and total hospitalizations. Recall that, as explained in the draft report, total hospitalizations is the sum of those hospitalized (but surviving) plus deaths in hospital. It was assumed, for

the sake of illustration, that 70% (or some similar, user-defined percentage) of influenza-related deaths will occur in hospital.]

Assumptions used in FluSurge: Table AII.2 lists the default assumptions in used in FluSurge [By clicking on the “View or Change Assumptions” button on the “Main Menu” page, users will be taken to the “Assumptions” page. The user can readily change any of the assumptions (see further details in the FluSurge manual). For the record, it is advisable to note any user-defined changes in these set of assumptions in Table AII.2]

Table AII.2: Assumptions used for both scenarios to calculate demand for hospital-based resources over duration of pandemic

	Input assumptions	Unit	Values
No. 1	Average length of non-ICU hospital stay for influenza-related illness	days	5
No. 2	Average length of ICU stay for influenza-related illness	days	10
No. 3	Average length of ventilator usage for influenza-related illness	days	10
No. 4	Average proportion of admitted influenza patients will need ICU care	Proportion	0.15
No. 5	Average proportion of admitted influenza patients will need ventilators	Proportion	0.075
No. 6	Average proportion of influenza deaths assumed to be hospitalized	Proportion	0.7
No. 7	Daily percentage increase in cases arriving compared to previous day	Percent	5

Results

Results are presented in the draft report, Table 2 and Figure 1.

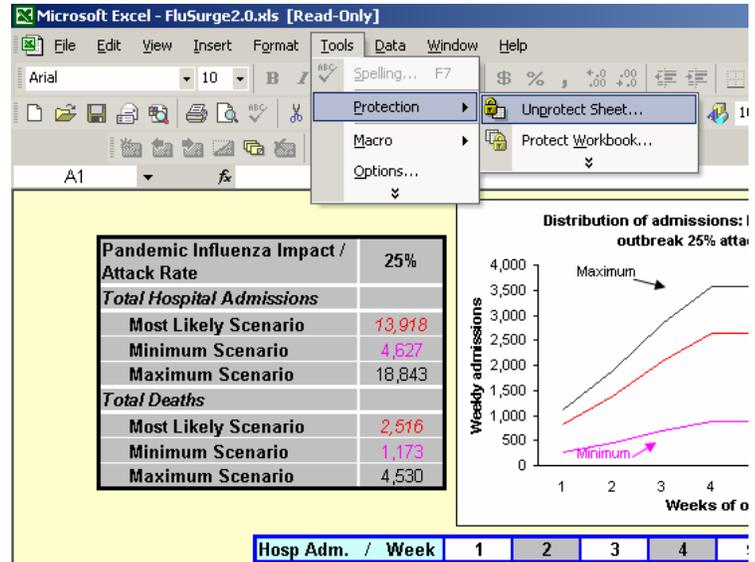
[Click to View Results](#)

[By clicking on the “Click to View Results” button, users are taken to the first page with results, and they can they access the second page.]

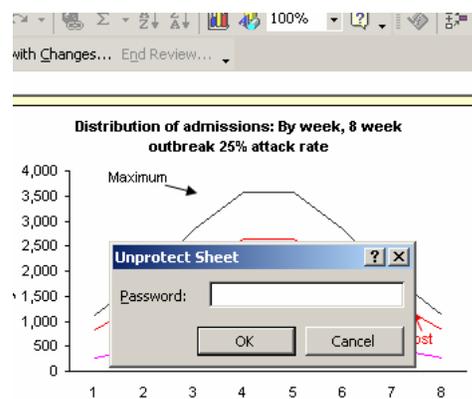
Notes on copying and pasting graphs and figures from FluSurge:

In order to prevent accidental alterations to the program, each FluSurge screen (i.e., worksheet) is protected by a password. That is, other than altering the numbers in the white data entry boxes, nothing in FluSurge can be altered or copied and pasted without first entering the password (i.e., the password “unlocks” the screen, allowing the user to then copy and edit at will).

To unlock a screen in FluSurge (see figure on right): Click on the “Tools” menu on the Excel menu list (at the top of the Excel spreadsheet), and with the mouse button still depressed/clicked, move down the set of menu options, selecting/stopping on the menu item “Protection.” Slide your computer mouse to the right, and take your finger of the mouse button. This will select the option “Unprotect Sheet.”



Once you have properly selected “Unprotect Sheet,” a small box labeled “Unprotect Sheet” will appear on the screen, “floating” on top of the page (see figure on right).



Enter the Password into the white square in the box. The password is “**influenza.**” The password must be entered in lower case—no capital letters. Once entered, click the “Ok” button on the “Unprotect Sheet.” If the removal of protection (unlocking) was successful, the “Unprotect Sheet” box should disappear from the screen.

The user is now free to copy and paste the graph and table in that page.

This process of removing password protection must be repeated for each screen (worksheet) in FluSurge from which a user wishes to copy and paste.

1918-type scenario

[Using FluSurge to produce estimates of potential impact on demand for hospital-based resources for a 1918-type scenario is very similar as using FluSurge to produce estimates for a 1968-type scenario. The number of non-ICU beds, ICU beds, and other data should be the same as those used to estimate the impact for the 1968-type scenario.]

Number of total hospitalizations: Table AII.3 presents the number of deaths and hospitalizations used in FluSurge to estimate the impact of a 1918-type scenario on hospital-based resources. [To enter the 1918-type scenario number of deaths and total hospitalizations, in FluSurge click the “View or Change Assumptions” button on the “Main Menu” page (see above). Clicking on the “Use Your Own Estimates” button will take you to a page where you can enter your own estimates. For example, you can enter the estimates from Table AII.3]

Table AII.3: Total hospitalizations used to calculate impact of 1918-type pandemic on hospital-based resources

Health outcomes	Gross attack rate 25%* Severe scenario (1918-type) †
Deaths	
Hospitalizations§	
Total hospital beds needed: Hospitalizations + deaths-in- hospital§	

Source: See Draft Report and Appendix I.

Results

Results are presented in the draft report, Table 3 and Figure 2.