

MedCon

Pre-Event

Beta Test Version 1.0

A Tool to Estimate the Pre-Event Population at Risk of Medical Consequences in a Disaster

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DISCLAIMER

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

SYSTEM REQUIREMENTS

MedCon:Pre-Event uses the Microsoft Windows¹ 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. *MedCon:Pre-Event* requires at least 2 megabytes of storage space on the computer's hard drive.

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1. INTRODUCTION

1.1 Background

Disasters such as bioterrorist attacks (e.g., anthrax attack) or major natural disasters (e.g., hurricanes, earthquakes, wildfires), likely to cause the displacement of hundreds of thousands of people from their homes, and they may experience delays returning home. Displaced people are disconnected from their communities, caregivers, and the support of friends and neighbors and experience disruption in access to prescription medicines and medical records. As a result, displaced people—especially those with pre-existing severe health conditions—are more vulnerable to medical consequences including health crises than those without pre-existing medical conditions, if their medical care requirements are not met.¹ Preparedness plans often focus on injuries and illness due to direct impact of an event.^{1,2,3} Such planning may overlook the medical care needs of those with pre-existing chronic conditions. Understanding and accurately estimating medical care requirements of the population with pre-existing medical conditions is critically important for preparedness planning and emergency response.

1.2 Purpose and intended users

The *MedCon:Pre-Event* has been designed to estimate the baseline medical care requirements (i.e., the number of persons that would require medical care) of a displaced population following a disaster due to pre-existing medical conditions. Users of *MedCon:PreEvent* should note that the *MedCon:Pre-Event* has not been designed for estimating the medical care requirements due to direct impact of the event (e.g., injuries and illness) or additional medical care requirements resulting from the aggravation of the existing medical condition. The intended users of the *MedCon:Pre-Event* model are public health preparedness planners at local, state, and federal levels involved in addressing the large scale medical care requirements resulting from man-made and natural disasters.

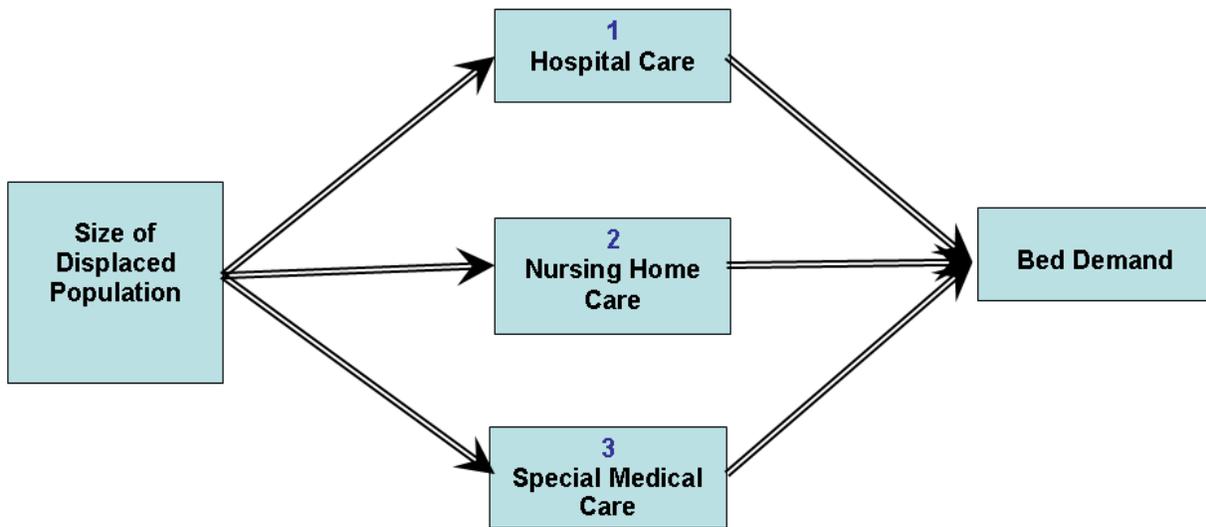
2. DATA AND METHODS

2.1 Framework

The *MedCon:PreEvent* is a spreadsheet-based (Excel 2003, Microsoft[§], WA) model. *MedCon:PreEvent* categorizes the medical care needs of those displaced due to a disaster, and with pre-existing medical conditions (i.e., are not injured but their usual sources of medical care are not available), into three major categories: Hospital Care, Nursing Home Care, and Special Medical Care (Figure 1).

Figure 1.

Populations that might need different levels of medical care due to pre-existing medical condition following a disaster



The first group of people who will need medical care includes those already in the hospital or likely to be hospitalized on any given day. The second group of people who will need medical care are patients in nursing homes. The third group of people who will need medical care are those needing Special Medical Care.

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Individuals at risk of "Special Medical Care" needs are those with pre-existing medical conditions not requiring hospitalization or nursing home care but with significant medical care requirements and very likely to require care in a special sheltered environment.

The default inputs in the *MedCon:PreEvent* are based on national averages of medical care and do not represent any individual state or county. However, the model allows you to alter and adjust the inputs for your specific geographical jurisdiction and population.

2.2 Data sources

The default data inputs in the *MedCon:Pre-Event* are from three nationally representative surveys: the 2006 National Health Interview Survey (NHIS) (<http://www.cdc.gov/nchs/nhis.htm>), the 2005 National Hospital Discharge Survey (NHDS) (<http://www.cdc.gov/nchs/about/major/hdasd/nhds.htm>), and the 2004 NNHS (<http://www.cdc.gov/nchs/nnhs.htm>). These surveys are conducted by the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC). The data from the U.S. Bureau of Census were also used for population estimates for the years of the above surveys (<http://www.census.gov/popest/estimates.php>).

The NHIS, a continuing cross-sectional survey, is a nationally representative survey that collects a wide range of information on the health of the civilian, non-institutionalized household population of the United States.⁴ In 2006, 75,716 persons in 29,868 families and 29,204 households were interviewed. 9,837 children and 24,275 adults were separately interviewed for more detailed information. The response rate for households was 87.3%. The remainder of the interviews was classified as refusals or as unacceptable partial interviews. For child and adult samples, the response rates were 91% and 71%, respectively.

The NHDS collects data from inpatient discharge records from a sample of hospitals located in 50 states and the District of Columbia. The hospital sample frame includes non-institutional hospitals. Institutional hospitals such as federal, military and Veterans Administration hospitals are excluded from the survey. In 2005, data were collected from the discharge records of 444 hospitals that participated in the survey.

The NNHS collects data on U.S. nursing homes, their services, their staff, and their residents. To be eligible for the survey, nursing homes are required to have at least 3 beds with Medicare or Medicaid certification, or a license to operate as a nursing home. A total of 1,174 nursing homes participated in the 2004 NNHS.

2.2 Estimation

2.2.1 Daily rate of hospitalization (All conditions)

The daily average number of persons in a population requiring hospitalization due to all pre-existing medical conditions is calculated per 100,000, using the 2006 NHIS data, as follows.

Daily average number of persons requiring hospitalization per 100,000 population = [The sum of (number of times overnight in hospital × frequency of number of times overnight in hospital) / Estimated population for 2006] × 100,000 / 365.

2.2.2 Demand for hospital beds

The potential demand for hospital beds per 100,000 persons on average day is estimated using 2006 NHIS data as follows.

Daily demand for hospital beds = Daily average number of persons requiring hospitalization × average length of hospital stay preceding 12 months.

2.2.3 Daily rate of hospitalization by medical condition

The daily average number of persons requiring hospitalization (all conditions) per 100,000 persons of a population is estimated for one or more of the following seven chronic medical conditions: heart problems, hypertension, stroke, diabetes, cancer, respiratory problems, and musculoskeletal/ connective tissue problems. These conditions, either individually or as comorbidities, account for approximately 71% of average daily hospitalizations due to all conditions in the U. S in 2006.

2.2.4 Average length of hospital stay

The person-specific average length of hospital stay preceding 12 months was calculated as follows.

Average length of hospital stay preceding 12 months = No. of nights in hospital preceding 12 months / No. of times in hospital overnight in preceding 12 months.

2.2.5 Seasonality of hospitalization

To capture seasonal variation in hospitalization, the 2005 NHDS data is used. The survey does not collect the data on the month of hospitalization but provides the year and the month of discharge and the length of stay. These variables were used to estimate the months of hospital admission by using century month codes (CMC).⁶ First, the CMC for discharge (CMC_D) was estimated as follows:

$$CMC_D = ([Survey\ year - 1900] \times 12) + Discharge\ month$$

This gives the number of months elapsed from 1900 to month of discharge, during the survey year. Second, number of months in hospital care (NM) was estimated as;

$$NM = Number\ of\ days\ of\ care / 30$$

Results were rounded up to an integer value. For instance, if the fraction is <2 but >1 for the previous month, the month is 2.

Third, the CMC for admission (CMC_A) was estimated as:

$$CMC_A = CMC_D - NM$$

This provides the number of months elapsed from 1900 to month of admission. Last, the month of admission was approximated as:

$$CMC_A - ([YA - 1900] \times 12)$$

where, YA is the year of admission, calculated as

$$int ([CMC_A - 1] / 12) + 1900.$$

The estimated month of admission was used to approximate the average daily rate of hospital admission for a month. For this, first, an adjustment factor for a specific month was calculated

as; the ratio of the rate of hospitalization for the month in question to average annual hospitalization rate.

Then, the daily average hospitalization rate for a specific month was calculated as; the product of daily average rate of hospitalization and the adjustment factor of the month.

2.2.6 Occupation of nursing homes beds

The number of patients (i.e., No. of beds occupied) in nursing homes per 100,000 persons is calculated using the 2004 NNHS data as follows.

The number of nursing home beds occupied per 100,000 persons = (The sum of nursing home patients in 2004/Estimated population for 2004) × 100,000.

2.2.7 Population needing Special Medical Care

Two sets of definitions are used to determine persons needing Special Medical Care following a disaster. For the first set of definitions, five health services utilization markers: emergency room(ER)/Emergency department (ED) visits, surgeries, home health care visits, overnight hospital stays, and office visits are used. For each marker, a threshold for people needing special medical care is specified assuming that persons who meet the threshold of any one or more of the markers would require Special Medical Care following a disaster. With the set of markers and the defined thresholds, three models are specified for the estimation as shown in Table 1.

Table 1.

Health services utilization markers and thresholds specifying criteria for individuals needing Special Medical Care

Health Services Utilization Markers	Thresholds		
	Option 1	Option 2	Option 3
No. of office visits in past 12 months, OR	>12	>9	≥6
No. of home visits/ month in past 12 months, OR	>4	>4	>2
No. of times in hospital overnight in past 12 months, OR	>6	>6	>3
No. of ER/ED visits in past 12 months, OR	≥6	≥6	>3
No. of surgeries in past 12 months	≥6	≥6	>3

*ER/ED = Emergency room/emergency department.

For instance, according to Option 1, an individual would potentially require Special Medical Care if during the preceding 12 months he or she made office visits more than 12 times, or received home visits by medical professionals for more than 4 times, or stayed in hospitals overnight more than 6 times, or visited the ER/ED at least 6 times, or had surgeries at least 6 times.

The number of home visits (one of the markers) was not enumerated as a single variable. This variable was constructed by using the number of months an individual had home care during preceding 12 months and the total number of home visits during the number of months mentioned earlier. These variables were combined to approximate the numbers of home visits per month, during the preceding 12 months. Because the individual response to number of home visits by medical professionals is a categorical variable, two steps were taken. First, the response was converted to a single numerical value, taking the mid-value of the class. Then the average number of home visits per month during the preceding 12 months was calculated as the ratio of the number of visits to the number of months in which a subject had home visits.

For the second set of definitions, persons needing Special Medical Care are based on the self-rated health and number of office visits during the preceding 12 months data based on 2006 NHIS. Self-rated “Poor” or “Fair” health is strongly associated with health care utilization, serious chronic conditions, and mortality.^{7,8,9} Based on these markers, three option are specified to determine persons needing Special Medical Care following a disaster due to their pre-existing medical conditions, as shown in Table 2.

Table 2.

Self-rated health and numbers of office visits specifying criteria for individuals needing SMC

Option 4	Option 5	Option 6
Self-rated "Poor" health	"Poor" health and ≥ 6 office visits or "Fair" health and > 12 office visits	"Poor" health or "Fair" health and > 12 office visits

The Option 4 defines persons needing Special Medical Care solely based on the self-rated “Poor” health. Options 5 and 6 combine the self-rated “Poor” and “Fair” health with numbers of office visits during the preceding 12 months, assuming that not all of those individuals who rated their

health as “Poor” may require Special Medical Care, and some of those individuals who rated their health as “Fair” may require it. (Please refer to Options 5 and 6 in Table 2.)

The numbers of persons needing Special Medical Care for all the options were estimated using the 2006 NHIS. The variables for this estimation are from sample adult, sample child and person files. These data files were merged together. Each of these samples has separate sample weights. Considering that person file sample weights better represent the complex sampling design we created an indicator variable for all data records as ‘1’ if includes both sample child and sample adult cases and ‘0’ otherwise. For estimation, we used domain analysis using the person level sampling weight. Variances of the estimates were estimated taking into consideration of complex sampling design using SAS 9.2 software.¹⁰ For each Special Medical Care option, first, the number persons needing Special Medical Care per 100,000 persons of the sub-population were estimated within the domain (=1). Second, to aid planners to prepare for patients by type of condition, those meeting the criteria for Special Medical Care were indentified with one of more of seven chronic medical conditions: heart problems, hypertension, stroke, diabetes, cancer, respiratory problems, and musculoskeletal/ connective tissue problems and other than these conditions among those needing special medical care.

2.2.8 Demand for clinical visits

The potential number of clinical visits among those needing Special Medical Care is calculated using the office visits during the preceding 12 months. For this, first, the number of office visits is categorized into three groups: <6 visits, 6-12 visits, and >12 visits and then proportion of sub-population under each group to the total population is calculated. Second, we assumed that, following a disaster, people needing Special Medical Care will make clinical visits approximately twice the average number of office visits prior to an event i.e., individuals who made <6 visits, 6-12 visits, and >12 visits prior to an event would make on average 1, 1.5 and 2 visits in the first month following an event, respectively. Third, the number of clinical visits per person among those needing Special Medical Care is calculated as follows.

Average clinical visits per person (no.) = the sum of the (average no. visits per persons in group × proportion of group of total population).

Last, the total demand for clinical visits among those needing Special Medical Care is calculated as follows.

Total clinical visits (no.) = Average clinical visits per person (no.) × total no. of people needing Special Medical Care

The weekly distribution of total clinical visits in the first month following a disaster is calculated as follows.

Clinical visits in the specific week (no.) = Total clinical visits (no.) × Weekly clinical visits as proportion of all clinical visit

The weekly proportion of clinical visits was derived from the distribution of daily clinical visits among evacuees in Houston Astrodome, following Hurricane Katrina.¹¹ The proportion of total clinical visits in the first, second, third and fourth week was 0.66, 0.24, 0.09 and 0.00, respectively.

3. USING MedCon:Pre-Event

The tasks required to utilize *MedCon:Pre-Event* are setting the Microsoft Excel security level, loading *MedCon:Pre-Event*, inputting data, viewing outputs, printing results, saving inputs and results, and exiting *MedCon:Pre-Event*.

3.1 Setting Microsoft Excel security level

The Microsoft Excel security level should be set to “medium” by opening a blank Excel spreadsheet and setting the security level. Changing the security level after opening *MedCon:Pre-Event* will not set the security level. Follow the steps below to set the security level.

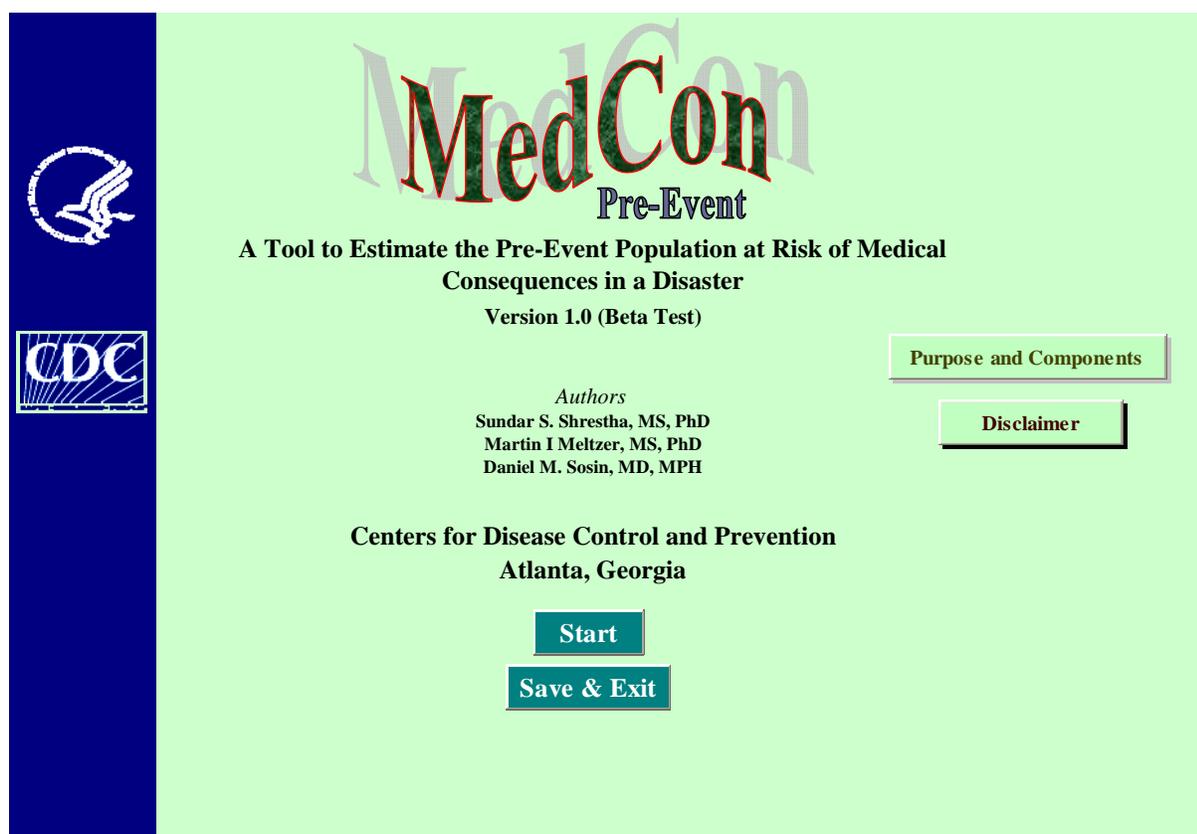
- 1) Open a blank Excel spreadsheet.
- 2) Go to **Tools**.

- 3) Under **Tools**, click **Macro** and then choose **Security**.
- 4) A **Security** window will open. Set security level to **Medium**.
- 5) Click **OK**.

3.2 Loading and starting *MedCon:Pre-Event*

- 1) Select the *MedCon:Pre-Event* file from the appropriate folder. Double click the file to open it.
- 2) You will be asked to “Disable Macros” or “Enable Macros.” Click **Enable Macros**, and the program will take you to the **Front Page** as shown in Figure 2.

Figure 2.



Now you are ready to begin *MedCon:Pre-Event*. Click  to go to the **Main Menu**.

3.3 Main menu

On the main menu, the steps 1 and 2 ask you to provide the location and the size of population potentially be displaced following a disaster for which you want to estimate the potential need for medical care, as shown in Figure 3.

Step 1. Enter the name of your state and city in the white cells for which you intend to estimate the demand for medical care following a disaster. The default inputs in the *MedCon:PreEvent* are national average estimates. If the default inputs are unaltered, the estimates you will obtain for your state and population will be based on national estimates. *MedCon:PreEvent* allows you to alter the inputs as they are available.

Figure 3.

Main Menu

Step 1. Provide the name of your state and city

State	USA
City	None

Step 2. Enter the size of population at risk of displacement following a disaster

Number	1,000,000
--------	-----------

Enter data in WHITE cells only

Back Next

Note: In the *MedCon:Pre-Event*, only the white cells allow users to enter your own rates. Based on the estimates entered in the white cells, the *MedCon:Pre-Event* model generates values in the gold shaded cells.

Step 2. Enter in the white cell the size of population (in numbers) that would potentially be displaced following a disaster. This information is linked to other worksheets to calculate the total size of the medical care requirements.

Click **Back** to return to **Front Page** and click **Next** to go to Input Worksheet for **Pre-Event Hospitalization**.

3.4 Input worksheet: Hospitalization

In steps 3 and 4, you will enter the inputs required for estimating the daily rate of hospitalization and occupation of hospital beds (i.e., demand for hospital beds) on a daily basis, as shown in Figure 4.

Figure 4.

Pre-Event Hospitalization

Input Worksheet

Step 3: Enter the rate of hospitalization per day per 100,000 persons due to pre-existing medical conditions

	Rate (No.)	95% Confidence Limits	
		Lower Limit	Upper Limit
Total	37.71	31.56	44.40

Step 4: Enter the average length of hospitalization for the given population

	Rate (Days)	95% Confidence Limits	
		Lower Limit	Upper Limit
Total	4.54	4.21	4.86

Data Source: National Health Interview Survey, NCHS, CDC, 2006

Notes: 1. The rates in the WHITE cells are national estimates per 100,000 population.
 2. If you enter your own estimates in the WHITE cells they MUST be per 100,000 population.

Back
Next

Enter data in WHITE cells only

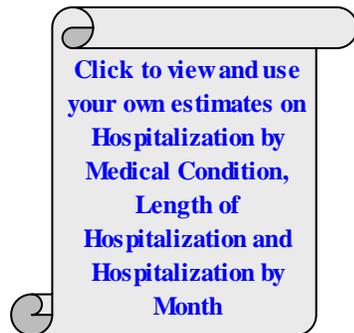
Click to view and use your own estimates on Hospitalization by Medical Condition, Length of Hospitalization and Hospitalization by Month

Step 3. Enter in the white cells the daily rate of hospitalization per 100,000 persons of the population you specified. The default values in the white cells are the national estimates for

mean and 95% confidence limits (CL) of hospitalization per day per 100,000 persons for the U.S. population, based on the 2006 NHIS.

Step 4. Enter in the white cells the average number of days in hospital during the preceding 12 months. The default values in the white cells are national estimates for mean and 95% CLs of the average length of stay per hospitalization (inpatient days) during the preceding 12 months, based on the 2006 NHIS. Again, you may enter your own estimates in the white cells, in rates per 100,000.

Steps 3 and 4 only allow you to enter the total rates of hospitalization and length of hospitalization per 100,000 persons. Clicking



will take you to **Steps 3.1, 3.2, and 4.1** in a sequence to view and use detail inputs by medical condition, length of stay in the hospitals, and hospitalization by month.

Click the above button to go to **Pre-Event Hospitalization by Medical Condition.**

3.5 Input worksheet: Hospitalization by medical condition

In step 3.1, enter the medical condition specific daily hospitalization rate per 100,000 person of the population you specified, as shown in Figure 5.

Step 3.1. Enter in the white cells the daily hospitalization rate per 100,000 persons for each medical condition. The values in the white cells are the national estimates for mean and 95% CLs of hospitalization per day per 100,000 U.S. population by medical condition, based on the 2006 NHIS. *MedCon:Pre-Event* allows you to enter your own estimates in the white cells, as rate per 100,000 population.

Figure 5.

Pre-Event Hospitalization by Medical Condition

Input Worksheet

Step 3.1: Enter the rate of hospitalization per day per 100,000 persons due to pre-existing conditions by medical condition

Medical Condition	Rate (No.)	95% Confidence Limit	
		Lower Limit	Upper Limit
Heart Diseases	11.39	8.12	15.08
Hypertension	16.06	12.56	20.01
Stroke	3.68	2.06	5.58
Respiratory Problems	4.23	2.56	6.28
Cancer	5.92	4.09	7.86
Diabetes	6.09	4.10	8.58
Musculoskeletal/Connective Tissue	19.88	15.70	24.58

Enter data in WHITE cells only

Back

Next

Intermediate results: Subtotal and total

At least one of the above medical conditions	27.45	22.19	33.35
Other	10.27	8.25	12.73
Total	37.71	31.56	44.40

Data Source: National Health Interview Survey, NCHS, CDC, 2006

Notes:

1. The rates in the WHITE cells are national estimates as per 100,000 population. *MedCon:Pre-Event* calculates the rates in GOLD cells based on weights derived from national average estimates
2. If you enter your own estimates in the WHITE cells, go to the previous sheet and re-enter the TOTAL rate and confidence limits in Step 3
3. Other= Persons who do not have any of the listed seven medical conditions, but any other conditions.

In Figure 5, the values in gold shaded cells are intermediate results, derived based on national estimates. If you enter your own rates in the white cells in Step 3.1, *MedCon:Pre-Event* will calculate:

- The rate for at least one of the listed chronic medical conditions, based on the weights derived from national estimates, as; the proportion of the sum of means of seven chronic medical conditions, to the mean of at least one of the listed chronic medical conditions.
- The rate for “other” than above listed medical conditions is calculated based on the weights derived, as; the proportion of the at least with one of the listed chronic medical conditions to “other” than above listed medical conditions.
- The total rate is calculated as sum of at least one of the above medical conditions and "other" than above listed medical conditions. *MedCon:Pre-Event* estimates CLs based on the weights derived from national estimates, as; the proportion of lower limits (LL) or upper limits (UL) to corresponding mean rates.

Click **Back** to return to Input Worksheet for **Pre-Event Hospitalization**.

and click **Next** to go to Input Worksheet for the **Hospitalization by Month**.

3.6 Input worksheet: Hospitalization by month

In steps 3.2 and 3.3, you will enter the inputs required for estimating the monthly variation in the daily rate of hospitalization, as shown in Figure 6.

Step 3.2. Enter in the white cells the adjustment factors for daily rate of hospitalization for each month. The default values in white cells are the adjustment factors for a specific month. This information is linked to other worksheets to estimate the hospitalization of patients by month.

Figure 6.

Step 3.2: Enter the monthly adjustment factors for daily rate of hospitalization by month

Month	Adjustment Factor	95% Confidence Limits	
		Lower Limit	Upper Limit
Jan	1.0254	1.0042	1.0466
Feb	1.1100	1.0878	1.1322
Mar	1.0546	1.0333	1.0759
Apr	1.0484	1.0272	1.0696
May	1.0260	1.0048	1.0473
Jun	0.9644	0.9450	0.9839
Jul	0.9780	0.9585	0.9976
Aug	0.9724	0.9528	0.9920
Sep	0.9257	0.9069	0.9445
Oct	0.8890	0.8705	0.9075
Nov	0.9371	0.9185	0.9558
Dec	1.0688	1.0470	1.0906
Yearly Average	1.0000	1.0000	1.0000

Data source: National Hospital Discharge Survey, NCHS, CDC, 2005

The values in the gold shaded cells in Figure 7 below are copied from annual average estimates from the previous worksheet (**Step 3.1**).

Figure 7.

Average annual rate of hospitalization per day per 100,000 persons

	Rate (No.)	95% Confidence Limits	
Total	37.71	31.56	44.40

From previous sheet

Step 3.3. Here you will select the month for which you want to estimate the average daily rate of hospitalization. The default option is set to annual (Figure 8). You may leave this option unchanged if you want to estimate an average daily rate of hospitalization for the year.

In the gold shaded cells, in Figure 8, you do not need to enter data. *MedCon:Pre-Event* will calculate the rate of hospitalization per day per 100,000 persons for the selected month or year in the gold shaded cells, as; the product of the annual rate and the adjustment factor entered in **Step 3.2**.

Figure 8.

Step 3.3: Select the month for which you want to estimate the pre-event hospitalization

Month/Annual ▼

Intermediate results:
Rate of hospitalization per day per 100,000 persons for the selected month or annual average

	Rate (No.)	95% Confidence Limits	
Total	37.71	31.56	44.40

Notes: 1. The rates in the WHITE cells are national estimates as per 100,000 population. *MedCon:PreEvent* calculates the rates in GOLD cells.
 2. If you enter your own rates in the WHITE cells, they MUST be per 100,000 population

Back **Next**

Note: If the default “Annual” option is unchanged, the rate calculated in gold shaded cells in Figures 7 and 8 would be exactly the same. If you select any one month, you will observe changes in the values in gold shaded cells in Figure 8.

Click **Back** to return to **Pre-Event Hospitalization by Medical Condition** and click **Next** to go to Input Worksheet for the **Length of Hospitalization by Medical Condition**.

3.7 Input worksheet: Length of hospitalization by medical condition

In step 4.1, you will enter the medical condition specific length of hospitalization during the preceding 12 months, as shown in Figure 9.

Figure 9.

Pre-Event Length of Hospitalization by Medical Condition

Input Worksheet

Step 4.1: Enter the average length of stay per hospitalization by medical condition

Medical Condition	Rate (Days)	95% Confidence Limit	
		Lower Limit	Upper Limit
Heart Diseases	5.34	4.93	5.76
Hypertension	5.29	4.79	5.78
Stroke	6.31	5.09	7.54
Respiratory Problems	4.31	3.70	4.91
Cancer	4.77	4.37	5.17
Diabetes	5.86	4.99	6.72
Musculoskeletal/Connective Tissue	4.83	4.40	5.27

Intermediate results: Subtotal and total

At least one of the above medical conditions	5.02	4.64	5.41
Other	3.50	3.03	3.97
Total	4.54	4.21	4.86

Data source: National Health Interview Survey, NCHS, CDC, 2006

Notes:

1. The rates in the WHITE cells are national estimates as per 100,000 population. MedCon:PreEvent calculates the rates in GOLD cells based on national average estimates
2. If you enter your own rates in the WHITE cells, they MUST be per 100,000 population and go to the previous two sheets and re-enter the TOTAL rate and confidence limits in Step 4
3. Other= Persons who do not have any of the listed seven medical conditions but other conditions.

Enter data in WHITE cells only

Back

Return to Hospitalization

Step 4.1. Enter in the white cells the medical condition-specific average number of days in hospital during preceding 12 months. The default values in the white cells are the national average estimates for means and 95% CLs of length of stay per hospitalization by medical condition, based on the 2006 NHIS. *MedCon:Pre-Event* allows to enter your own estimates in the white cells, but the numbers you entered must be rates per 100,000 persons for the population you specified.

If you enter your own estimates in the white cells, *MedCon:Pre-Event* will calculate intermediate results for sub-total and total in the gold shaded cells as shown in Figure 9. The calculation is based on the weights derived from national estimates as described in **Step 3.1**.

In the worksheet, click  to return to Input Worksheet for the **Hospitalization by Month** and click  to go to Input worksheet for **Pre-event Hospitalization**.

In Input Worksheet for the **Pre-event Hospitalization**, click  to return to **Main Menu** and Click  to go to Input Worksheet for **Occupation of Nursing Home Beds**.

3.8 Input worksheet: Occupation of beds in nursing homes

Step 5. Enter in the white cells the rates of patients in nursing homes per 100,000 persons in total and by age category, as shown in Figure 10.

The default values in the white cells are the national average estimates of patients in nursing homes per 100,000 persons of the U.S. population, based on 2004 NNHS. You may enter your own estimates in the white cells, but the mean rates and 95% CLs you have entered must be as rates per 100,000 persons.

Figure 10.

Occupation of Nursing Home Beds Input Worksheet

Step 5: Enter the rate of patients in nursing homes per 100,000 persons by age category

Age category (in Yrs)	Rate (No.)	95% Confidence Limits	
		Lower Limit	Upper Limit
≤ 5	0	0	1
5 - 17	0	0	1
18 - 64	59	56	62
≥ 65	450	444	455
Total	509	504	515

Enter data in WHITE cells only

Data source: National Nursing Homes Survey, NCHS, CDC, 2004

Notes: 1. The rates in White cells are national average estimates per 100,000 population.
 2. If you enter your own estimates, they MUST be per 100,000 population

Back
Next

Click Back to return to Input Worksheet for **Pre-Event Hospitalization** and click Next to go to Input Worksheet for **Special Medical Care**.

Figure 11.

Special Medical Care (SMC) Input Worksheet

Step 6: Evaluate the cut-off criteria to determine an individual at risk of SMC needs

Health Services Utilization Markers	Thresholds						Explanation
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	
No. of office visits in past 12 months, OR	>12	>9	≥6	Self-rated "Poor" health	"Poor" health and ≥6 office visits or "Fair" health and >12 office visits	"Poor" health or "Fair" health and >12 office visits	Background Data
No. of home visits/ month in past 12 months, OR	>4	>4	>2				
No. of times in hospital overnight in past 12 months, OR	>6	>6	>3				
No. of ER/ED visits in past 12 months, OR	≥6	≥6	>3				
No. of surgeries in past 12 months	≥6	≥6	>3				

*ER/ED = Emergency Room/Emergency Department.

3.9 Input worksheet: Special Medical Care

Step 6. Here you do not need to enter any data. Figure 11 provides you the criteria used to define persons needing Special Medical Care following a disaster due to their pre-existing medical conditions. Also provided are the explanations of criteria and background data estimates for your review to help you decide an option for Special Medical Care.

Clicking **Explanation** will take you to explanation of options for Special Medical Care, as shown in Figure 12.

Figure 12.

“Special Medical Care”

Individuals at risk of "Special Medical Care" are those with pre-existing medical conditions not requiring hospitalization but with significant medical care requirements and very likely to need care in special shelter environment.

There is no single mathematical formula that could be used to determine "Special Medical Care" requirements of general population. We used two approaches to determine individuals requiring "Special Medical Care".

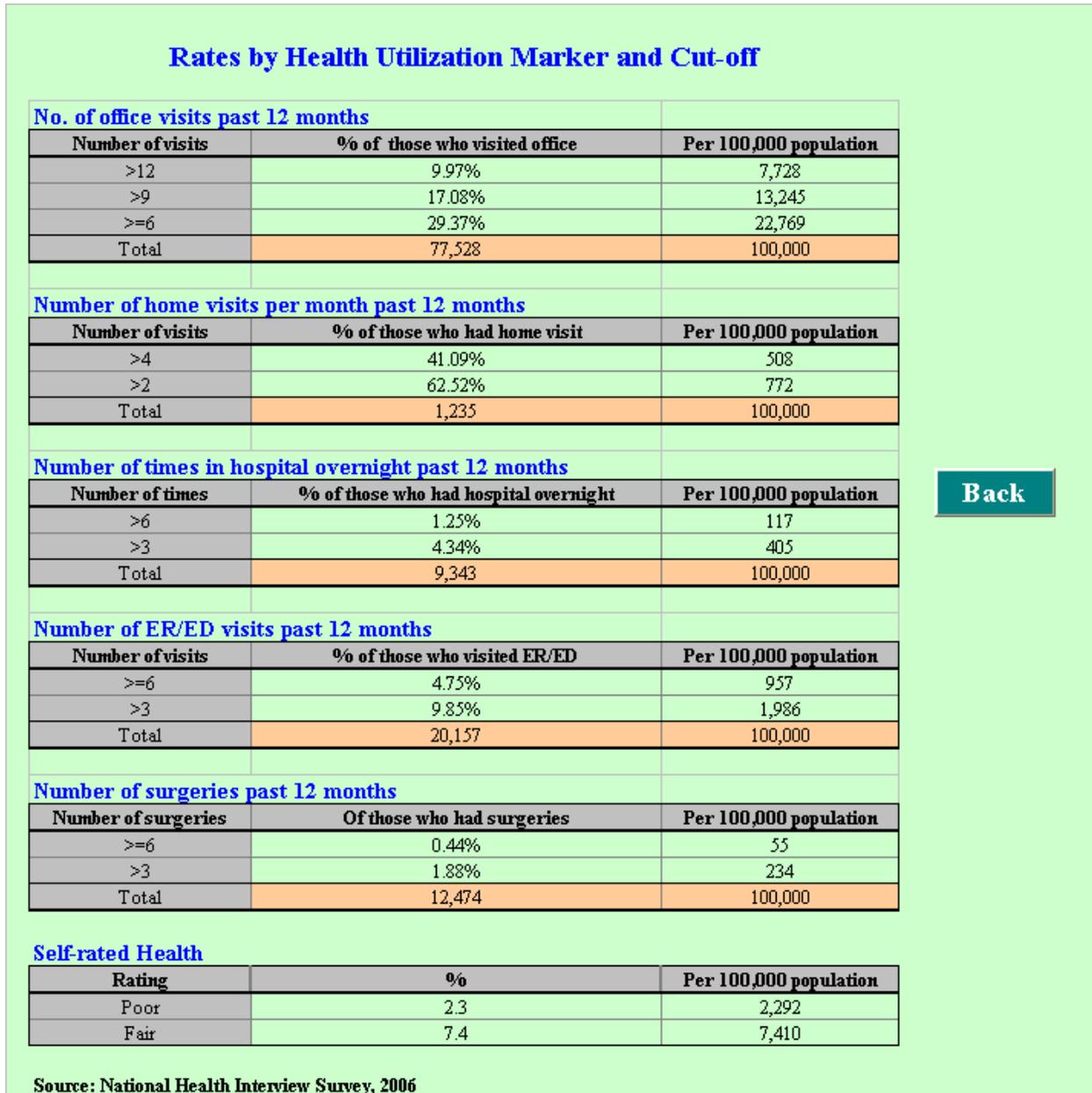
Using the first approach we determine individuals requiring special medical care based on five health utilization markers : number of office visit, surgeries, ER/ED visits, overnight hospitalization, and home visits by medical professionals. An individual is defined as at risk of "Special Medical Care" if he/she meets the cut-off of at least any one of the markers.

Using the second approach we determine individuals requiring special medical care based on self-rated "Poor" and "Fair" health and office visits.

Background Data

Clicking **Background Data** will take you to Figure 13, which shows you the distribution of general population by the thresholds and markers to assist you in reviewing various options and selecting one that you think reasonable.

Figure 13.



Back

Click **Back** to return to worksheet for **Special Medical Care (SMC)**.

Step 7. Select an option based on your review of options for the Special Medical Care in **Step 6**, as shown in Figure 14.

Figure 14.



Click **Back** to return to Input worksheet for **Occupation of Nursing Home Beds** and click **Go to the Selected Option** to go to Input Worksheet for the **Special Medical Care Option 1: Medical Condition**. Note that, the “Option 1” is set as default.

3.9.1 Input worksheet: Special Medical Care Option 1: Medical condition

Step 8. Enter in the white cells the condition-specific rate meeting the criteria of Special Medical Care with Option 1 per 100,000 persons (Refer to Figure 15). The default rates in the white cells are national average estimates based on the Option 1 (Default option), based on the 2006 NHIS. You may enter your own estimates per 100,000 persons in the white cells.

In gold shaded cells, in Figure 15, you do not need to enter any data. If you enter your own estimates in the white cells, *MedCon:Pre-Event* calculates values in the gold shaded cells based on the weights derived from national estimates as described in **Step 3.1**.

Figure 15.

Special Medical Care (SMC)
Input Worksheet for Option 1: Medical Condition

Step 8: Enter the rates of those needing SMC per 100,000 persons by medical condition

Medical Conditions	Rate (No.)	95% Confidence Limits	
		Lower Limit	Upper Limit
Heart diseases	2,049	1,901	2,189
Hypertension	3,233	3,053	3,403
Stroke	618	531	700
Respiratory problems	1,100	994	1,201
Cancer	1,305	1,183	1,421
Diabetes	1,281	1,157	1,397
Musculoskeletal/connective tissue problems	4,995	4,772	5,204

Intermediate results: Subtotal and total

At least one of the above medical conditions	6,308	6,066	6,536
Other	1,635	1,506	1,756
Total	7,943	7,694	8,177

Data source: National Health Interview Survey, NCHS, CDC, 2006

In the current worksheet, *MedCon:PreEvent* also provides link buttons that take you to additional intermediate results by number of medical conditions and age category as shown in Figure 16.

Figure 16.

Additional Intermediate Results for Option 1:
Distribution by

No. of Medical Conditions

Age Category

Back

Next

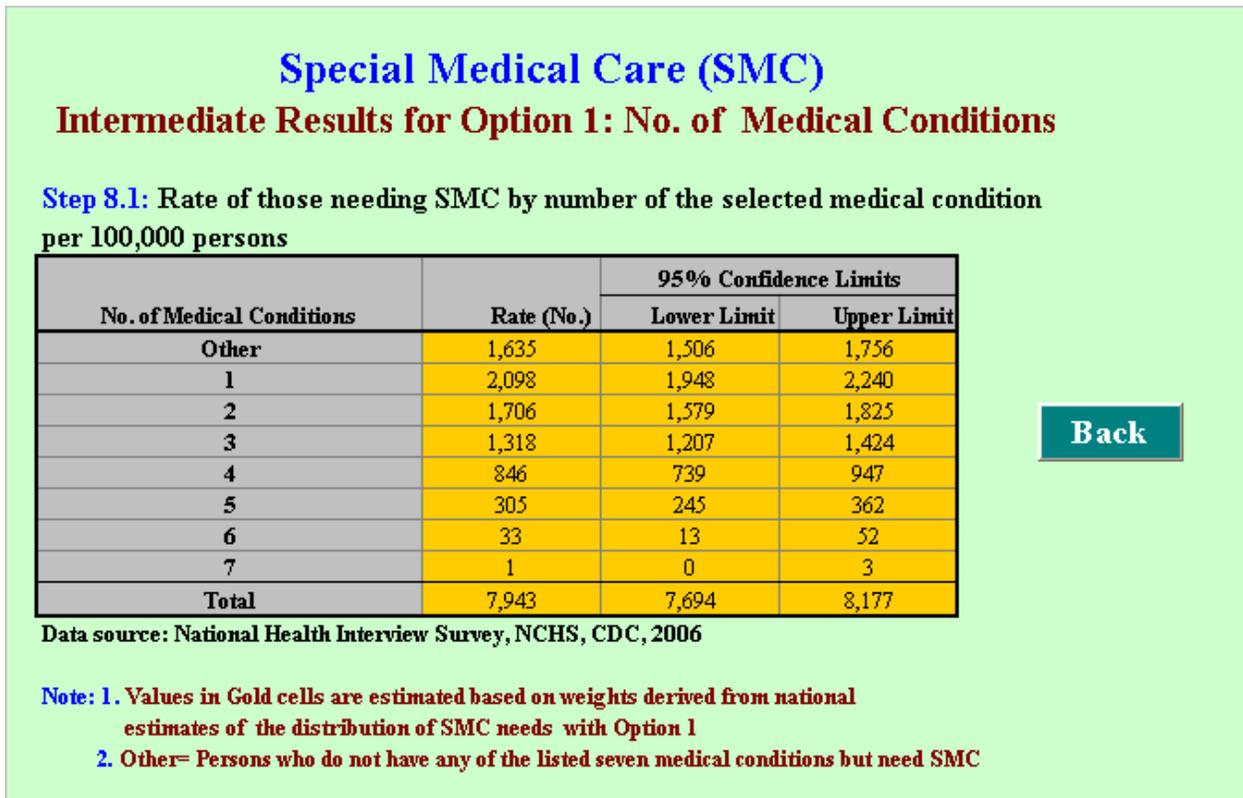
Clicking No. of Medical Condition will take you to **Intermediate Results for**

Option 1: No. of medical conditions.

3.9.2 Intermediate results: Special Medical Care Option 1: No. of medical conditions

Step 8.1. Based on the Special Medical Care option you have chosen and the data you entered in the white cells (if any), *MedCon:Pre-Event* calculates the distribution of people needing Special Medical Care by number of medical conditions. The rates calculated are based on the weights derived from national average estimates based on 2006 NHIS. The weights for the Means (No.) are derived as; proportion of the rate of the number of medical conditions to total, and the weights for CLs are derived as; ratio of Lower Limits or Upper Limits to Mean (No.) (Refer to Figure 17).

Figure 17.



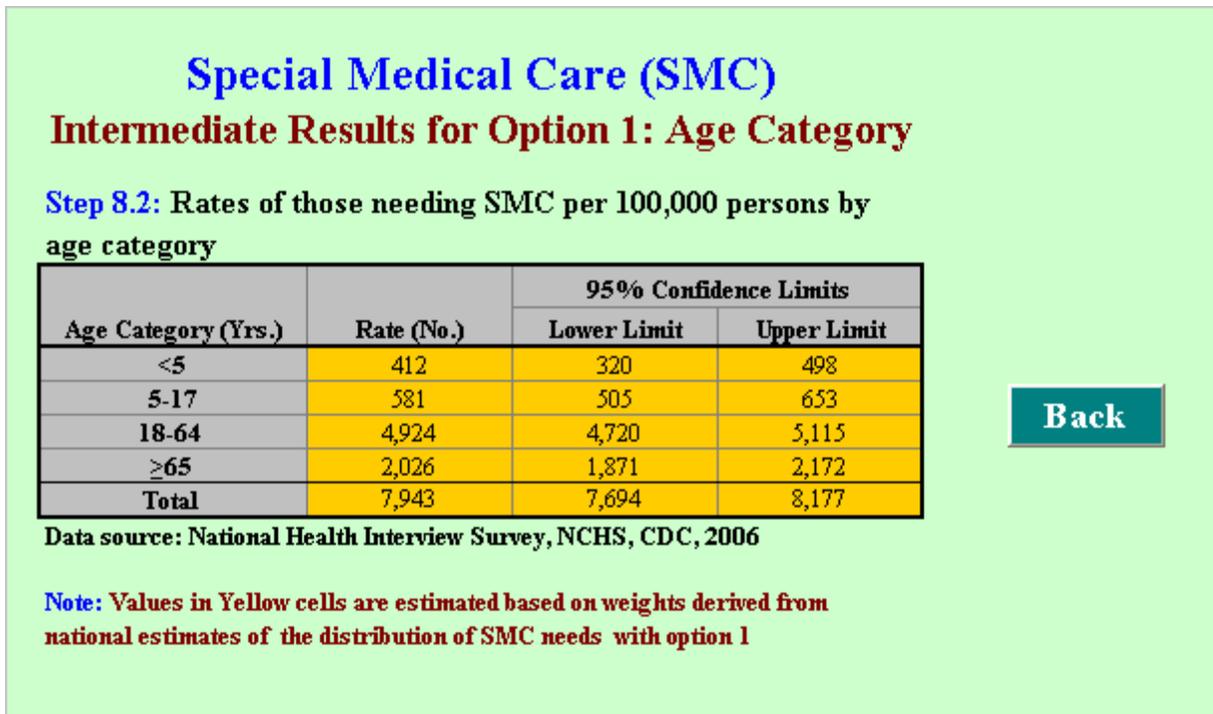
Click **Back** to return Input Worksheet for the **Special Medical Care Option 1: Medical Condition.**

On worksheet for the **Special Medical Care Option 1: Medical Condition**, Clicking **Age Category** will take you to **Intermediate Results for Option 1: Age Category**.

3.9.3 Intermediate results: Special Medical Care Option 1: Age category

Step 8.2. As in the **Step 8.1**, *MedCon:Pre-Event* calculates the persons needing Special Medical Care by age category as shown in Figure 18. If you enter your own estimates in white cells in **Step 8**, *MedCon:Pre-Event* calculates values in the gold cells based on the weight derived from national estimates for persons needing Special Medical Care by age category as described in **Step 8.1**.

Figure 18.



Click **Back** to return to Input worksheet for **Special Medical Care Option 1: Medical**

Condition. On current worksheet, clicking **Next** will take you to the Input Worksheet for **Special Medical Care (SMC) Option 1: Clinical Visits**.

3.9.4 Input worksheet: Special Medical Care Option 1: Clinical visits

In this worksheet, you will enter data for estimating the number of clinical visits and their distribution among those needing Special Medical Care during first month following a disaster (Figure 19).

Step 9. In white cells, in the first row, under each group of number of office visits enter the proportion of total office visits during preceding 12 months due to pre-existing medical condition. In second row, enter the assumed number of clinical visits under each group in the first month following a disaster.

Figure 19.

Special Medical Care (SMC)				
Input Worksheet for Option 1: Clinical Visits				
Step 9: Determine the number of clinical visits by those needing SMC in the first month following a disaster				
	No. of office visits by those needing SMC in past 12 months due to pre-existing medical conditions			
	<6	6-12	>12	
Proportion of total office visits before an event in past 12 months*	0.04	0.06	0.9	1.00
Assumption: No. of clinical visits in the first month following a disaster	1	1.5	2	
*Data source: National Health Interview Survey, NCHS, CDC, 2006				
Intermediate results:				
Average number of clinical visits by those needing SMC in the first month following a disaster				1.93

The default proportions in the white cells are based on the national estimates of number of office visits by those needing Special Medical Care during the preceding 12 months, based on 2006 NHIS. If you enter your own estimates for the proportion of total office visits due to pre-existing medical conditions in the preceding 12 months (corresponding to category of number of office visits), the sum must be 1. The default values in the assumption row (i.e., the bottom row) are based on the assumption that among those needing Special Medical Care due to their pre-existing

medical conditions, who made <6, 6–12, or >12 office visits during the preceding 12 months, would make 1, 1.5, or 2 clinical visits, respectively, in the first month following a disaster. You may change this assumption and enter your own rates in the white cells. With the Option 1, the average number of clinical visits among those needing Special Medical Care in the first month following disaster would be 1.9 visits.

Step 10. Enter in the white cells the proportion of total clinical visits by week in the first month following a disaster (Figure 20). The default values in the white cells are calculated based on the distribution of clinical visits by evacuees in Astrodome/Reliant Complex in Houston following Hurricane Katrina in 2005. You may enter your own estimates, but the sum of the proportion across the weeks must be 1.

Figure 20.

Step 10: Enter the distribution of clinical visits by week among those needing SMC in the first month following a disaster

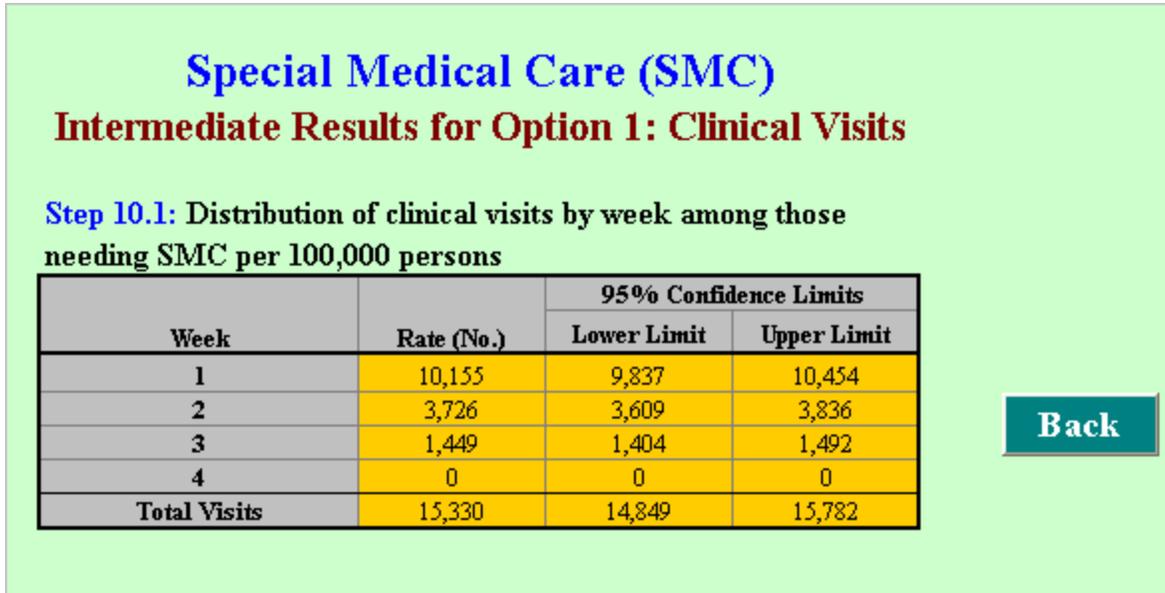
Week	1	2	3	4	
Proportion*	0.66	0.24	0.09	0.00	1.00
Cum Proportion	0.66	0.91	1.00	1.00	

On the current worksheet, clicking will take you to **Intermediate Results of SMC Option 1: Clinical Visits.**

3.9.5 Intermediate results: Special Medical Care Option 1: Clinical visits

Step 10.1. Based on the inputs entered in steps 9 and 10, and the option chosen for Special Medical Care, *MedCon:Pre-Event* calculates the distribution of total clinical visits among those needing Special Medical Care per 100,000 persons by week in the first month following a disaster (Refer to Figure 21).

Figure 21.



Click **Back** to return to Input Worksheet for **Special Medical Care Option 1: Clinical Visits**.

On the Input Worksheet for **Special Medical Care option: Clinical Visits**, click **Back** to return to Input Worksheet for **Special Medical Care Option 1: Medical Condition**; click **Go to Option Page** to return to the Input worksheet for Special Medical Care (option page) where you can change the options for people needing Special Medical Care, and see the changes in results; and click **Go to Summary Results** to go to the **Summary Results**, showing the main results based on the inputs you have entered into the model.

4. RESULTS

4.1 Summary results

On the summary results worksheet, the first section shows you some of the inputs you entered into the model as shown in Figure 22.

Figure 22.

Summary Results					
Inputs Entered by User					
State/Country:	USA		No. of office visits past 12 months, OR	≥12	
City:	None		No. of home visits per month past 12 months, OR	≥4	
Population at risk	1,000,000		No. of times in hospital overnight past 12 months, OR	≥6	
Cut-off option for special needs	1		No. of times ER/Ed visits past 12 months, OR	≥6	
Hospitalization rate: Month/Annual	Annual		No. of surgeries past 12 months	≥6	NA

In Figure 22, tan cells on the left side of the arrow remind you of the values you have entered, corresponding to name of the state, county, city, population, special need option, and hospitalization rate calculation option as selected month or annual mean. The information on the right side of the arrow reminds you of the criteria of the Special Medical Care option you have chosen. If you choose options 1–3, the last column would be Not Applicable (NA) and the fourth column will show you the thresholds corresponding to markers. If you choose options 4–6, the last column will show you the criteria corresponding to option chosen and the cells in the fourth column will be NA.

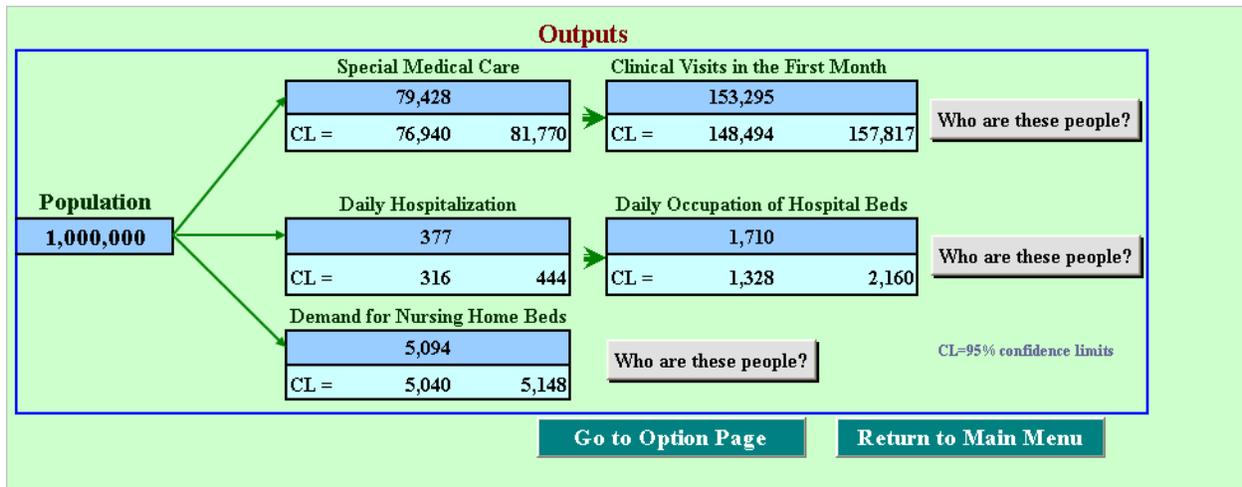
In the next section, *MedCon:Pre-Event* provides you the the following summary results as per the population specified as shown in Figure 23.

- The total number (mean) and the 95% CLs for the daily hospitalization and the daily occupation of hospital beds.
- The number of persons needing Special Medical Care in a special needs shelter and the number of clinical visits by those needing Special Medical Care, and.
- Occupation of nursing home beds.

According to default set-up (Option 1), 79,428 [95% CL = 76,940–81,770]/million displaced would potentially require Special Medical Care following a disaster because of their pre-existing

medical conditions. The demand for clinical visits by these people would be 153,295 [95% CL = 148,494–157,817] visits in the first month following the disaster. On average, 377 persons [95% CL = 316–444] would be hospitalized/day/ million population displaced. 1,710 hospital beds [95% CL = 1,328–2,160] would be occupied on a daily basis, and 5,095 [95% CL = 5,040–5,148] /million beds would be occupied in nursing homes.

Figure 23.



Note: The results presented in Figure 23 are subject to change, depending upon the rates you enter in the white cells, option you have chosen for Special Medical Care, and your decision on whether to estimate hospitalization by a specific month.

On Summary Results worksheet, clicking **Who are these people?** next to “Clinical Visits in the First Month” will take you to detailed results for **Demand for Special Medical Care** and **Clinical Visits**, based on the population you specified, rates you entered, and the thresholds option you have chosen for Special Medical Care.

4.2 Detailed results: Demand for Special Medical Care

As on the **Summary Results** worksheet, the first section of results in gold shaded cells and tan shaded cells provides you the values for name of state/country, city, population at risk, and

threshold option you have chosen to determine persons needing Special Medical Care (Refer to Figure 24).

Figure 24.

Demand for Special Medical Care (SMC)		
Input Entered By User		
State/Country:	State	
City:	City	
Population at risk	1,000,000	
Selected Option	1	

Markers	Threshold	
Number of office visits past 12 months, or	>12	NA
Number of home visits per month past 12 months, or	>4	
Number of times in hospital overnight past 12 months, or	>6	
Number of ER/Ed visits past 12 months, or	>6	
Number of surgeries past 12 months	>6	

MedCon:Pre-Event provides you four sets of results for the option you selected for Special Medical Care. Clicking the button as shown in Figure 25 below one-at-a-time will take you to the detailed results.

Figure 25.

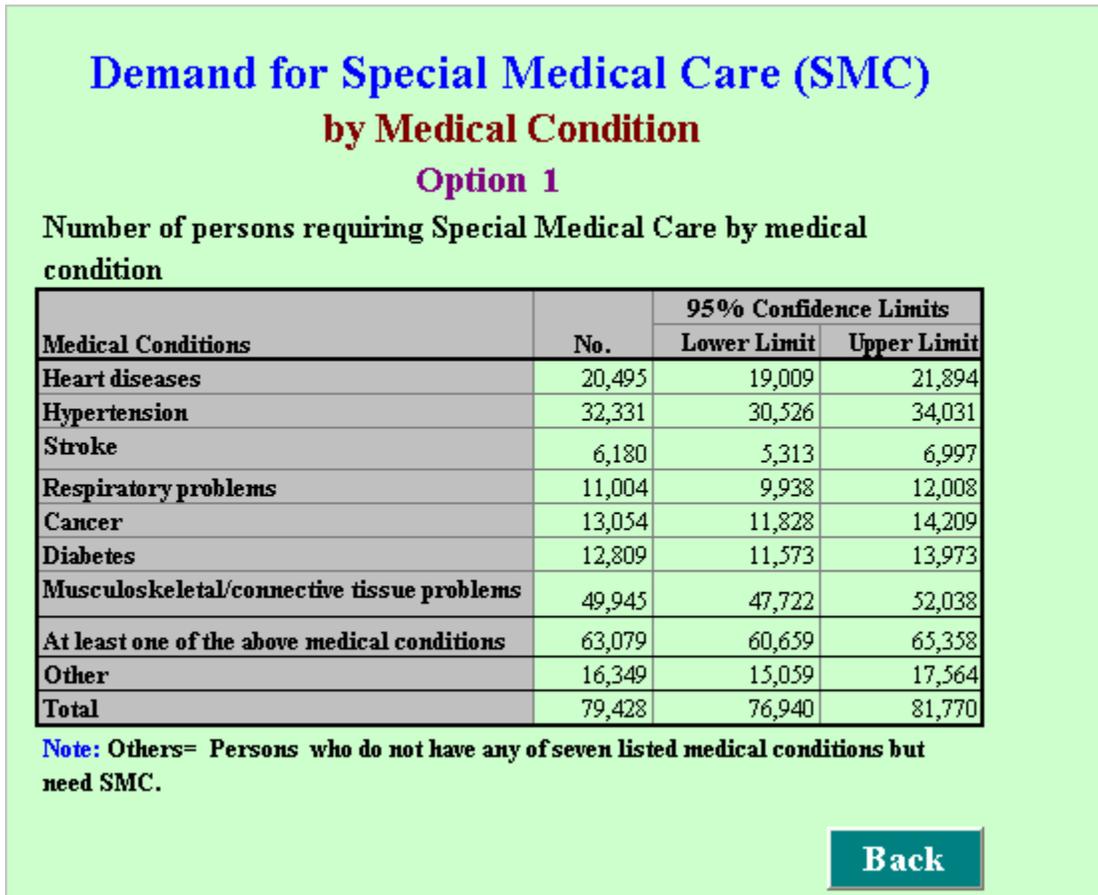
Detailed Results: By

Medical Conditions	No. of Medical Conditions	Age Category	Clinical Visit
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[Back to Summary Results](#)

Clicking [Medical Condition](#) takes you to the first set of results, as shown in Figure 26.

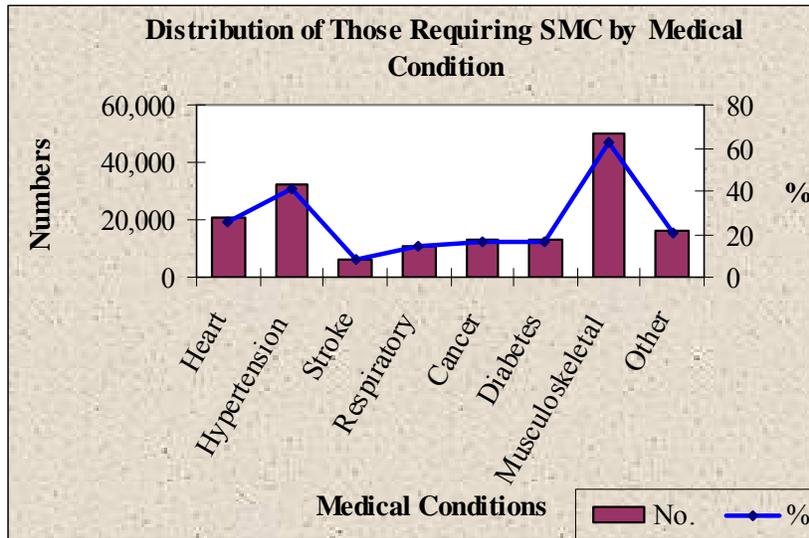
Figure 26.



Of those meeting the criteria of Special Medical Care with Option 1, 63,079 [95% CI = 60,659–65,358]/million displaced would have at least one of the seven selected chronic medical conditions. The remaining individuals would have other than these conditions. The musculoskeletal/ connective tissue problem appears as the most common condition, followed by hypertension, heart disease, diabetes, cancer, respiratory problems, and stroke. It should be noted that some individuals would report more than one condition; therefore, the sum of the numbers will exceed the total.

The Figure 27 below illustrates the mean estimates as shown in Figure 26 and percentage by medical condition among those meeting the criteria of Special Medical Care with Option 1.

Figure 27.



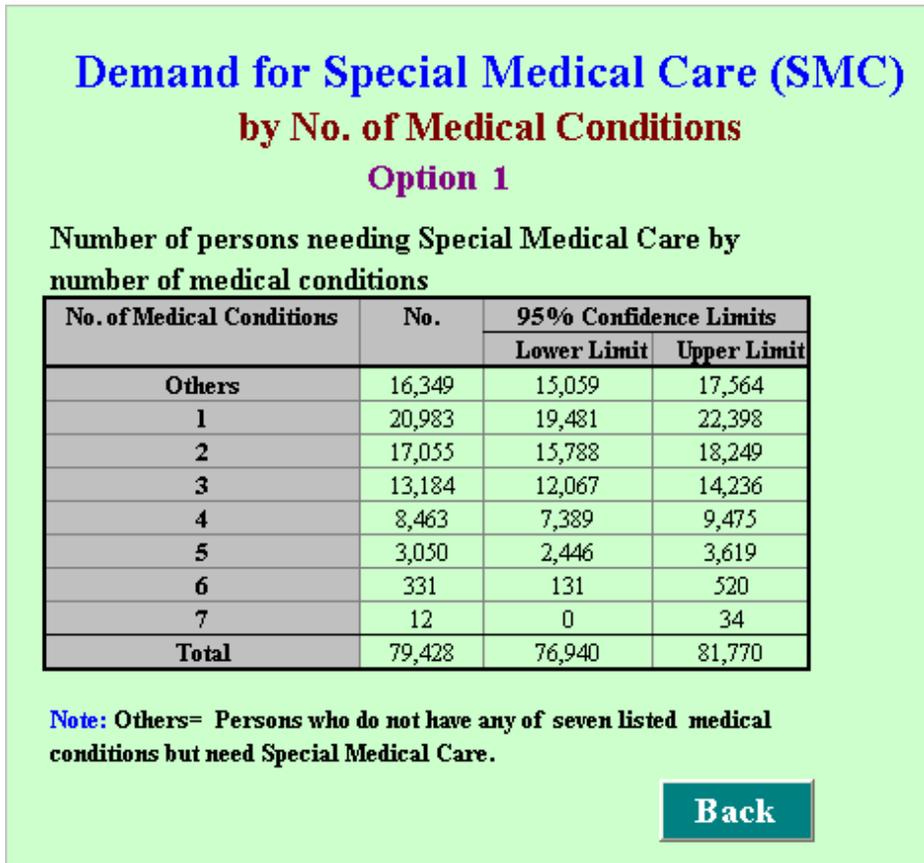
Click [Back](#) to return to result worksheet for **Demand for Special Medical Care**.

On result worksheet for **Demand for Special Medical Care**, Clicking

[No. of Medical Conditions](#) will take you to the second set of results for Special Medical Care needs by number of medical conditions as shown in Figure 28.

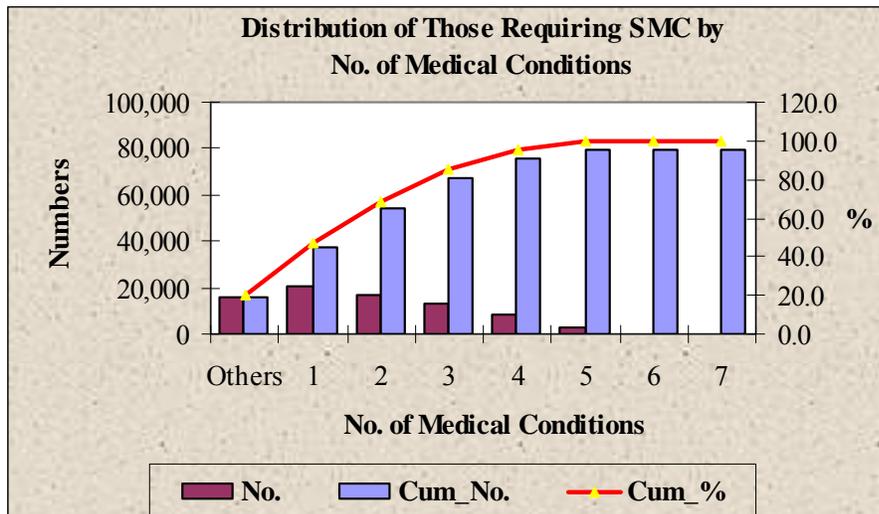
As shown in Figure 28, of those meeting the criteria of Special Medical Care with Option 1, the number of persons having any one of the seven selected chronic medical condition is 20,983 [95% CL=19,481-22,398]/ million displaced population. The number decreases with the increase in the number of conditions.

Figure 28.



Results are also presented graphically showing both the number and the cumulative number of cases of those meeting the criteria of Special Medical Care (Figure 29).

Figure 29.

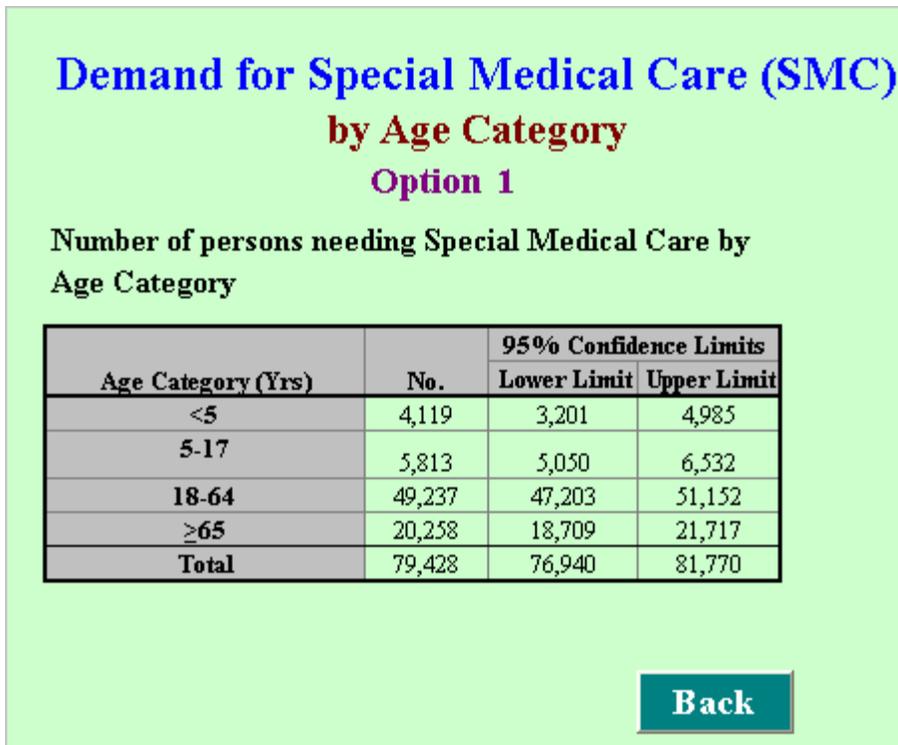


Of the total persons needing Special Medical Care with option 1, about 79% would have at least any one of the seven selected medical conditions, 53% at least any two medical conditions, and 15% at least any three medical conditions and 4% would have at least any four of the seven medical conditions.

Click [Back](#) to return to the result worksheet for **Demand for Special Medical Care**.

On result worksheet for **Demand for Special Medical Care**, Clicking [Age Category](#) takes you to the results showing distribution by age category of those meeting the criteria of Special Medical Care with Option 1, as shown in Figure 30.

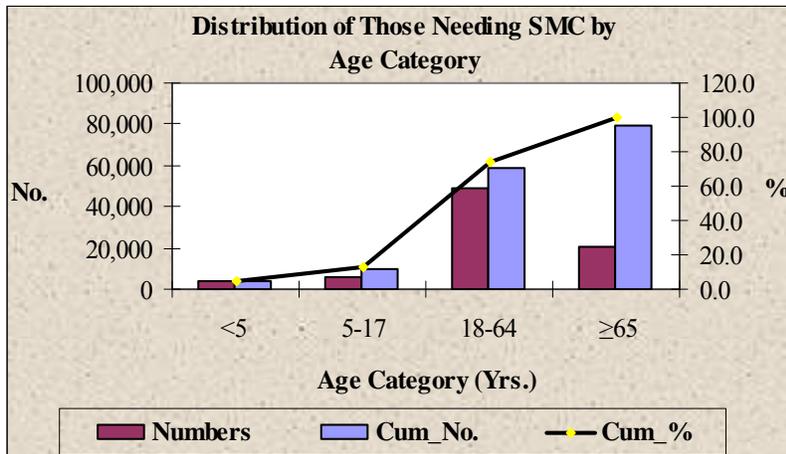
Figure 30.



Of those meeting the criteria of Special Medical Care with Option 1, the 18–64 age cohort accounts for the greatest number, followed by ≥65 years, 5–17 years, and <5 years age cohorts. This distribution is determined by the size of the cohorts in the population. However, in terms of the population within the age cohort, the elders (≥65 years) would require Special Medical Care

the most following a disaster. Results are also presented in graphical form that includes distribution by numbers, percentage, and cumulative percentage (refer to Figure 31).

Figure 31.



Click [Back](#) to return to result worksheet for **Demand for Special Medical Care**.

On result worksheet for **Demand for Special Medical Care**, Clicking [Clinical Visit](#)

takes you to the final sets of results, showing the distribution of total clinical visits by those needing Special Medical Care by week in the first month following a disaster (Figure 32).

Figure 32.

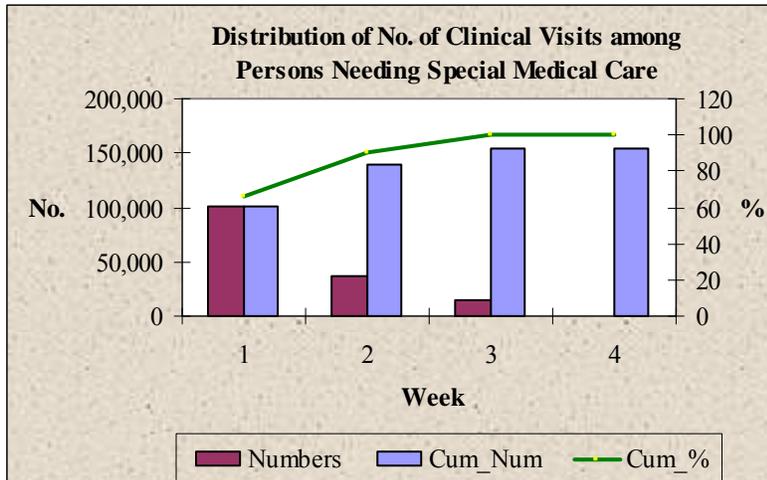
Demand for Special Medical Care (SMC)
No. of Clinical Visits
Option 1

Number of clinical visits among persons requiring Special Medical Care

Week	No.	95% Confidence Limits	
		Lower Limit	Upper Limit
1	101,546	98,365	104,541
2	37,258	36,091	38,357
3	14,492	14,038	14,919
4	0	0	0
Total	153,295	148,494	157,817

Among those needing Special Medical Care with Option1, the total number of clinical visits needed would be 153,295 (95% CL = 148,494–157,817)/ million U.S. population. The majority of visits would occur in the first week following a disaster. Results are also presented graphically as shown in Figure 33.

Figure 33.



Cum_No.= Cumulative Numbers; **Cum_%**= Cumulative percentage

About 66% of the clinical visits would occur in the first week following a disaster. In two weeks following a disaster, clinical visits account for 91% of total.

Click [Back](#) to return to result worksheet for **Demand for Special Medical Care**.

On result worksheet for **Demand for Special Medical Care**, Click [Back to Summary Results](#) to return to worksheet for **Summary Results**.

On the worksheet for **Summary Results**, click [Who are these people?](#) next to “Daily Hospitalization” and “Daily Occupation of Hospital Beds” to go to detailed results for **Demand for Hospital Services** based on the population you specified and rates you have chosen.

4.3 Detailed Results: Demand for hospital care

In the current worksheet, the first section of results shows you the option you chose for estimating daily rate of hospitalization (Figure 34).

Figure 34.



The value in the tan cell is the month or annual average you have chosen to estimate the daily hospitalization and daily bed demand for the population you have specified.

MedCon:Pre-Event provides three sets of results for the demand for hospital care. The first set of results is the daily average numbers of persons who would potentially be hospitalized for the population specified and its distribution by medical condition. The second set of results includes the estimates of average daily occupation of hospital beds and the distribution of demand by medical condition. The last set of results comprises the estimates of daily average number of hospitalizations by month.

Figure 35.

The figure is a table titled "No. of Persons at Risk of Daily Hospitalization and Demand for Beds". The table is organized into columns for "Medical Condition", "Daily Hospitalization", and "Daily Bed Occupation". Each of these three main categories has a sub-column for "95% Confidence Limit", which is further divided into "Lower Limit" and "Upper limit".

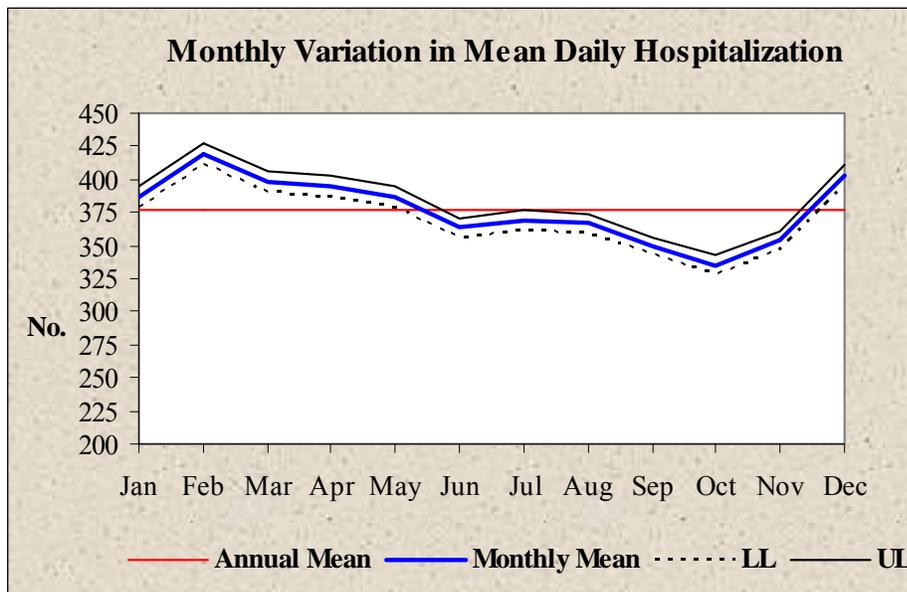
Medical Condition	Daily Hospitalization			Daily Bed Occupation		
	No.	95% Confidence Limit		No.	95% Confidence Limit	
		Lower Limit	Upper limit		Lower Limit	Upper limit
Heart Diseases	114	81	151	608	400	868
Hypertension	161	126	200	850	602	1,157
Stroke	37	21	56	232	105	420
Respiratory Conditions	42	26	63	182	95	308
Cancer	59	41	79	283	179	406
Diabetes	61	41	86	357	205	577
Musculoskeletal/Connective Tissue	199	157	246	961	690	1,295
At least one of the above medical conditions	274	222	333	1,378	1,029	1,804
Other	103	82	127	360	250	506
Total	377	316	444	1,710	1,328	2,160

Note: Others= Persons who do not have any of seven listed medical conditions but need special medical care.

The first and second sets of results are presented in Figure 35. Of every million people, on average 377 patients [95% CL = 316–444] would be hospitalized each day. Of those, 274 [95% CL=222–333] would have at least one of the selected chronic medical conditions and remaining would have other than the selected medical conditions. On average, daily occupation of hospital beds would be 1,710 beds [95% CL = 1,328–2,160]/million U.S. population. Heart patients would out number other patients in occupying hospital beds then followed by musculoskeletal and connective tissue, hypertension, diabetes, cancer and respiratory and stroke patients.

The last set of results comprises the estimates of number of daily hospitalizations by month. The Figure 36 shows the monthly variation in mean daily hospitalization/million U.S. population. The red horizontal line depicts the annual average mean daily rate of hospitalization. By months, the mean daily rate of hospitalization would be highest in February month and lowest in October month. In half of all months (i.e., December–February), the mean daily hospitalization would be higher than the annual average, and in other months they would be lower than annual average.

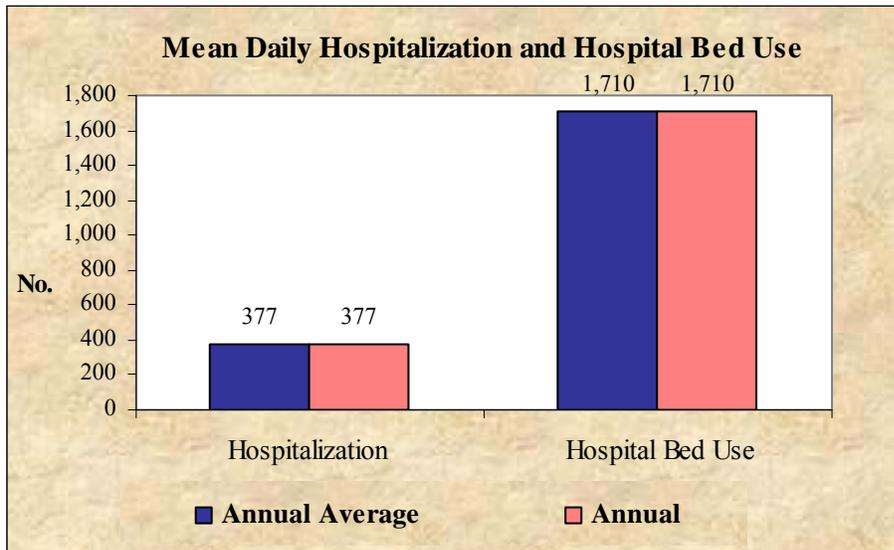
Figure 36.



LL= 95% Confidence Lower Limit; UL= 95% Confidence Upper Limit

The Figure 37 below compares the mean daily hospitalization and the number of hospital beds in use between the annual mean and monthly mean for which the hospitalization rates were calculated. Note that if you do not select the month for which you wish to estimate the hospitalization rate, *MedCon:Pre-Event* will estimate the annual average. Therefore, in the Figure 37, you can see the same level of hospitalization.

Figure 37.



Click [Back to Summary Results](#) to return to worksheet for **Summary Results**.

In the **Summary Results** worksheet, click [Who are these people?](#) next to the **Demand for Nursing Homes Beds** to go to detailed results for **Demand for Nursing Home Care**, based on the population you specified and rates you have chosen.

4.4 Detailed results: Occupation of nursing home beds

In the first section of the current worksheet, *MedCon:Pre-Event* reminds you of the state/country and city you entered and the population you specified as shown in Figure 38.

Figure 38.

Occupation of Beds in Nursing Home	
State/Country:	USA
City:	None
Population at risk	1,000,000

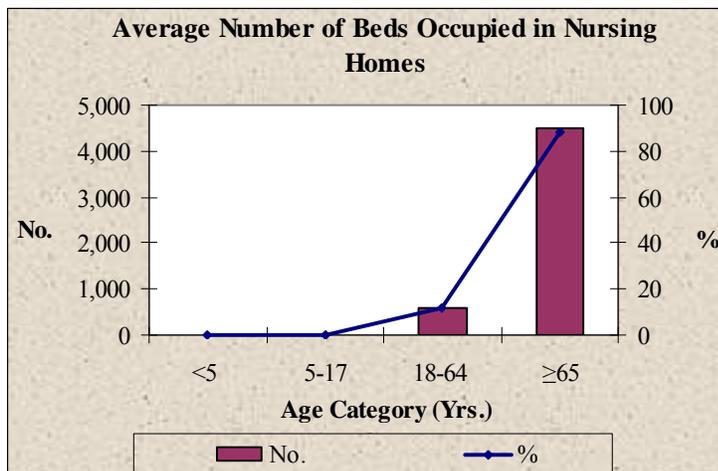
In the second section, *Medcon:Pre-Event* provides the number of patients by age group in nursing homes per million U.S. population in 2004 (Figure 39).

Figure 39.

Number of Patients in Nursing Homes			
Age Category (Yrs.)	No.	95% Confidence Limits	
		Lower Limit	Upper Limit
<5	5	1	8
5-17	5	1	9
18-64	588	555	622
≥65	4,497	4,439	4,554
Total	5,094	5,040	5,148

Of every one million U.S. population, 5,094 [95% CL = 5,040-5,148] would require medical care in nursing homes on any one day. Results are also presented graphically as shown in Figure 40. The elderly age cohort (≥65 years) accounts for 88% of patients in nursing homes.

Figure 40.



Click **Back to Summary Results** to return to worksheet for **Summary Results**.

On the **Summary Results** worksheet, click **Go to Option Page** to return to input worksheet for **Special Medical Care, i.e.**, option page for Special Medical Care, where you can select from a variety of options and see the changes in results going back and forth between this

worksheet and the **Summary Results** worksheet. Click **Return to Main Menu** to return to the **Main Menu**, where you can restart *MedCon: Pre-Event*. On the **Main Menu**, click **Back** to return to the **Front Page**.

5. PRINTING RESULTS AND EXITING *MedCon:Pre-Event*

For any Excel worksheet, set your printing orientation to “Landscape” format to print your results on a single page.

1. Click **File** and choose **Page Set-up**.
2. Select **Landscape** under the orientation section of the **Page** tab.
3. Click **OK**.

To exit *MedCon:Pre-Event*,

1. Click **Return to Main Menu** on the Summary Result worksheet to return to the **Main Menu**.
2. On the **Main Menu**, click **Back** to go to the **Front Page**.
3. To save the data and results and exit *MedCon:Pre-Event*, click **Save & Exit**.
4. To save the data and results without exiting *MedCon:Pre-Event*, just close Microsoft Excel.

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