The Missouri Public Health Risk Assessment Tool (MOPHRAT)

Version 1.0 -- Spring 2023

MISSOURI STATE EMERGENCY MANAGEMENT AGENCY

MISSOURI DEPARTMENT OF HEALTH & SENIOR SERVICES

Table of Contents

Preface....3
Overview of the Missouri Public Health Risk Assessment Tool....3
The MOPHRAT Excel Workbook....7
Step 1: Enter Baseline Data....8
  Baseline Health, Services, and Infrastructure....8
  Baseline At-Risk Populations....11
  Baseline Preparedness Capabilities....13
  Community Characteristics....15
Step 2: Hazard Data....16
  Scenarios Used in the Hazard Data Analysis....16
  Completing Hazard Worksheets....31
    1. Open a Hazard Worksheet....31
    2. Hazard Scenarios Data....31
    3. Probability....33
  Entering Severity Assessment Impact Data....34
    1. Quantitative Severity Assessment Completion....36
    2. Qualitative Severity Assessment Completion....38
  Automatic Risk Calculations....39
  At-Risk Population Data....39
  Adjusted Risk Calculated Automatically....41
  Entering Preparedness Data....41
  Planning Priority Score Calculated Automatically....42
Hazard Analysis Worksheets....43
Step 3. Analysis....46
  Summary of Impacts....46
  Severity....47
  Planning Priority Scores....48
  Summary of Scores....49
  Public Health vs. Healthcare....50
  Probability vs. Severity....51
  Adjusted Risk vs. Preparedness....52
  At-Risk Populations....53
  Individual Hazard Analyses....54
Downloading Information & Uploading Completed Assessments....55
References....56

Preface

This Public Health Risk Assessment tool was originally developed by the Center for Public Health Readiness at the Drexel University School of Public Health, funded by the Pennsylvania Department of Health. This publication was supported by Cooperative Agreement Number 2U90TP316967–11 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

The Missouri Department of Health and Senior Services (DHSS) and the Missouri State Emergency Management Agency (SEMA) have collaborated with Dr. Esther Chernak and her team at Drexel University School of Public Health to update and modify The MOPHRAT for use in the state of Missouri at the local and state levels. The Missouri MOPHRAT Team includes at time of publication:

Kay Beesley, Preparedness Planner, SEMA
Mark Pethan, Public Health Emergency Preparedness (PHEP) and Hospital Preparedness Program (HPP) Grant Coordinator, SEMA
Jessica Sexton, Planning Program Manager, SEMA
Jody Starr, Public Health Emergency Preparedness (PHEP) Grant Coordinator, DHSS
Holly Withrow, GIS Specialist, DHSS

Overview of the Missouri Public Health Risk Assessment Tool

The ***Missouri Public Health Risk Assessment Tool (MOPHRAT)*** helps Local Public Health Agencies (LPHAs) prioritize jurisdictional impacts to public health by guiding planners through an analysis of various hazards. The MOPHRAT helps assess the level of planning necessary to ensure access to emergency response and preparedness resources, taking into account the services provided by LPHAs and the healthcare system. This document will guide public health planners through the use of the MOPHRAT, a workbook developed in Microsoft® Excel.

The term **risk**, as used in this document, refers to the expectation of loss from a hazard or incident (UCLA 2006). Risk is the product of the expected severity of the event and the probability that the event will occur. To assess the public health risk resulting from a specific hazard, severity is measured in five major domains:

1. human health,
2. healthcare services,
3. inpatient healthcare infrastructure,
4. community health, and
5. public health services.

The MOPHRAT takes a quantitative approach to impact assessment, measuring baseline levels of morbidity, services, and activities, and comparing them to the morbidity, service impacts, and activities that result from specific hazard incidents. Each domain contains six to eight different metrics that are used to assess the impact of a hazard in that specific area (see Figure 1, p. 5). In general, the metric is calculated by creating a ratio of a hazard-specific impact (e.g., number of EMS transports or number of Emergency Department beds needed during the incident) to a baseline number for the community during non-disaster times (e.g., average daily number of EMS transports of Emergency Department beds in the jurisdiction). In this way, the severity metrics take into account an increase in morbidity or mortality that may result from a disaster, as well as either a depletion of services or surge requirement. If quantitative data are not available, planners can calculate severity ratios based on a subjective estimate of how an incident would impact services or morbidity in a specific area.

The MOPHRAT can generate a composite risk to the overall health of the entire jurisdiction, or it can assess the risk of a hazard from the perspective of either the public health system or healthcare system, respectively, using one of the two component or sub-analyses. The two sub-analyses are the **Public Health System Risk Assessment** and the **Healthcare System Risk Assessment** (illustrated in Figures 1, 2, and 3). The Public Health System Risk Assessment examines the severity of specific hazards based on their impact on human health, healthcare services, the functioning of the community and the impact on public health agency services. The Healthcare System Risk Assessment analysis examines severity in two of these areas (human health and healthcare services), and also on inpatient healthcare facility infrastructure. The overall Public Health Risk Assessment calculates severity based on a hazard's impact in all five of these domains.

Many hazards result in disproportionate consequences for certain vulnerable or at-risk populations. Planning for the whole community requires both the recognition of potentially severe impacts of disasters on specific populations, and focused planning to mitigate or respond to those impacts. The MOPHRAT introduces the concept of adjusted risk, which weights the risk of a hazard based on the additional planning necessary to ensure universal access to emergency response resources for at-risk populations. The **Adjusted Risk Score** thus reflects the overall health risk from a hazard in a jurisdiction (i.e., an assessment of its probability and anticipated impact on the health of a jurisdiction), viewed through the lens of the effort required to minimize the consequences to vulnerable communities.

In addition to generating an Adjusted Risk Score for each hazard, the MOPHRAT can also be used to integrate an assessment of preparedness efforts into planning for public health emergencies. The prioritization of planning should be driven by the current status of preparedness for each hazard. The MOPHRAT attempts to generate a **Planning Priority Score** for specific hazards by including a quantified assessment of preparedness into the analysis.

The MOPHRAT uses the 15 Public Health Emergency Preparedness (PHEP) capabilities enumerated by the CDC (CDC 2011), and the four Healthcare Preparedness Program (HPP) capabilities from the U.S. Department of Health and Human Services (HHS) to determine a **Status Score** for each capability. These Status Scores are generated through self-assessment processes conducted by public health and healthcare agencies. In the MOPHRAT, each capability is also assigned a hazard-specific **Relevance Score** that is unique to each hazard, based on the relevance or importance of each capability to the public health response for that hazard. A **Preparedness Score** for each hazard is then calculated by using both the Status Scores and the Relevance Scores for all 15 Public Health Preparedness or all four Healthcare Preparedness capabilities. In the Public Health System Risk Assessment sub-analysis, the 15 PHEP capabilities are used to calculate preparedness. In the Healthcare System Risk Assessment, the four HPP capabilities are used to calculate preparedness. The Adjusted Risk Score for each hazard is then compared to the jurisdiction's Preparedness Score for that hazard. The ratio of the Adjusted Risk Score to the Preparedness Score is referred to as the **Planning Priority Indicator**. These scores are then ranked, and the rank is referred to as the **Planning Priority Score**. This Planning Priority Score reflects a relationship between preparedness efforts and hazard impact, but unlike other risk assessments, it does not propose or presume a specific reduction of risk based on achieving a certain degree of preparedness or mitigation.

We believe that the ultimate impact of most disasters is difficult to predict, and it is impossible to say that a certain level of preparedness will reduce risk in knowable or quantifiable ways. ***Therefore, the final assessment or score generated for each hazard is intended only to prioritize planning*.** If jurisdictional and LPHA planners wish to lessen actual risks by implementing specific hazard mitigation or preparedness activities, the MOPHRAT measures that reduction by decreasing the actual severity impact of specific hazards and/or increasing response capacity in measurable ways – thereby reducing the Planning Priority Indicator by either reducing the Risk Score or increasing the Preparedness Score.

Several hazard vulnerability analysis and risk assessment instruments informed the development of the MOPHRAT. The severity and probability analyses used in the MOPHRAT were developed using the Hazard Risk Assessment Instrument created by UCLA's Center for Public Health and Disasters, and the Medical Center Vulnerability Analysis developed by Kaiser Permanente. The use of CDC's PHEP capabilities to measure a jurisdiction's preparedness and response capacity was originally proposed by the New York City Department of Health and Mental Hygiene's Regional Catastrophic Planning Team's Worksheet Instructions for the Public Heath Jurisdictional Risk Assessment Tool. The overall assessment of impact and special planning necessary to address access and functional needs (adjusted risk), as well as the concept of the Planning Priority Score, were developed by the Center for Public Health Readiness and Communication (CPHRC) at the Drexel University School of Public Health.

Figure 1 illustrates an overview of the MOPHRAT, and Figures 2 and 3 illustrate the sub-analyses (pp. 5-6).

Figure 1
Missouri Public Health Risk Assessment Conceptual Overview

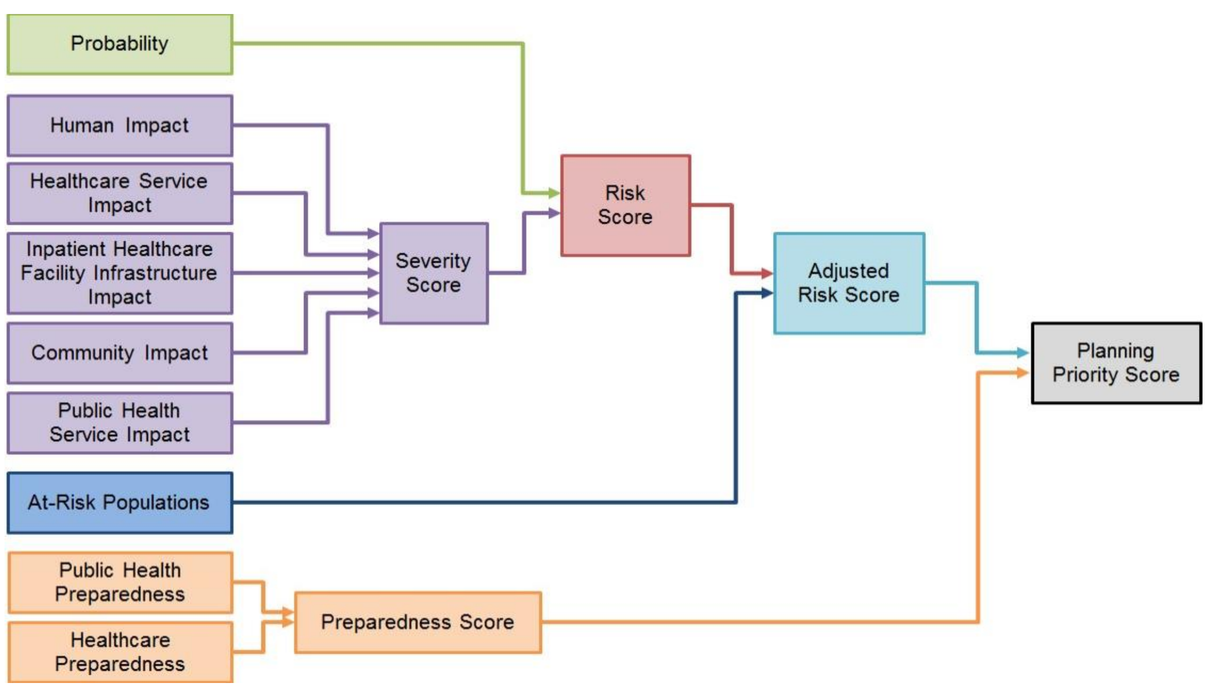


Figure 2

Sub-analysis: Public Health System Risk Assessment Conceptual Overview

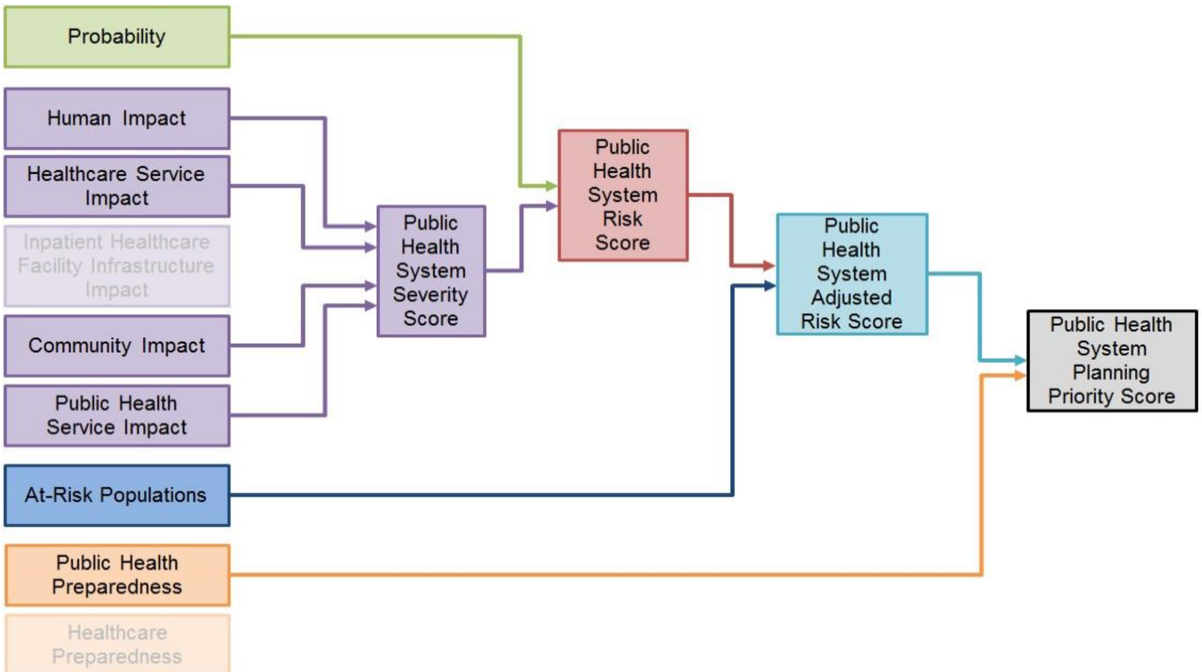
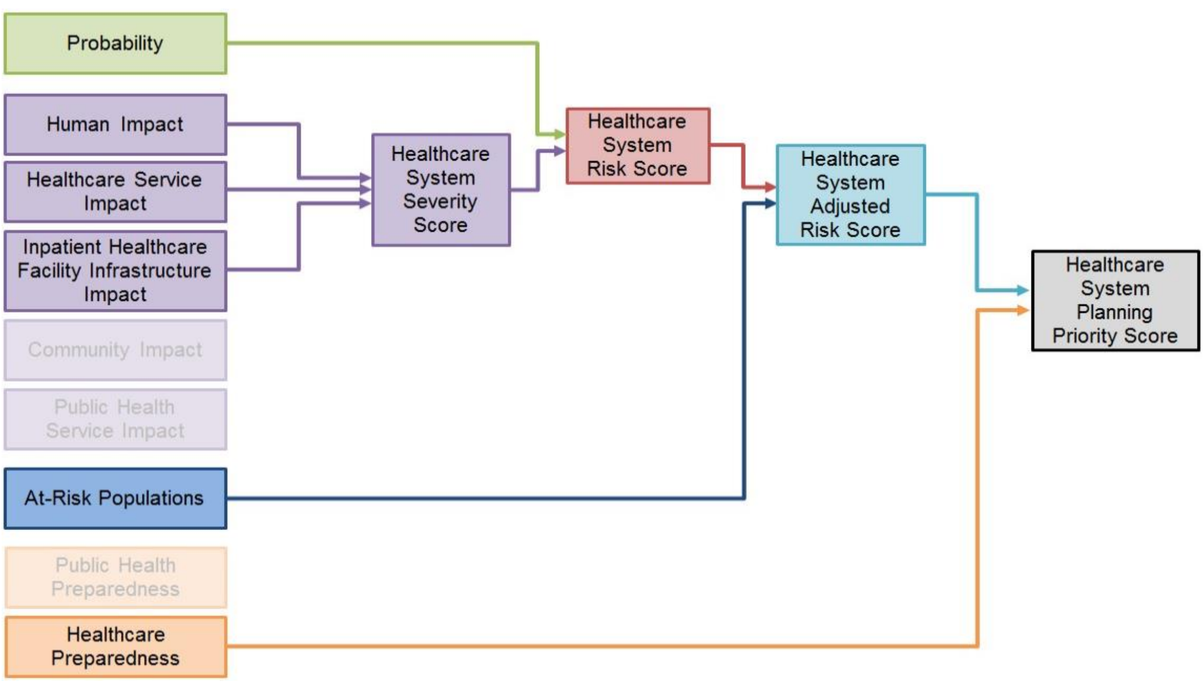


Figure 3

Sub-analysis: Healthcare System Risk Assessment Conceptual Overview



The MOPHRAT Excel Workbook

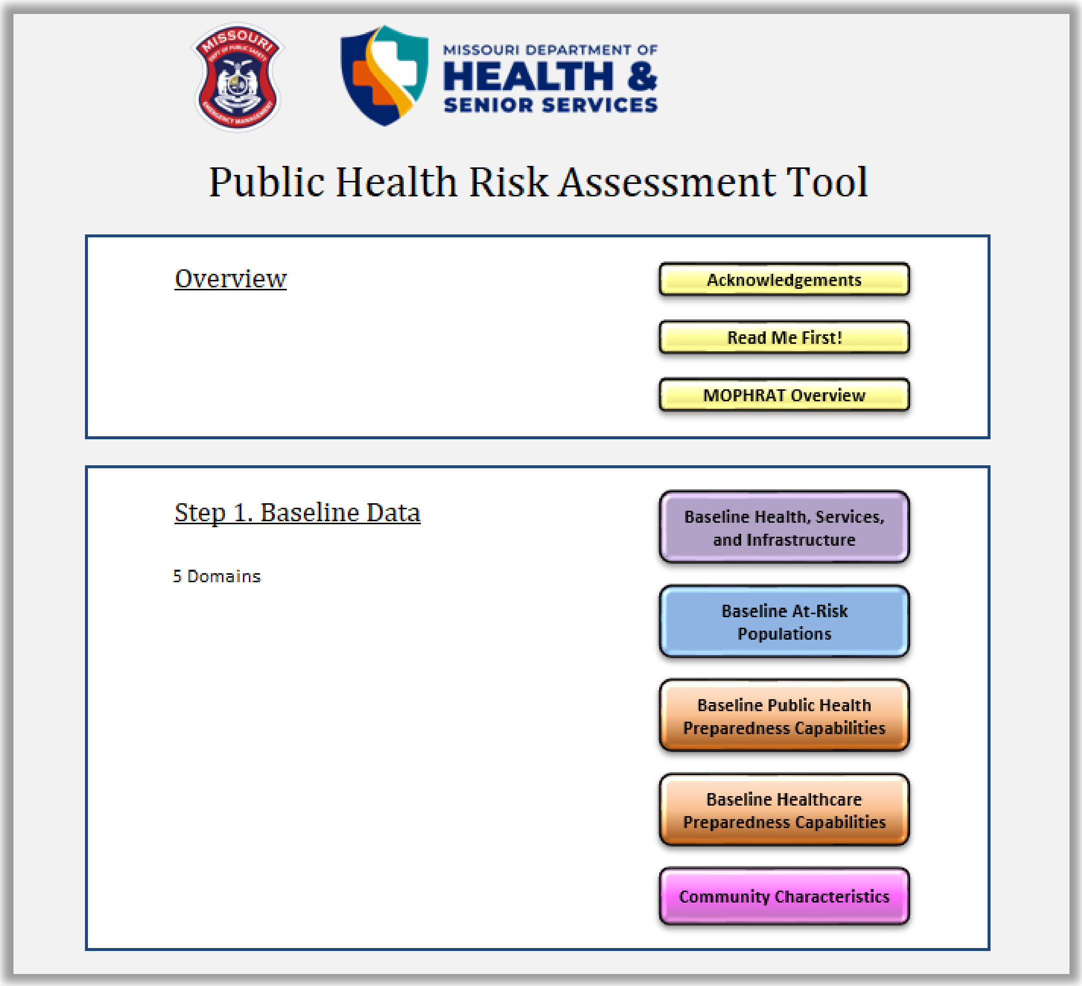
This document guides public health planners through using the MOPHRAT, an automated (macro-enabled) workbook developed in Microsoft® Excel. The MOPHRAT is completed in three steps, discussed in detail through the following sections of this How-To Guide.

In order for the workbook to operate correctly, planners must enable macros that have been programmed into the tool to facilitate data entry and analysis. Enable content and macros when prompted to do so in Microsoft Excel.

When the workbook is opened, the **Main Menu** will appear, as shown in Figure 4. To learn more about the workbook and the tool, click on the buttons that say, "**Read Me First-Quick Start**" and "**Overview of the Tool**."

Return to the Main Menu from any other worksheet by clicking on the green button that reads Main Menu in the upper right corner of the worksheet.

Figure 4
MOPHRAT Main Menu



Step 1: Enter Baseline Data

Before entering information about the specific hazards being analyzed, you must enter **Baseline Data** about your jurisdiction. There are five worksheets into which baseline data should be entered. You can navigate to these pages by clicking on the various buttons in the “Step 1. Baseline Data” box in the Main Menu.

Baseline Health, Services, and Infrastructure Worksheet

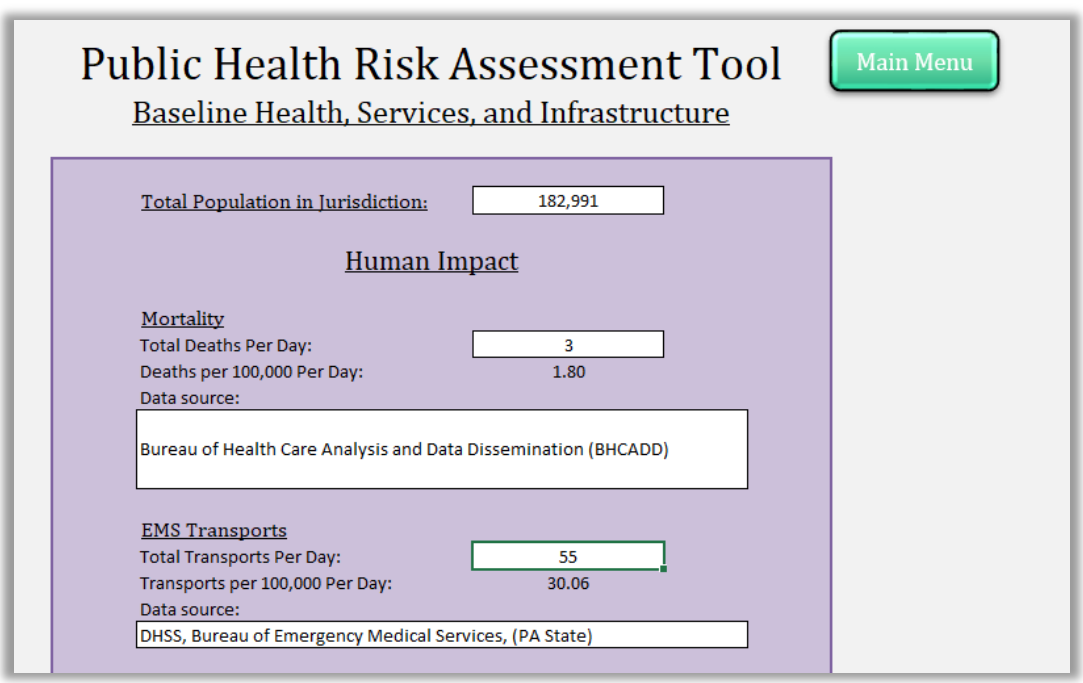
The tool calculates severity by comparing hazard-specific values to baseline values in a number of metrics. In order to do this, baseline information must be entered in the **Baseline Health, Services, and Infrastructure** worksheet. Navigate to this sheet using the **purple** button in the “Step 1. Baseline Data” box in the Main Menu. There are 4 Impact Areas within this worksheet: Human, Healthcare Service, Inpatient Healthcare Facility Infrastructure, Public Health Service.

It is still possible to use the tool without entering baseline data, if data are unavailable or if planners prefer to assess the potential impact of disasters subjectively, based on the knowledge and experience of subject matter experts. More information about this option can be found in the "Step 2: Hazard Data" section below. If you choose to use the tool without entering baseline data, this worksheet may be left blank. However, where data are available, it is recommended that you enter baseline data, as the information will help you estimate impacts **qualitatively**. If you choose to use the tool **quantitatively**, this baseline data worksheet must be completed.

The **Baseline Health, Services, and Infrastructure** worksheet is illustrated in Figure 5. Enter values specific to your jurisdiction in the white cells outlined in black, as shown in the figure.

Figure 5

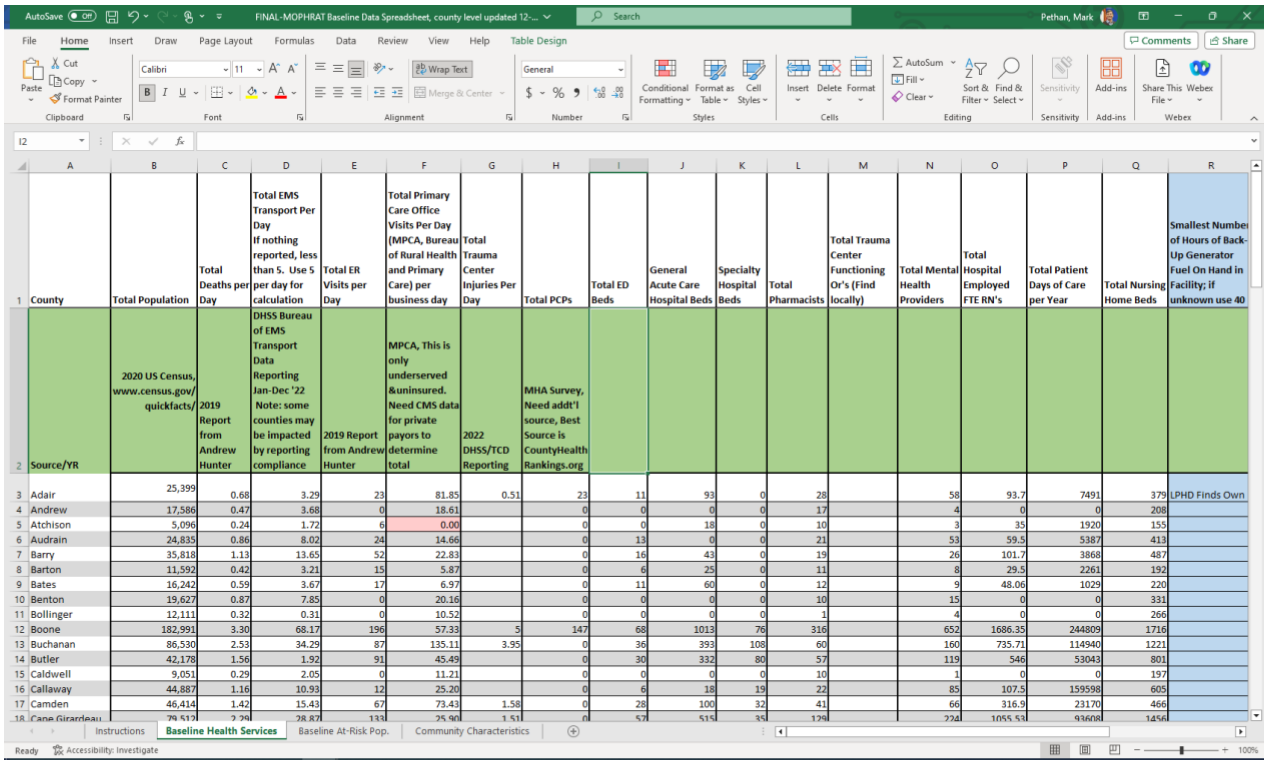
Baseline Health, Services, and Infrastructure Worksheet



For each metric, there is space to enter a **data source**. This is a great way to document and explain your methodology and nuances. Entering this information is optional, and may be helpful as a citation for conducting future analyses. If you do not wish to enter a data source, simply leave these spaces empty, however citing the data source is strongly encouraged for future use of the MOPHRAT tool.

When completed, return to the Main Menu by clicking on the **green** Main Menu button in the upper right corner of the worksheet.

You will find a separate MOPHRAT Baseline Data Spreadsheet (on the MOPHRAT page, Missouri Public Health Risk Assessment Tool (MOPHRAT) populated with county level data that will assist you in completing this worksheet. Most of the data metrics have been queried at a state level by the Bureau of Health Care Analysis and Data Dissemination (BHCADD), Missouri Department of Health and Senior Services. Data is based on reporting, therefore there will be inconsistencies in values.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	County	Total Population	Total Deaths per Day	Total EMS Transport Per Day If nothing reported, less than 5. Use 5 per day for calculation	Total ER Visits per Day	Total Primary Care Office Visits Per Day (MPCA, Bureau of Rural Health and Primary Care) per business day	Total Trauma Center Injuries Per Day	Total PCPs	Total ED Beds	General Acute Care Hospital Beds	Specialty Hospital Beds	Total Pharmacists	Total Trauma Center Functioning Or's (Find locally)	Total Mental Health Providers	Total Hospital Employed FTE RN's	Total Patient Days of Care per Year	Total Nursing Home Beds	Smallest Number of Hours of Back-Up Generator Fuel On Hand in Facility; if unknown use 40
2	Source/YR	2020 US Census, www.census.gov/ quickfacts/	2019 Report from Andrew Hunter	DHSS Bureau of EMS Transport Data Reporting Jan-Dec '22 Note: some counties may be impacted by reporting compliance	2019 Report from Andrew Hunter	MPCA, This is only underserved &uninsured. Need CMS data for private payors to determine total	2022 DHSS/TCD Reporting	MHA Survey, Need addt'l source, Best Source is CountyHealth Rankings.org										
3	Adair	25,399	0.68	3.29	23	81.85	0.51	23	11	93	0	28		58	93.7	7491	379	LPHD Finds Own
4	Andrew	17,586	0.47	3.68	0	18.61		0	0	0	0	17		4	0	0	208	
5	Atchison	5,096	0.24	1.72	6	0.00		0	0	18	0	10		3	35	1920	155	
6	Audrain	24,835	0.86	8.02	24	14.66		0	13	0	0	21		53	59.5	5387	413	
7	Barry	35,818	1.13	13.65	52	22.83		0	16	43	0	19		26	101.7	3868	487	
8	Barton	11,592	0.42	3.21	15	5.87		0	6	25	0	11		8	29.5	2261	192	
9	Bates	16,242	0.59	3.67	17	6.97		0	11	60	0	12		9	48.06	1029	220	
10	Benton	19,627	0.87	7.85	0	20.16		0	0	0	0	10		15	0	0	331	
11	Bollinger	12,111	0.32	0.31	0	10.52		0	0	0	0	1		4	0	0	266	
12	Boone	182,991	3.30	68.17	196	57.33	5	147	68	1013	76	316		652	1686.35	244809	1716	
13	Buchanan	86,530	2.53	34.29	87	135.11	3.95	0	36	393	108	60		160	735.71	114940	1221	
14	Butler	42,178	1.56	1.92	91	45.49		0	30	332	80	57		119	546	53043	801	
15	Caldwell	9,051	0.29	2.05	0	11.21		0	0	0	0	10		1	0	0	197	
16	Callaway	44,887	1.16	10.93	12	25.20		0	6	18	19	22		85	107.5	159598	605	
17	Camden	46,414	1.42	15.43	67	73.43	1.58	0	28	100	32	41		66	316.9	23170	466	
18	Cape Girardeau	79,512	2.29	28.87	133	25.90	1.51	0	57	515	35	129		224	1055.53	93608	1456	

Human Impact

Mortality (deaths per day), EMS Transports (runs per day), ED visits per day and Trauma Center Injuries per day have been populated by county in the companion data spreadsheet tool. The Primary Care Office visits per day was difficult to glean at a state level. The spreadsheet column for PCP Office visits per day only includes data that was provided by the Missouri Primary Care Association; these visits at Federal Qualified Health Care Centers (FQHC's) and Rural Health Clinics (RHC's), mostly for uninsured and underinsured. You will want to take an average of office visits per day in other clinics and add to this number for a total sum.

Healthcare Service Impact

An additional source for health data is: https://www.countyhealthrankings.org/explore-health-rankings/missouri?year=2023 This site has data related to many health outcomes and clinical care services. The number of practitioners is listed as a ration. Ex. number of Primary Care Physicians is 1490:1. This means there is 1 PCP for every 1490 persons. To calculate the number for your assessment, divide the total population (187,000) / number of PCP's for every person (1490) = 125.

Several of the metrics in this section require some research and are nuanced:

** Inpatient Healthcare Facilities Infrastructure Impact

Facility Generator Fuel Supply

Many hospitals, nursing homes and health departments have back-up generator capabilities. Use the Data Source text box to describe the facilities (type/capacity of generator, fuel supply on hand, whether a facility has a storage tank or is connected to a pipeline). Use an average/estimate for the smallest number of hours of Back-Up Generator Fuel on Hand in a facility.

Facility Critical Supplies

Estimate the smallest number of days of linen on hand for a facility. Average/estimate is fine.

**Public Health Service Impact

Total Number of Public Health Staff

Use the number of full time and part time employees. Do not count the number of volunteers.

Number of Case Reports Per Day to the Health Department

The LPHA's receive disease reports that require investigation from multiple sources including, but not limited to, CD1's, assigned through Websurv/EpiTrax (disease registry), received via phone, email, etc. from reporters such as schools, daycares, summer camps,… and also directly from the public. All of these reports typically require some form of follow up and investigation. The information collected during the investigation is used to determine which of the individuals meet the case definition and are subsequently counted as a case. Additional public health follow such as monitoring, isolation, quarantine, etc. is generally limited to persons who are contacts to a case. In many instances, there are many more disease reports and investigations than there are cases.

If you are interested in data on cases and the subsequent follow up of cases then the number would be number of individuals meeting the case definition i.e, number of cases. If more interested to assess impact of "work load" then would be better to go with total number of reports received and investigated from all sources including, but not limited to those received by the CD-1. The website is a good reference. It is likely there is a variety of ways LPHAs are tracking all the reports received.

CD1's assigned through Websurve/EpiTrax	**Schools, Day Cares, Summer Camps**	**Direct from the public**	**Total Number of reports requiring investigation**

Number of Specimens Processed Per Day

Use the number of water samples and biological (blood, sputum, urine) samples collected per day. This would accurately reflect your current workload which will be contrasted with a workload during a public health incident when additional samples are needed.

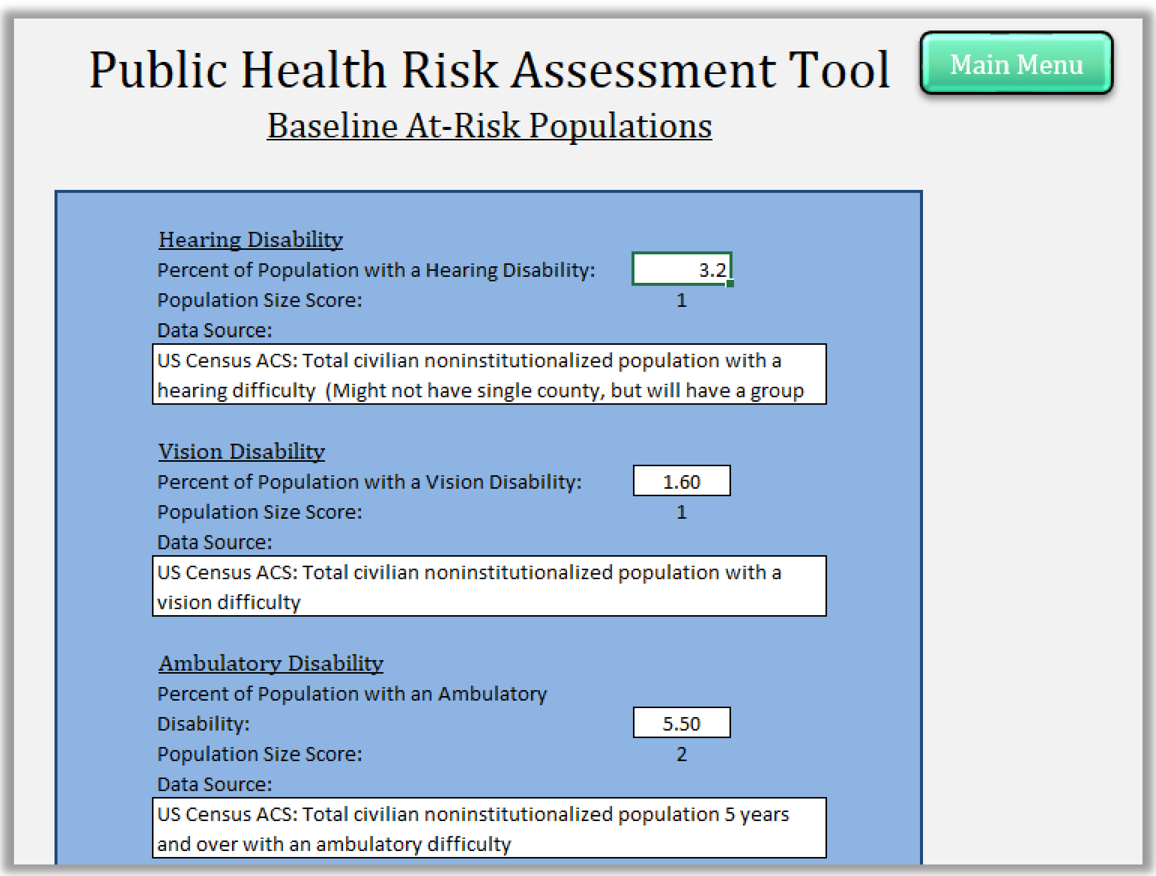
Water samples	Biological (blood, sputum, urine)	Total

Baseline At-Risk Populations Worksheet

The tool assesses the need for plans addressing at-risk populations by examining both the special needs (entered in the Hazard Worksheets) and the size of these populations (entered as Baseline Data) in your jurisdiction. Enter this population size data in the **Baseline At-Risk Populations** worksheet. Navigate to this sheet using the **blue** button in the “Step 1. Baseline Data” box in the Main Menu. A portion of this worksheet is illustrated in Figure 6. ***You can also utilize the data source box with text to customize information regarding the population group (example, School for the Deaf in your community) and name specific organizations that plan for and support the population (example, Area Agency on Aging, Senior Center).***

Figure 6

Baseline At-Risk Populations Worksheet



The Baseline At-Risk Populations worksheet provides space for entering information about the percentage of individuals in your jurisdiction that are at higher risk for suffering severe consequences of disasters than the general population. For this analysis, nine specific populations will be assessed, although additional at-risk populations may exist in your jurisdiction and might require specific planning initiatives in your jurisdiction's preparedness activities. The nine populations were selected for this risk assessment tool because they represent a spectrum of communities who require special planning initiatives for disasters, and because they have been shown to experience severe outcomes.

Population data for your jurisdiction may be located in the U.S. Census American Community Survey (ACS), County Health Profiles, CountyHealthRankings.org, or CDC's Behavioral Risk Factor Surveillance System (BRFSS) data. Potential Sources of demographic data are listed in Table 1.

For each metric, there is space to enter a **data source**. Entering this information is optional, and may be helpful as a citation for conducting future analyses. If you do not wish to enter a data source, simply leave these spaces empty, however citing the data source is strongly encouraged for future use of the MOPHRAT tool.

Table 1

Potential Sources for Population Size Data

Population	Potential Source of Population Size Data
Hearing Disability	U.S. Census ACS: Total civilian non-institutionalized population with a hearing difficulty
Vision Disability	U.S. Census ACS: Total civilian non-institutionalized population with a vision difficulty
Ambulatory Disability	U.S. Census ACS: Total civilian non-institutionalized population 5 years and over with an ambulatory difficulty
Cognitive Disability	U.S. Census ACS: Total civilian non-institutionalized population 5 years and over with a cognitive difficulty
Limited English Proficiency	CountyHealthRankings.org: Percentage of a population considered not proficient in English
Poverty	U.S. Census ACS: Below poverty level

Chronic Diseases (use persons with Diabetes)	CountyHealthRankings.org: Percentage that are diabetic
Children, 18 and under	U.S. Census ACS: Under 18 years
Elderly, 65 and older	U.S. Census ACS: 65 years and over

A **Population Size Score** is automatically generated based on the number you enter in the space provided. The score is calculated based on the following scale:

0 = Population represents 0% of the total population
1 = Population represents more than 0% but less than 5% of the total population
2 = Population represents at least 5% but less than 10% of the total population
3 = Population represents at least 10% but less than 15% of the total population
4 = Population represents at least 15% of the total population

When completed, return to the Main Menu by clicking on the green "Main Menu" button in the upper right corner of the worksheet.

Baseline Preparedness Capabilities

In order to assess the level of preparedness in the jurisdiction, the current status of the 15 Public Health Emergency Preparedness Capabilities and the eight Healthcare Preparedness Capabilities must be entered. Navigate to these worksheets using the **orange** buttons in the "Step 1. Baseline Data" box in the Main Menu. Choose the appropriate status from the drop-down menu next to each function in the **Baseline Public Health Preparedness Capability Status** and **Baseline Healthcare Preparedness Capability Status** worksheets. If you are unfamiliar with the level of Healthcare Preparedness Capabilities, contact the Health Care Coalition in your region/area. Nonurban HealthCare Coalition - MHA (mhanet.com)

Figure 7 illustrates the Baseline Public Health Preparedness Capability Status worksheet, and shows how the current status can be selected from the drop-down menu. The Healthcare Preparedness Capability Status worksheet can be completed in the same way. These capabilities/functions are consistent with the Public Health Emergency Preparedness (PHEP) and Hospital Preparedness Program (HPP) grants. For more information to go to the following sites:

Public Health Emergency Preparedness and Response Capabilities | State and Local Readiness | CDC
2024-2028 PHEP Cooperative Agreement Guidance/Budget Period 1 | State and Local Readiness | CDC

Hospital Preparedness Program (HPP) (hhs.gov)

Figure 7. Baseline Public Health Preparedness Capability Status Worksheet

Public Health Risk Assessment Tool

Main Menu

Baseline Public Health Preparedness Capability Status

Community Preparedness	Current Status:	Status Score:
Function 1: Determine risks to the health of the jurisdiction. Identify the potential hazards, vulnerabilities, and risks in the community that relate to the jurisdiction's public health, medical, and mental/behavioral health systems, the relationship of those risks to human impact, interruption of public health, medical, and mental/behavioral health services, and the impact of those risks on the jurisdiction's public health, medical, and mental/behavioral health infrastructure.	Some ability/capacity	2
Function 2: Build community partnerships to support health preparedness. Identify and engage with public and private community partners who can do the following: • Assist with the mitigation of identified health risks • Be integrated into the jurisdiction's all-hazards emergency plans with defined community roles and responsibilities related to the provision of public health, medical, and mental/behavioral health as directed under the Emergency Support Function #8 definition at the state or local level.	Some ability/capacity	2
Function 3: Engage with community organizations to foster public health, medical, and mental/behavioral health social networks. Engage with community organizations to foster social connections that assure public health, medical and mental/behavioral health services in a community before, during, and after an incident.	Significant ability/capacity	3

After the current status of each function is selected, a numerical Status Score will automatically be generated based on the following scale:

- 0 = No ability / capacity
- 1 = Limited ability / capacity
- 2 = Some ability / capacity
- 3 = Significant ability / capacity
- 4 = Full ability / capacity

An overall **Capability Score** will then be calculated automatically, using the average of the **Status Scores** for each of the functions of that capability. This score is automatically generated.

These worksheets must be completed for the **Preparedness Score** and the **Planning Priority Score** to be calculated for each hazard. If you do not complete the Preparedness Capabilities worksheets, it is possible to assess the risks of the hazards by examining only the relative Adjusted Risks.

When completed, return to the Main Menu by clicking on the green "Main Menu" button in the upper right corner of the worksheet.

Community Characteristics

The MOPHRAT uses certain community characteristics to estimate the impact of specific hazard scenarios. For example, the number of hospital beds located within 10 miles of a nuclear reactor is used to determine the impact of an accident at a nuclear facility on the region's supply of hospital beds.

There are hyperlinks in this Section of the tool which will provide the references to U.S. Census Bureau Quick Facts, https://www.census.gov/quickfacts/fact/table/US, www.city-data.com, and the FEMA Resilience Analysis and Planning Tool (RAPT), https://www.fema.gov/about/reports-and-data/resilience-analysis-planning-tool These sites will help you gather data to complete this section of the tool.

If you would like to change the hazard-specific estimates pre-entered into the hazard worksheets in the MOPHRAT, this worksheet does NOT need to be completed. You may leave it blank and enter your own estimates in the specific hazard worksheets. However, if you would like to accept the impact estimates developed by the DHSS/SEMA in the many individual hazard worksheets, data must be entered into the **Community Characteristics** worksheet. Navigate to this sheet using the pink button in the "Step 1. Baseline Data" box in the Main Menu.

You will need to complete a calculation to determine your counties % of population using well water:
# of actual wells from DHSS MO Private Drinking Water Site (https://storymaps.arcgis.com/stories/4a71c2f84c3349fcb7e4a528ac261b35) x Average # of persons per household (https://www.census.gov/quickfacts/fact/table/US)

1857 x 2.47 = 4586
4586 people using well water / county population (82,899) = 5.5 % of population using well water.

Step 2: Hazard Data

Individual worksheets for entering the specific impacts of each hazard are located in the "Step 2. Hazard Data" box in the Main Menu. These sheets are pre-filled with data from scenarios. The MOPHRAT's authors made a number of assumptions about the likely impacts of hazards, based on local data from historic incidents, published literature from similar incidents in other regions, and information about local infrastructure and vulnerabilities.

These assumptions may not apply to geographically distinct regions. For example, the impact of an earthquake would likely be much more severe along the Eastern and Southeastern part of the state.

If you would like to accept the assumptions made, the "Community Characteristics" worksheet must be completed. Navigate to this sheet using the **pink** button in the "Step 1. Baseline Data" box in the Main Menu.

If you would like to reject the assumptions, you can determine hazard-specific data that is more relevant to your unique jurisdiction, then enter data directly into the hazard worksheets.

Even if you choose to accept the assumptions, you may have to alter the scores of certain metrics if your jurisdiction has a baseline of zero in any metric. For example, if the jurisdiction has zero hospital beds, the hospital bed metric will be scored as "Not Calculated," because division by zero is impossible. In this scenario, use the instructions below to score the metric qualitatively.

Scenarios Used in the Hazard Data Analysis

1. **Active Shooter:** The proxy scenario used to predict the impacts of an active shooter incident is the Virginia Tech Massacre of 2007. On April 16, 2007, student Seung Hui Cho murdered 32 and injured 17 students and faculty in two related incidents on the campus of Virginia Polytechnic Institute.

   - In the Virginia Tech Massacre of 2007, 33 died at the scene including the shooter, and 17 were transported by EMS (Armstrong & Frykberg, 2007).
   - In the Virginia Tech Massacre of 2007, 27 are known to have been treated at local emergency departments (Virginia Tech Review Panel, 2007).
   - In the Virginia Tech Massacre of 2007, 10 were taken to surgery at Level III trauma centers, and 2 at a Level I trauma center (Armstrong & Frykberg, 2007).
   - Population displays distress with 25% - 49% psychopathology.
   - After the Virginia Tech Massacre of 2007, 15.4% of Virginia Tech students screened showed high levels of posttraumatic stress symptoms (Hughes et al., 2011). In addition to PTSD, behavioral changes, anxiety, depression, and other behavioral health consequences are likely to occur.

2. **Biological Terrorism:** The proxy scenario used to predict the impacts of a biological event is the National Planning Scenario (NPS): Biological Attack - Aerosolized Anthrax. A single aerosolized anthrax attack is delivered by a truck using a concealed improvised spraying device in a densely populated urban city with a significant commuter workforce (Department of Homeland Security, 2006).

- Anthrax spores delivered by aerosol delivery result in inhalation anthrax, which develops when the bacterial organism, Bacillus anthracis, is inhaled into the lungs. A progressive infection follows.
- 13,208 untreated fatalities are predicted (Department of Homeland Security, 2006).
- The incubation period has a range of about 30 days (Meselson et al., 1994).
- It is predicted that 328,484 people will be exposed (Department of Homeland Security, 2006). Thousand" will seek care at hospitals. It is assumed that about 1% of those exposed will seek care (approximately 3,000). The incubation period is about 30 days (Meselson et al., 1994).
- It is assumed that about double that number – including many worried well – will want to meet with a primary care physician for prophylactic antibiotics or follow-up care over one month.
- Evidence suggests that 30-40% of people affected by a terrorist action are likely to develop PTSD (Whalley & Brewin, 2007). In addition to PTSD, behavioral changes, anxiety, depression, and other behavioral health consequences are likely to occur.
- It is assumed that 2% of providers are unable to report to work due to illness, based upon the attack rate in Sverdlovsk after an accidental weaponized anthrax release (Meselson et al., 1994).
- It is assumed that the number of staffed beds is reduced because 2% of providers being unable to report to work due to illness, based upon the attack rate in Sverdlovsk after the 1979 accidental weaponized anthrax release (Meselson et al., 1994).

3. **Chemical Terrorism:** The proxy scenario used to predict the impacts of a chemical terrorism incident is based on the National Planning Scenario (NPS): Chemical Attack - Nerve Agent. In the scenario, a terrorist builds six spray dissemination devices and releases Sarin vapor into the ventilation systems of three large commercial office buildings in a metropolitan area.

- The nerve agent kills 95% of the people in the buildings, and kills or sickens many first responders. In addition, some of the agent exits through rooftop ventilation stacks, creating a downwind hazard (Department of Homeland Security, 2006). In the altered scenario, spray dissemination devices are released in the ventilation of a large local building - the building with the largest daytime population in the region. The morbidity and mortality rates of the NPS are applied to the occupancy of this building.
- 5% of the building's occupants will be found unconscious, suffering from seizures. They will be decontaminated and transported to medical facilities (Department of Homeland Security, 2006).
- In the NPS, 5% of the building's occupants are predicted to be hospitalized with prolonged seizures for four to six weeks (Department of Homeland Security, 2006).
- It is estimated that PCP visits will increase significantly (by approximately 50%) due to behavioral health impacts, the worried well, and patients with psychosomatic symptoms.
- It is estimated that demand for pharmaceuticals will increase due to the high rate of anxiety and post-traumatic stress in the population.
- In the NPS, injuries are predicted due to panic on the street, including falling and crushing injuries, as well as motor vehicle accidents on the surrounding roadways (Department of Homeland Security, 2006). Most of these injuries will be minor; it is assumed that two will require trauma centers.
- Population displays distress with ≥50% psychopathology. After the Tokyo Sarin attack, almost 60% of victims suffered from PTSD (Ohbu et al., 1997).
- In general, 40 providers are needed per 250 disaster victims (Landesman, 2005). It is predicted that 60% of the population will be affected (Ohbu et al., 1997).

4. **Civil Disturbance:** The proxy scenario used to predict the impacts of a civil disturbance is the Ferguson Unrest/Protests that occurred on August 10, 2014, after the shooting death of Michael Brown. Thousands of people rioted for many days and months after the incident.

   - During the Ferguson unrest, 14 people were injured on Aug. 12, 2014. Seven people were transported to hospitals (two admitted, and five were released).
   - In addition, 61 arrests were made in Ferguson the night of Aug. 12, 2014; 21 were arrested in nearby St. Louis.
   - The local population displays distress with <25% psychopathology
   - Hospitals remained open during the Civil Unrest. No decrease in bed availability has been noted.
   - There is an estimate 10% increase in providers needed for mental health services.
   - During the incident, service was deemed unreliable for bus and metro rail for about one week.
   - In all, 25 structures and 27 business were damaged in the following riots; 18 buildings were eventually demolished.
   - During the riots, 27 businesses were damaged, and 12 businesses were looted or vandalized.
   - The LPHA may provide information regarding mental health services or health, hygiene, and safety for protestors/rioters. It is predicted that eight hours will be required.

5. **Coastal Storm:** Not applicable in Missouri.

6. **Conventional Explosive:** The proxy scenario used to predict the impacts of a conventional explosive incident is the Oklahoma City bombing. On April 19, 1995, a Ryder truck containing more than 4,800 pounds of ammonium nitrate fertilizer, nitromethane, and diesel fuel mixture detonated in front of the north side of the nine-story Alfred P. Murrah Federal Building in Oklahoma City. The blast destroyed or damaged 324 buildings within a 16-block radius, destroyed or burned 86 cars, and shattered glass in 258 nearby buildings. To estimate the impacts of a worst-case reasonable scenario, the truck bomb is assumed to be detonated outside of the building with the largest daytime population in the region. The morbidity and mortality rates from the Alfred P. Murrah Federal Building are applied to the known occupancy of that building at the time of the attack.

   - The fatality rate inside the Murrah Building was 46% (North et al., 1999).
   - Within the first hour of the explosion, 139 patients (38% of the building's occupancy) were transported to area hospitals (Maningas, Robison, & Mallonee, 1997). Most victims arrived at local emergency departments by private vehicle; only the most severely injured were transported by ambulance (Teague, 2004).
   - 18 hospitals in the metropolitan area treated 511 adults and 38 children (151% of the building's occupancy) (McLain, 2001).
   - 233 persons were treated in physicians' offices or clinics (64% of the building's occupancy) (McLain, 2001).
   - 83 people (23% of the building's occupants) had serious injuries requiring operative care (Rivara, Nathens, Jurkovich, & Maier, 2006).
   - The population displays distress with 25% - 49% psychopathology
   - 34% of survivors had PTSD within four to eight months after Oklahoma City Bombing (North et al., 1999). A total of 9,106 individuals received one-on-one counseling or group therapy, and 190,000 individuals received some kind of mental health services (McLain, 2001).

- 90 patients (25% of the building's occupants) were admitted to hospitals (Maningas, Robison, & Mallonee, 1997). The last patient was discharged from the hospital five months after the bombing (McLain, 2001).
- 40 providers are needed per 250 disaster victims (Landesman, 2005).
- 34% of survivors had PTSD within four to eight months after Oklahoma City Bombing (North et al., 1999). A total of 9,106 individuals received one-on-one counseling or group therapy, and 190,000 individuals (about 500x the occupancy of the building) received some kind of mental health services (McLain, 2001).
- Over 300 buildings in a six-block radius were damaged, and 25 were destroyed (McLain, 2001). For the first week following the blast, an entire eight-block radius was closed to the general public (Arnold, 2001).
- Interruption is predicted because transportation route closures will prevent personnel from getting to work.
- An increased demand for personnel is expected due to the need to conduct environmental assessment and surveillance.
- A small increase in surveillance is expected due to the monitoring of blast victims for long-term outcomes.
- Public information regarding mental health services, environmental hazards, and dust inhalational hazards will be released. Communications with hospitals will also be vital. This is predicted to require a minimum of 12 hours.

7. **Cyber-Terrorism:** The proxy scenario used to predict the impacts of a cyber-terrorism incident is the January 2005 botnet attack at Seattle's Northwest Hospital. Christopher Maxwell created a botnet that increased computer traffic as it scanned the system and interrupted normal hospital computer communications. Among other things, doors to the operating rooms did not open, pagers did not work, and computers in the intensive care unit shut down (Gage, 2007).

- The population displays distress with <25% psychopathology.
- Concerns about privacy, security, and an impending physical attack are likely to be related to a mental health impact.
- After the Seattle hospital botnet attack, the aftermath lasted for weeks. As computers stopped working, extra workers were brought in to help carry out tasks by hand. Lab results, for instance, were run from the lab to the hospital floor to the patient's bedside.
- To save time, elective procedures were postponed (Gage, 2007). The number of staffed beds is expected to decline due to the additional demands on staff.
- After a Seattle hospital botnet attack, the aftermath lasted for weeks. As computers stopped working, extra workers were brought in to help carry out tasks by hand. Lab results, for instance, were run from the lab to the hospital floor to the patient's bedside. To save time, elective procedures were postponed (Gage, 2007).
- The number of staffed beds is expected to decline due to the additional demands on staff.
- After a Seattle hospital botnet attack, the aftermath lasted for weeks. As computers stopped working, extra workers were brought in to help carry out tasks by hand. Lab results, for instance, were run from the lab to the hospital floor to the patient's bedside. To save time, elective procedures were postponed (Gage, 2007).
- The number of pharmacists needed is expected to increase due to the additional demands on staff.

- Additional mental health providers are expected (additional 10%) to be required due to the mental health impact of the attack.
- After a Seattle hospital botnet attack, the aftermath lasted for weeks (Gage, 2007). It is assumed that the attack occurs at the region's largest hospital.
- Communication with the public will be necessary regarding the status of the hospital & the attack, security, privacy, etc. (Additional 75 hrs. needed)

8. **Drought:** The proxy scenario used to predict the impacts of drought occurred in 1963 and was the worst drought event on record in Pennsylvania. Precipitation statewide averaged below normal for 10 of 12 months. Drought emergency status led to widespread water use restrictions, and reservoirs dipped to record low levels. Corn, hay, and other agricultural products shriveled in parched fields, causing economic losses. Governor William Scranton sought drought aid for Pennsylvania in the face of mounting agricultural losses, and the event became a presidentially-declared disaster in September, 1963 (Baker, 2010).

    - Higher water temperatures usually accompanying drought and resultant low flow conditions can affect the susceptibility and spread of disease (bacterial, fungal, parasitic) in fish and shellfish (Centers for Disease Control and Prevention et al., 2010).
    - Other drought-related factors affect air quality, including the presence of airborne toxins originating from freshwater blooms of cyanobacteria. These aerosolized toxins have been associated with lung irritation, which can lead to adverse health effects in certain populations.
    - The dry, dusty conditions associated with drought also can lead to infectious disease, such as coccidioidomycosis (valley fever).
    - People who engage in water-related recreational activities during drought may be at increased risk for waterborne disease caused by bacteria, protozoa, and other contaminants (e.g., chemicals and heavy metals) (Centers for Disease Control and Prevention et al., 2010).
    - There is an expected increase in primary care office visits per day of 1%.
    - The population displays distress with <25% psychopathology.
    - The financial implications of drought have an adverse effect on persons who rely on rainfall and water for their economic survival, including farmers and other agriculture-related professionals, ranchers, landscapers, horticulturalists, nursery and garden supply owners and employees, and recreational facility operators. Financial-related stress and worry can cause depression, anxiety, and a host of other mental and behavioral health conditions and disorders.
    - During the 1980s, male farmers and ranchers in the states of Wisconsin, Minnesota, North Dakota, South Dakota, and Montana demonstrated rates of suicide that were twice the national rate. It is believed that drought was a major contributor to this outcome (Centers for Disease Control and Prevention et al., 2010).
    - The demand for mental health services is expected to increase due to the adverse psychological consequences of drought by 1%.
    - Runoff from drought-related wildfires can carry extra sediment, ash, charcoal, and woody debris to surface waters, killing fish and other aquatic life by decreasing oxygen levels in the water. During the 1996 Buffalo Creek fire in Colorado, municipal water supplies were forced to shut off, one of Denver’s water treatment plants closed, a water-supply reservoir required extensive cleaning, and a local beverage manufacturer was forced to haul in water for use during production activities (Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Agency, & American Water Works Association, 2010).
    - 5% of the population are projected to be affected by boil water orders.

- Lack of water, along with the changes in water temperature that often accompany drought, can compromise production capacity within power plants. Lower production capacity causes shortages in available electricity (Centers for Disease Control and Prevention et al., 2010).
- During the 1996 Buffalo Creek fire in Colorado, a water-supply reservoir required extensive cleaning (Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Agency, & American Water Works Association, 2010). Well-water would require testing.
- During the early stages of drought, public health professionals should inform the public about a wide range of drought-related issues, such as water conservation practices and the hazards posed by recreational water (Centers for Disease Control and Prevention et al., 2010). Public Health information must be released regarding the quantity and quality of potable water, food and nutrition, energy, air quality, recreation, mental and behavioral health, infectious diseases, and certain chronic diseases (respiratory conditions and immune disorders). An additional 12 hours of public health communications is expected.

9. **Earthquake:** The proxy scenario used to predict the impacts of an earthquake is a 7.6 magnitude earthquake in the New Madrid Seismic Zone (NMSZ) comprised of eight states: Alabama, Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee. The State of Missouri will incur substantial damage and loss. Well over 80,000 buildings are damaged leaving more than 120,000 people displaced and causing over 15,000 casualties. Total direct economic losses in Missouri reach nearly $40 billion**.**

    - A 1991 Missouri State Emergency Management Agency (SEMA) and FEMA report estimates the following damages from a 7.6 magnitude New Madrid Seismic Zone (NMSZ) earthquake to the Missouri Bootheel counties:
        - Mississippi, New Madrid and Pemiscot would see 0.2-2% of their population killed, 1-10% of their population seriously injured, 10% of their buildings collapsed, and 30% of their buildings receiving severe structural damage.
        - For Scott, Stoddard, and Dunklin counties, the percentage estimates are 0.1-1% killed, 0.5-5% seriously injured, 5% of structures collapsed, and 20% with severe structural damage.
        - For Butler, Bollinger, Cape Girardeau, Perry, St. Louis (County and City), Lincoln, Pike, Marion, and Lewis Counties, the estimates are 0.02- 0.2% killed, 0.1-1% seriously injured, 1% building collapses, and 10% with severe structural damage.
    - Serious impacts are to be projected by likely impacted counties for mortality, EMS transports, ED visits, trauma injuries, primary care office visits, mental health impacts, as well as hazard related losses for PCPCs, ED and hospital beds, pharmacists, mental health service providers, hospital personnel, electricity, IT/Communications, etc.
    - Counties that have potentially patient receiving hospitals should quantify patient surge activities and determine values for entry into data fields.
    - Health alerts regarding water safety would be released. It is estimated that one full-time employee is necessary to generate this information, up to 40 hours per week.

10. **Flood:** The proxy scenarios used to predict the impacts of flooding is the Dec. 26-29, 2015 flooding incident. A total of 15 fatalities resulted from drowning swept away in cars and electrocution; seven of the 15 deaths occurred in Pulaski County.

- EMS transports and ED visits are expected to increase.
- Mental health impacts may result in an occasional or minor loss of nonessential social functions in a circumscribed geographical area.
- Hospitals may expect staff shortages due to transportation route closures during the incident, possibly up to 50% of the employees.
- While there may be some staff shortages, hospitals will likely compensate and not experience loss in bed availability. There may be some increased demand due to the inability to discharge patients during the storm, but this is likely counterbalanced by non-emergent patients being discharged in preparation for the storm.
- 50% demand is expected due to the need for environmental assessment, public information, and surveillance.
- Some people will be displaced from homes due to flooding and will require shelters.
- Alerts regarding water safety and mold removal will be needed. It is estimated that one full-time employee is necessary to generate this information, possibly up to 40 hours.

11. **Hazard Materials Release:** The proxy scenario used to predict the impacts of a hazardous materials release is the train derailment and subsequent chlorine spill in Graniteville, South Carolina, on January 6, 2005. After a worker forgot to toggle the switch that disconnects the spur from the main line, Freight Train 192 was mistakenly diverted from the main line onto the spur at 47 miles per hour, and collided with a parked train at 2:39 a.m. Three engines and 18 cars were derailed. Roughly 60 tons of liquefied chlorine gas spilled out of the ninth freight car. The liquefied gas rapidly vaporized, with volumetric expansion ratio of 450:1 (Dunning & Oswalt, 2007). The leaking tank car was patched with a temporary repair four days later (CDC, 2005). The economic impact for the small community of Graniteville was over $1 billion, and according to Detter-Hoskin: "Had this occurred in Atlanta or another large city, you will have had hundreds of thousands of people hurt and killed within a 10-minute period. The financial impact will be immense, as well. Metal equipment and electrical wiring will be destroyed, and computer data will be lost" (GRTI, 2007).

    - 511 were examined in EDs (CDC, 2005); it is assumed that half were transported by EMS.
    - 18 were treated at area physician offices (CDC, 2005).
    - 44 out of 94 community respondents to a questionnaire screened positive for PTSD (Duncan et al., 2011). In addition to PTSD, behavioral changes, anxiety, depression, and other behavioral health consequences are likely to occur. Population displays distress with ≥50% psychopathology.
    - 69 were hospitalized in seven area hospitals (CDC, 2005).
    - Demand for Mental Health Services = (Population of largest city or population center) × 40 / 250.
        - In general, 40 providers are needed per 250 disaster victims (Landesman, 2005).
        - It is assumed that the hazardous materials release will occur in the most densely populated city or geographic area.
    - Affected train tracks and adjacent roads were heavily damaged. The South Carolina Department of Transportation had to remove and completely reconstruct the nearby roads (Dunning & Oswalt, 2007). Major routes within the chlorine plume were closed temporarily.
    - Area schools and businesses remained closed for about 14 days (CDC, 2005). Shelters were set up for residents within a one-mile radius (CDC, 2005). The shelters were closed on Day 5; those who could not return to their homes found other accommodations.
    - Residents within a one-mile radius were evacuated for several weeks (CDC, 2005).
        - Equation for probable population affected by evacuation:

3.14159 × population density of the most densely populated city or geographic area in county, for more than 14 days

- Homes within a 500-yard radius were monitored and evaluated (EPA, 2005).
- 70 additional public health personnel were brought in to maintain 24-hour surveillance for 17 days (Cladwell, 2005).
- All persons with symptoms were assessed via interview and monitored for long-term complications (CDC, 2005).
- An additional 100 environmental samples to be processed/analyzed due to contamination for up to two weeks.
- It is estimated that one full-time employee will be required to disseminate information regarding signs and symptoms, protection, treatment, evacuation, shelter facilities, and mental health services for up to 40 hours per week.

12. Localized Infectious Disease: The proxy scenario used to predict the impacts of a localized infectious disease outbreak is the 2022 Measles Outbreak in Central Ohio.

- The outbreak included a total of 85 cases resulting in 36 hospitalizations, and no deaths.
- 42% of cases were hospitalized in a population of 906,528. 94% of cases were five years of age or younger.
- The vaccination status for cases was 94% unvaccinated, 4.7% partially vaccinated, and one with unknown vaccination status.
- The outbreak included one or more childcare facilities.
- The investigation into the outbreak likely resulted in the evaluation of hundreds of contacts; suspected cases; tests, doses of vaccine and immunoglobulin were administered to resolve symptoms.
- Of the 36 cases that were hospitalized, half were transported to the hospital by ambulance. The highest number transported per day at the peak was 12 (this is an estimate, not actual).
- All 85 cases, plus many additional patients suspected of having measles, presented to primary care offices for evaluation. The exact number is not known. The burden can be expected greatest in the pediatric offices. For measles, every singular case has the potential to infect 12 -18 persons
    - Equation: **85 total cases x 12 potential persons infected**
- Patients hospitalized with measles require implementation of airborne and standard precautions. Airborne precautions include isolation in a negative air pressure isolation room, also known as airborne infection isolation (AII) or airborne infection isolation room (AIIR). In clinic settings where a negative air pressure isolation room may not be available, a single room with the door closed and away from susceptible contacts may be used when evaluating persons in whom measles is suspected.
- Healthcare workers without presumptive evidence of immunity should be offered the first dose of MMR vaccine and excluded from work from day five after the first exposure to day 21 following their last exposure. Therefore, exposed workers without evidence of immunity to measles would be excluded from work for up to 16 days. Healthcare workers with active measles will be excluded for four days after the rash appears. Therefore, workers could be excluded for more than 10 days depending on illness.
    - For purpose of determining hazard-related losses, 3% of the vaccinated population does not have immunity.
- A 3% increase in laboratory specimens were processed daily for up to two weeks.

- The MMR vaccine, if administered within 72 hours of initial measles exposure, and immunoglobulin (IG), if administered within six days of exposure, may provide some protection or modify the clinical course of disease among susceptible persons. The prompt identification, evaluation of exposures, evaluation of evidence of immunity, and subsequent post exposure with MMR and IG persons without evidence of immunity is warranted. (Based on 85 of cases, all will receive treatment).
- Public information would be distributed regarding signs/symptoms, treatment and vaccination. It is predicted that one full-time employee would be necessary for communication for a maximum of 40 hours.

13. **Nuclear Facility Incident:** The proxy scenario used to predict the impacts of a nuclear facility accident is the Fukushima Daiichi nuclear disaster of 2011.

- During the Fukushima Daiichi disaster, there was no mortality.
- An increase in EMS transports is expected due to panic and evacuation, including heart attacks, anxiety, trip and fall accidents, etc.
- It is assumed that 10% of the region's population will seek emergency care/assessment.
- PCP visits are expected to increase due to a surge of patients seeking assessment and advice regarding the appropriate use of KI and other protective measures. In Fukushima, all children will have thyroid checks every two years until age 20 (Tedder, 2011).
- Mental Health Impact: the population displays distress with ≥50% psychopathology.
- All PCPs within a 10-mile radius of the nuclear reactor would be evacuated.
- All EDs within 10-mile radius of nuclear reactor would be closed/evacuated.
- All hospitals within a 10-mile radius of the nuclear reactor would be closed/evacuated.
- All pharmacies within a 10-mile radius of the nuclear reactor would be closed/evacuated. Some increased demand for pharmacists is expected due to the surge of patients wanting to fill prescriptions before or after evacuation.
- All mental health providers within a 10-mile radius of the nuclear reactor will be evacuated. In general, 40 providers are needed per 250 disaster victims (Landesman, 2005).
  - Demand = (Population within 10-mile radius of a nuclear reactor) × 40 / 250.
- All nurses within a 10-mile radius of the nuclear reactor will be evacuated.
- Other power plants on the same grid may not be able to compensate for the loss of the nuclear reactor's generating capacity. The area will most likely experience rolling brown-outs.
- Employees of the facility who are injured may require decontamination, though they are likely to receive decontamination on site.
- After Fukushima, water as far as Tokyo (238 KM or 147 miles) was unsafe for infants (McCurry, 2011).
- Roads within a 10-mile evacuation zone will be closed, including any possible major transportation arteries.
- Businesses that fall within the 10-mile exclusion zone around a nuclear reactor will be closed/evacuated.
- Agricultural products within a 50-mile radius will have to be assessed and monitored.
- An increased demand for public health staff is expected in order to dispense KI, assess radiation exposure, staff shelters for evacuees, distribute public information, conduct environmental assessments, and monitor health impacts.
- In Fukushima, 160,000 people in the general population were screened in March, 2011 for radiation exposure (Nuclear and Industrial Safety Agency, 2011). 100,000 were evacuated. The

ratio of screenings per evacuees is used to determine the number of screenings predicted given the number of people in the county who live within a 10-mile radius of a nuclear reactor.

- People within 10 miles of the reactor will be evacuated to shelters and require monitoring for signs of contamination.
- Medical Countermeasures: Percent = Percent of county under age 40, if part of the county falls within a 50-mile radius of a nuclear reactor. All children and adults under 40 should receive KI.
- Laboratory Services: Bioassays would be needed to examine victims for signs of radioactive contamination, and air, soil, water, milk, and agricultural products would be regularly tested for radiological contaminants for years.
- Public information would be distributed regarding mental health services, signs and symptoms of radiation exposure, food and water contamination, appropriate use of KI, evacuation, shelters, etc. It is predicted that four full-time employees would be necessary for communication. The need would exist for greater than 2 weeks, or approximately 150 hours, of additional public information staff capacity would be needed.

14. **Pandemic:** The proxy scenario used to predict the impacts of a pandemic is the National Planning Scenario: "Biological Disease Outbreak - Pandemic Influenza." The scenario entails a 1918-like Category 5 influenza pandemic. Additional predictions for a similar scenario from the department of Health and Human Services and other government agencies are used where necessary.

- The scenario predicts 121 deaths per 100,000 during the peak week, or about 0.017% of the population per day (Department of Homeland Security, 2006).
- HHS estimates that 15% of the population will seek outpatient care over eight weeks, or 0.268% per day (Department of Homeland Security, 2006).
- Mental Health Impact: According to the NPS, "Family members are distraught and outraged when loved ones die within a matter of a few days. Public anxiety heightens mistrust of government, diminishing compliance with public health advisories." The population displays distress with 25% - 49% psychopathology.
- OSHA predicts 40% workplace absenteeism during the peak week of a pandemic (OSHA, 2007). Additionally, medical equipment supply may be disrupted due to illness in truck drivers (Department of Homeland Security, 2006).
- The scenario predicts 0.57% of the population to be hospitalized during the peak week (Department of Homeland Security, 2006).
- The scenario predicts that 30% of the population will be ill over eight weeks (Department of Homeland Security, 2006).
    - It is assumed that one pharmacist can fill 480 drug orders per day (3 minutes each); therefore, (population x 30%) / 480 = pharmacists needed.
- Mental Health Impacts: With 40% possible absenteeism and during the SARS incident in Toronto, 16% of the population experienced traumatic stress (Ursano et al., 2006). It is assumed that a pandemic will cause a similar number rate of traumatic stress.
    - In general, 40 providers are needed per 250 disaster victims (Landesman, 2005), so (16% of the population) / 250 × 40 additional providers are required.
- Absenteeism can affect drinking water and wastewater system operators and their capability to operate and maintain their systems adequately, thereby increasing the risks to public health. Absenteeism would also affect workers from other essential and interdependent sectors such as the transportation, power, and chemical sectors. It can have an adverse impact on services such as delivery of chemicals and other essential materials and supplies." (EPA, 2009).

- Medical equipment supply may be disrupted due to illness in truck drivers (Department of Homeland Security, 2006).
- The HHS Pandemic Influenza Plan includes plans to curtain interstate modes of transportation and close mass transit systems (HHS, 2005).
- Business Continuity: "In communities, during the peak weeks of influenza outbreaks of six to eight weeks in length, about a quarter of workers are absent because of illness, the need to care for ill relatives, and fear of becoming infected in public or workplace settings... Supplies of food, fuel, and medical supplies are disrupted as truck drivers become ill or stay home from work. In some areas, grocery store shelves are empty, and social unrest occurs" (Department of Homeland Security, 2006).
- Environmental Contamination: "Evacuations will have no meaningful effect on the spread of disease and may be counter-productive by spreading infection to as yet unaffected areas and by overburdening services in a site that soon is likely to experience an outbreak of disease. Isolating ill persons at home, if hospital care is not needed, can decrease the transmission of infection but requires that health care and other services can be delivered, as needed. Quarantine of exposed persons is not likely to affect the spread of influenza because of the short incubation" (Department of Homeland Security, 2006)
- OSHA predicts 40% workplace absenteeism during the peak week of a pandemic (OSHA, 2007). The demand for public health personnel is expected to increase due to the need to track and monitor illness, distribute public information, and dispense vaccinations and medication.
- Surveillance: During H1N1, a laboratory in New York City reported a 7.5× increase in laboratory specimens (Crawford et al., 2010).
- Medical Countermeasures: Immunization and/or antivirals will be distributed to 100% of the population.
- Public information would be distributed regarding signs and symptoms of illness, precautions against exposure, vaccinations, medication, mental health services, etc. It is predicted that two full-time employees would be necessary for communication up to an additional 75 hours.

15. **Radiation Dispersal Device (RDD),** also known as a “Dirty Bomb”, consists of radioactive materials combined with conventional explosives: The proxy scenario used to predict the impacts of a radiation dispersal device detonation is based on the National Planning Scenario: "Radiological Attack - Radiological Dispersal Device". In the scenario, a 3,000-lb truck bomb containing 2,300 Curies of cesium-137 is detonated in a moderate-to-large city. The contaminated region covers approximately 36 blocks and includes the business district, residential row houses, crowded shopping areas, and a high school (Department of Homeland Security, 2006). Where possible, additional predictions are drawn from the EPA exercise, "Liberty RadEx" (EPA, 2010). In order to modify the scenario to be appropriate for this region, blast casualty estimates are extrapolated from the 4,800-pound truck bomb.

- Fatalities would result from the initial blast. After the Oklahoma City bombing, the fatality rate inside the Murrah Building was 46% (North et al., 1999).
- After the Oklahoma City bombing, within the first hour of the explosion, 139 patients (38% of the building's occupancy) were transported to area hospitals (Maningas, Robison, & Mallonee, 1997). Most victims arrived at local emergency departments by private vehicle; only the most severely injured were transported by ambulance (Teague, 2004).
- The National Planning Scenario predicts 50,000 worried well will visit EDs (Department of Homeland Security, 2006).

- After the Oklahoma City bombing, 233 persons were treated in physicians' offices or clinics (64% of the building's occupancy) (McLain, 2001).
- After an RDD detonation, many additional PCP visits are expected due to radiation exposure or psychosomatic symptoms. After the radiation exposure in Goiânia, 8% of the population presented to PCPs with psychosomatic symptoms (Hall, Hall, & Chapman, 2006).
- After the Oklahoma City bombing, 83 people (23% of the building's occupants) had serious injuries requiring operative care (Rivara, Nathens, Jurkovich, & Maier, 2006).
- 34% of survivors had PTSD within four to eight months after Oklahoma City Bombing (North et al., 1999), but additional symptoms are expected due to the radiologic nature of an RDD. After the Goiânia accident, 35.8% of the population experienced psychopathology (Hall et al., 2006).
- Because the radiation exposure from a Radiation Dispersal Device would occur in the context of a terrorist attack, it is expected that the rate of psychopathology would be even higher. Population displays distress with ≥50% psychopathology.
- Research suggests that 26% of providers will be unable or unwilling to report to work after a radiation dispersal device (Redlener, Garrett, Levine, & Mener).
- After the Oklahoma City bombing, 90 patients (25% of the building's occupants) were admitted to hospitals (Maningas, Robison, & Mallonee, 1997). The last patient was discharged from the hospital five months after the bombing (McLain, 2001).
- After the Goiânia accident, 35.8% of the population experienced psychopathology (Hall et al., 2006). In general, 40 providers are needed per 250 disaster victims (Landesman, 2005). (35.8% of population) / 250 × 40 additional providers are necessary.
- Even if individuals with blast injuries (38%) are decontaminated before transport, the presence of radioactive shrapnel in wounds may require additional decontamination at hospitals.
- In Liberty Rad Ex, the declared relocation area for downwind/potentially contaminated regions is 10.29 square miles (EPA, 2010). The population of this region is calculated based on the residential population density of the surrounding area.
- A three-mile radius will require assessment/decontamination (Department of Homeland Security, 2006; EPA, 2010).
- The demand for public health personnel is expected to increase 100% (double) due to the need to assess radiation exposure, staff shelters for evacuees, distribute public information, conduct environmental assessments, and monitor health impacts.
- People in a region a half to one-mile long potentially have detectable surface contamination (Department of Homeland Security, 2006) and must be followed and monitored. The population of this region is calculated for a county based on the daytime population density of the surrounding region.
- Neighboring jurisdictions will likely not permit evacuees to enter due to fear of contamination, so all evacuees will have to be sheltered initially (Department of Homeland Security, 2006).
- Laboratories will have to conduct bioassays to determine internal contamination as well as assessments of environmental contamination.
- Public information would be distributed regarding mental health services, signs and symptoms of radiation exposure, evacuation, shelters, protection, etc. It is predicted that two full-time employees would be necessary for communication up to 75 hours.

16. **Temperature Extremes:** The proxy scenario used to predict the impacts of extreme temperatures is the 1995 Chicago Heat Wave. During this five-day heat wave, the heat index reached a high of 119°F at Chicago O'Hare International Airport, and 125°F at Midway International Airport (NOAA, 2010).

- A total of 1,177 deaths occurred in Chicago. This is an 85% increase over the same period in 1994 (637 deaths) (CDC, 1995).
- Chicago experienced a 67% increase in 911 calls (Kaplan, 1995).
- Chicago experienced 3,300 excess ED visits (Kaplan, 1995). Based on Chicago's 2.7 million population, this is 0.122% of the population.
- During and after the heat wave, hospital admissions in Chicago increased 3.4% for one month.
- Some communities lost water pressure due to open fire hydrants around the city (Klinenberg, 2002).
- 40,000 people lost power overnight due to strain on the power grid (Changnon, 1996). Based on Chicago's 2.7 million people, this represents 1.5% of the population.
- Commuter and freight delays were experienced due to buckling roads and warped railroad tracks from the heat (Changnon, 1996).
- Some increased (up to 50%) surveillance is expected for diarrheal illness associated with spoiled food, due to power outages. Public Health officials will also monitoring heat-related illness.
- It is expected that information will be disseminated about heat exhaustion/stroke, keeping cool, drinking water, using cooling centers, etc. An additional 12 staff hours will be necessary to generate and disseminate this information.

17. **Tornado:** The proxy scenario used to predict the impacts of a tornado is the May 22, 2011 EF5 tornado that struck Joplin, Missouri. The tornado left a track of destruction that was 22 miles long and one mile wide, tracking eastward through Joplin and continuing across Interstate 44 into rural portions of Jasper and Newton counties. The tornado damaged nearly 8,000 buildings, destroying nearly 4,000. More than 160 lives were lost and 1,150 were injured. It was the seventh deadliest tornado in the history of the United States.

- There were 160 fatalities from the tornado.
- Freeman Health and the Alternate Care Site (ACS) reported 1,000 patients the day of the tornado (500 patients within a 6 hour period), performing 22 surgeries.
- 800 children were in need of therapy (Morris, 2011), 40 adults treated for severe depression, and 3 suicides took place (MU, 2011). Joplin is a city of 50,000. Population displays distress with <25% psychopathology.
- It was estimated that 90% of businesses sustained damage or lost power, so it is estimated that 90% of doctor's offices were closed.
- Due to power outage, residents reliant on well water will lose the ability to pump water until power is restored.
- Some sewage treatment centers use electricity to move sewage through system; will become backed up after extended power outage.
- Downed trees and power lines closed roads for days/weeks.
- Debris and damaged homes/buildings had to be assessed for asbestos and other contaminants.
- Additional personnel are expected to be required to conduct environmental health assessment and surveillance, provide public information, provide immunizations, staff shelters with medical needs, etc.
- Surveillance will be required to monitor casualty counts, hospitalizations, mental health sequelae, skin and soft tissue infections, fractures, etc.
- After the tornado, approximately 9,200 people were displaced. 1,308 pets were left homeless; 529 were later reunited with owners (Joplin Globe, May 2021).

- The demand for laboratory services is expected to increase up to 50% due to testing of clinical specimens and environmental specimens.
- The demand for public health staff is expected to increase up to 50%.
- Public information will be disseminated related to fungal and bacterial infections, shelters, safety, food and water safety related to the power outage, the need for immunizations and medical treatment for infections, etc. It is estimated that a minimum of three full-time employees will be necessary to generate and disseminate this information (up to 112.50 hours each).

18. **Utility Interruption:** The proxy scenario used to predict the impacts of a widespread utility interruption is the Northeast Blackout of 2003, which began on Thursday, August 14, 2003, at 4:15 p.m. A cascading electrical power failure occurred throughout parts of the Northeastern and Midwestern United States and Ontario, Canada, resulting in the second most widespread power failure in history (Beatty, 2006).

- During the Blackout, two deaths in New York City were linked to the use of flame for candlelight (Prezant et al., 2005).
- Calls to 911 in New York City increased 9% (Prezant et al., 2005).
- One ED in NYC reported a 4× increase in volume (Pérez-Peña, 2003), and another reported only a 6% increase (Prezant et al., 2005). A 2× increase is assumed.
- New York Presbyterian in New York City did not experience an increase in volume (Eachempati, Mick, & Barie, 2004).
- Many residents feared the blackout was the result of a terrorist attack and experienced panic. Vulnerable populations, people stuck in elevators and on subway trains, etc., would be disproportionately impacted. The population displays distress with <25% psychopathology.
- Many private offices do not have backup generators. It is assumed that all PCP offices will be closed.
- Four hospitals in New York City experienced backup generator failure for approximately two hours (Beatty et al., 2006). It is assumed that backup generator failures occur at two region hospitals, including the region's largest hospital.
- Many private offices do not have backup generators. It is assumed that half of mental health provider offices will be closed.
- Most data/communication networks are supplied with backup generator power. During the blackout, four hospitals in New York City experienced backup generator failure for approximately two hours (Beatty et al., 2006). It is assumed that backup generator failures occur at two region hospitals, including the region's largest hospital.
- Due to power outages, residents reliant on well water will lose the ability to pump water until power is restored.
- Amtrak and other regional rail lines will be closed.
- After the blackout, backup generators at two sewage treatment plants failed and emptied 500 million gallons of untreated waste into the surrounding waterways (Beatty et al., 2006).
- Interruption is estimated due to personnel being unable to report to work due to school closings, public transportation closure, etc. During the blackout, no additional personnel were needed in New York City, but 12-hour shifts were established (Beatty et al., 2006), representing a 1.5× increase. Restaurants will have to be inspected, and loss of electronic surveillance will result in additional work for personnel.

- Syndromic surveillance was used in New York City to monitor for a terrorist attack. Heat stroke and carbon monoxide poisoning were monitored. Syndromic surveillance detected diarrheal illness due to spoiled food. Electronic reporting was inoperable, so staff were discharged to hospitals to manually collect data (Beatty et al., 2006).
- Cooling centers with backup generators were opened for the elderly, mentally impaired, and other vulnerable populations (Beatty et al., 2006). It is assumed that 0.1% of the population will use these shelters.
- Demand increased due to 50 sets of beach water specimens testing positive for fecal coliform after sewage was released (Beatty et al., 2006).
- Public health officials developed health alerts for newspapers and radio to inform the public of contamination of recreational waterways, and to alert the public to discard spoiled food (Beatty et al., 2006). It is estimated that one full-time employee is necessary to generate this information up to 40 hours.

19. **Wildfire**: Not as applicable as in other locations. LPHAs can add data specific to their jurisdictions as they see fit by using one of the additional hazards options on the tool.

20. **Winter Storm:** The proxy scenarios used to predict the impacts of a winter storm are the North American Blizzards of February, 2010. From February 4-6, 2010, the storm dubbed “Snowmageddon” caused government offices, schools, and airports to close across a significant portion of the U.S. Some locations in Maryland, Pennsylvania, Virginia, and West Virginia recorded more than 30 inches of snow. Washington, D.C., received 17.8 inches in two days. Philadelphia received 28.5 inches (NOAA, 2010). Another blizzard followed closely behind the first, from February 9-11, 2010. The second storm produced 14 inches in D.C., 24 inches in Northern Maryland, 17 inches in New Jersey, and more than 27 inches in Pennsylvania. Several locations broke century-old seasonal snowfall records (NOAA, 2010).

- There were 8 storm-related deaths in New Castle County, DE, which is about 0.002% of the population (Kane, 2010).
- Hospitals typically experience a 60% decline in visits during winter storms (CDC, 1982); it is extrapolated that PCPs will experience a similar decline.
- Trauma incidents will increase due to transportation accidents, injuries from snow removal equipment, falling objects, etc.
- Mental Health Impact: Minimal change in population behavior and negligible effects on social functioning.
- 60% of PCP offices are expected to close.
- It is assumed that EDs will experience a 5% interruption due to reduced staff.
- It is assumed that hospitals will experience a 5% interruption due to reduced staff. Hospitals typically experience a 60% decline in visits during winter storms (CDC, 1982).
- Some increased demand is expected pre-incident as patients prepare for the storm.
- It is assumed that 60% of mental health providers will be closed, and that there will be a 60% reduction in demand due to many non-critical patients canceling appointments.
- It is assumed that hospitals will experience a 5% interruption of personnel due to weather conditions.
- During the February 2010 blizzards, no hospitals lost electricity.
- Supply chains may be disrupted for up to three days due to weather conditions and road closures.

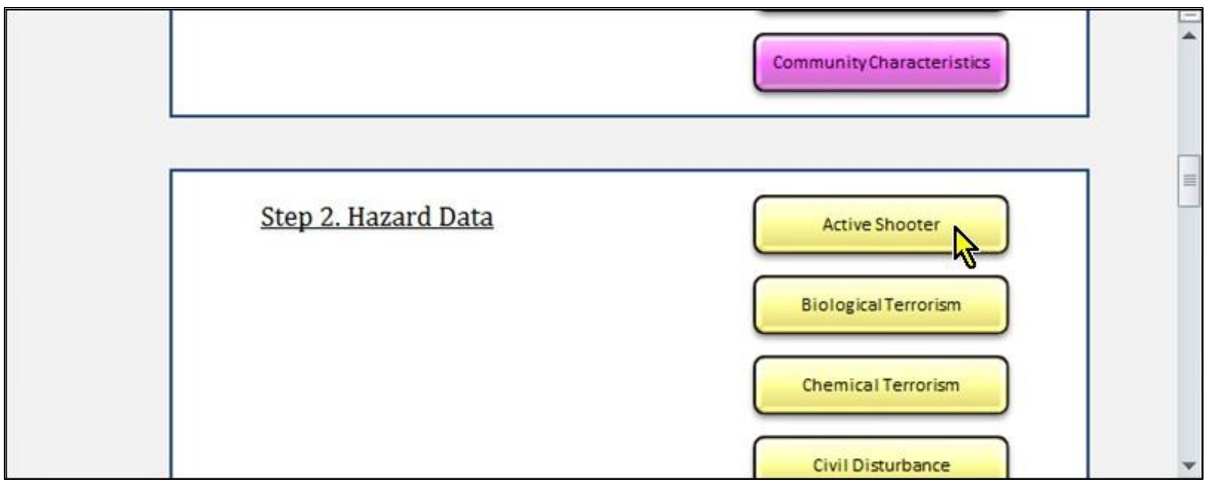
- Due to power outage, some residents reliant on well water will lose the ability to pump water until power is restored.
- There were 106,000 power outages in the five-county Southeast Pennsylvania region, which took up to five days to restore (Electric Light & Power, 2010). Out of 1,657,226 total households in the five counties, 106,000 is 6.4%.
- Most trains and buses were stopped Friday evening and closed most of Saturday (McFadden, 2010).
- Staff shortages are predicted due to road closures and school closings.
- No additional surveillance is expected (CDC, 1982).
- Health officials will likely release bulletins regarding carbon monoxide poisoning, food spoilage, hypothermia, and related risks. It is assumed that half of one full-time employee's time will be necessary to generate and disseminate this information up to 18.75 hours.

Completing Hazard Worksheets

1. Open a Hazard Worksheet

Open a hazard worksheet by clicking on the name of the hazard in the box labeled "Step 2. Hazard Data" in the Main Menu, as shown in Figure 8.

Figure 8. Opening a Hazard Worksheet



2. Hazard Scenarios Data

When assessing the severity of a hazard, consider the worst-case scenario that is reasonable to assume could occur in your jurisdiction. Planners may be able to rely on their own records and experiences to assess the impact of hazards that occur frequently in their jurisdiction. For example, a jurisdiction that experiences frequent and severe winter storms may be able to use data from the most severe storm on record to assess the impact of the worst-case reasonable scenario of a winter storm.

For other hazards, such as a nuclear facility accident, the worst-case scenario likely has not occurred in the jurisdiction, and therefore planners should examine predictive models or data from similar events in other regions to extrapolate what the impact would be on their own jurisdiction.

Enter a brief description of the worst-case reasonable scenario in the space provided, as illustrated in Figure 9. All of the data entered on the worksheet should refer to this worst-case scenario.

Figure 9. Worst-Case Scenario Description Example

Public Health Risk Assessment Tool

Main Menu

Active Shooter

An active shooter is an individual actively engaged in killing or attempting to kill people in a confined and other populated area. In most cases, active shooters use firearms and there is no pattern or method to their selection of victims. Active shooter situations are unpredictable and evolve quickly (FEMA, 2011). The shooter in an active shooter scenario may be a sniper. A sniper is a concealed, usually skilled shooter who fires at exposed persons, typically using powerful high-energy, military-style assault rifles. Assault rifles are becoming more available to the public (Ciottone, 2006).

The following hazard impacts have been estimated using historical data, predictive models, estimations where necessary, and the information entered in the "Baseline Data" worksheets. The information below can be altered as needed to more accurately reflect hazard impacts in your jurisdiction. The impacts should reflect the worst-case reasonable scenario.

Briefly describe the worst-case reasonable scenario of this hazard (the scenario to which the following impacts apply) here:

The proxy scenario used to predict the impacts of an active shooter incident is the Virginia Tech Massacre of 2007. On April 16, 2007, student Seung Hui Cho murdered 32 and injured 17 students and faculty in two related incidents on the campus of Virginia Polytechnic Institute.

Probability

Probability: The hazard is likely to occur at least once in the system lifecycle (100 years).

Probability Score: 2
Occasional

Human Impact

Mortality

Baseline Mortality per Day: 3

Hazard-Related Increase in Mortality per Day: 33

Magnitude Score: 4

0: No change from baseline
1: ≤ 5% increase
2: ≤ 50% increase
3: ≤ 100% increase
4: >100% increase

3. Probability

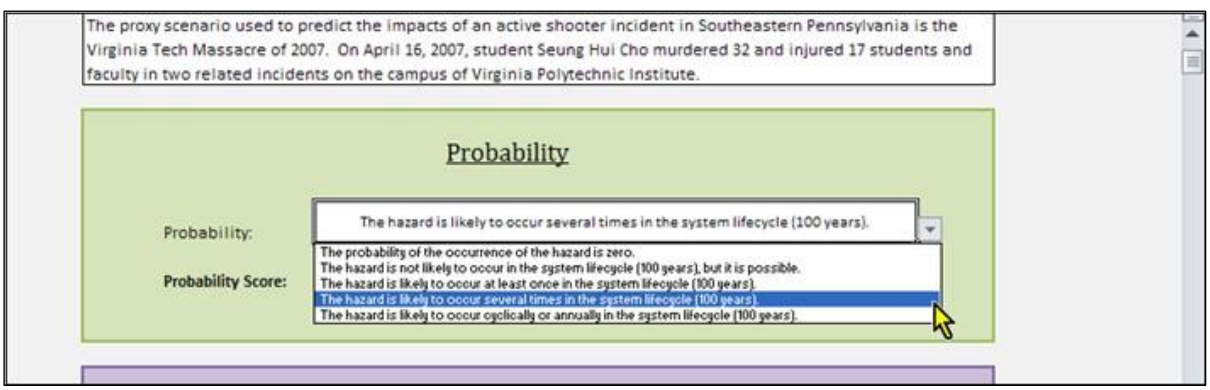
The first component of the Risk Score in The MOPHRAT is an assessment of the probability that a given hazard will occur. The MOPHRAT defines the probability of an incident as the likelihood that a hazard or threat will affect the jurisdiction within a system lifecycle of 100 years. 100 years was selected as the system lifecycle because many pandemics and serious public health threats would be excluded from an analysis that used a shorter lifecycle. The probability of a hazard occurrence can be determined by examining the frequency of historic occurrences or, as in the case of incidents that have not occurred but that may possibly occur in the future, by relying on the best intelligence or predictive models to which planners have access.

Some jurisdictions may define probability differently depending on how they define the hazard. For example, in a jurisdiction with a lot of chemical plants, relatively small chemical releases with no off-site contamination may be frequent, but large releases that require a public health response may be rare. In these cases, *consider an incident of large enough magnitude that a public health response is required when assessing probability.*

To enter the probability for each hazard, scroll to the green box labeled "**Probability**" within the hazard worksheet. Select the appropriate category from the drop-down menu, as shown in Figure 10. After the probability is selected, a numerical Probability Score will be generated automatically. The **Probability Score** is assigned based on the following 0-4 scale:

0 = Improbable	The probability of the occurrence of the hazard is zero
1 = Remote	Not likely to occur in the system lifecycle (100 years), but it is possible
2 = Occasional	Likely to occur at least once in the system lifecycle
3 = Probable	Likely to occur several times in the system lifecycle.
4 = Frequent	Likely to occur cyclically or annually in the system lifecycle.

Figure 10. Hazard Worksheet: Entering Probability



Entering Severity Assessment Impact Data

The **Severity Score** is an assessment of the total impact that a hazard incident would have on the jurisdiction. It is the average of five separate **Impact Scores: Human Impact, Healthcare Service Impact, Inpatient Healthcare Facility Infrastructure Impact, Community Impact, and Public Health Service Impact**. Each of these scores is derived from an assessment of six to eight specific metrics that reflect a quantitative assessment of the impact of an event with respect to morbidity or mortality, healthcare or public health service delivery, or community or healthcare infrastructure. The metrics that make up each of the five Impact Scores are delineated in Table 2.

Table 2. Severity Metrics

Domain	Metric	Score Based On:
Human Impact	Mortality	Deaths/day
		Duration
	EMS Transports	Transports/day
		Duration
	ED Visits	ED visits/day
		Duration
	Outpatient Visits	Visits/day
		Duration
	Trauma Center Injuries	Trauma center injuries/day
		Duration
	Mental Health Impact	Percent of population developing psychopathology and behavioral changes after the incident, including PTST, depression, anxiety, alcohol and substance abuse, domestic violence, and loss of social functions
		Duration
Healthcare Service Impact	Outpatient Services	PCPs supply/demand
		Duration
	Emergency Department Services	ED bed supply/demand
		Duration
	Hospital Beds	Bed supply/demand
		Duration

	Ancillary Services	Pharmacist supply/demand
		Duration
	Trauma Units	Functioning OR supply/demand
		Duration
	Mental Health Services	Mental Health provider supply/demand
		Duration
Inpatient Healthcare Facility Infrastructure Impact	Hospital Personnel	Patient to nurse ratio
		Duration
	Facility Water Supply	Percent of Beds affected
		Hours without water in HC facilities
	Facility Electricity	Percent of Beds affected
		Hours without electricity in HC facilities
	Facility Generator Fuel Supply	Percent of Beds affected
		Hours of generator fuel required in HC facilities
	Hospital IT/Communication Systems	Percent of Beds affected
		Hours without access to EMRs/IT/communication systems
	Facility Critical Supplies	Percent of Beds affected
		Days without linen service
	Facility Evacuation	Percent of regional beds requiring evacuation
	Hospital Patient Decontamination	Number of pts requiring decontamination, as percent of regional ED capacity
Community Impact	Water Supply	Percent of population with water outage or mandatory boil water order
		Duration
	Sanitation/Sewage System	Percent with sanitation/sewage system disruption
		Duration
	Public Utilities	Percentage of population with no access to electricity
		Duration
	Transportation	Duration that at least ONE major transportation corridor is closed
	Business Continuity	Percent of businesses are closed
		Duration

	Population Displacement	Number of persons evacuated from or to the jurisdiction
	Environmental Contamination	Radius of area requiring environmental safety assessment, remediation, or decontamination
		Duration
Public Health Service Impact	Personnel	Public health employee supply/demand
		Duration
	Surveillance	Case reports requiring tracking, monitoring, investigation, or other public health action/day
		Duration
	Mass Care	Persons requiring mass care/sheltering/public health monitoring
		Duration
	Medical Countermeasures	Percentage of population that requires medication or prophylaxis
	Laboratory Services	Specimens processed/day
		Duration
	Health Communication	Personnel hours per week needed to generate health communications to external partners or general public
		Duration
	Fatality Management	Morgue capacity supply/demand
		Duration

In the two sub-analyses conducted within the tool, only some of the severity domains are used to calculate the **Severity Score**. The Public Health System Severity Score is calculated as the average of the Human Impact, Healthcare Service Impact, Community Impact, and Public Health Service Impact. Alternatively, the Healthcare System Severity Score is calculated as the average of the Human Impact, Healthcare Service Impact, and Inpatient Healthcare Facility Infrastructure Impact Scores.

The severity assessment portion of The MOPHRAT can be completed either quantitatively or qualitatively.

1. Quantitative Severity Assessment Completion

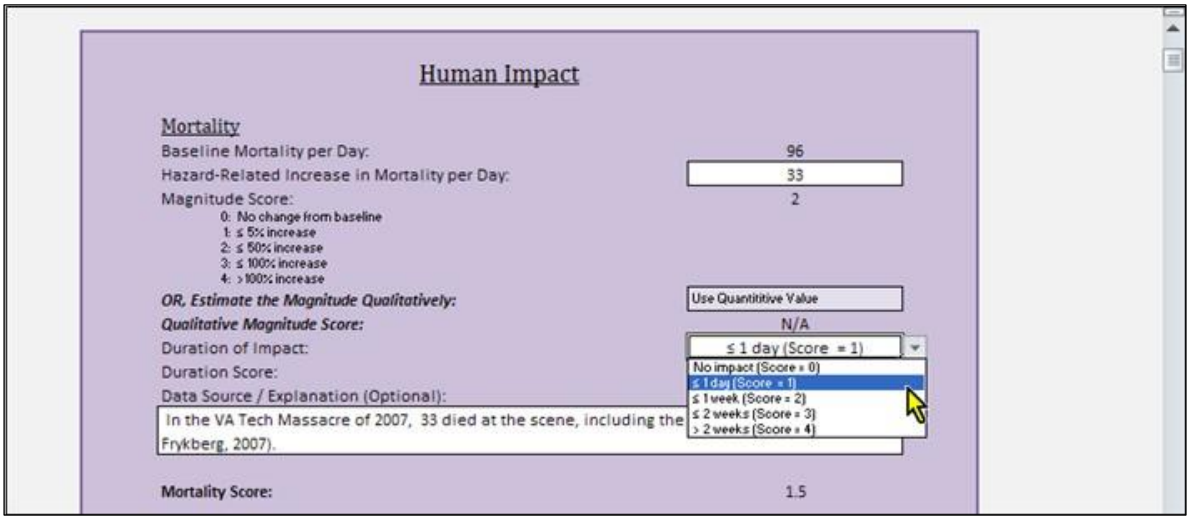
If planners choose to conduct a **quantitative** assessment of severity, hazard-specific data relevant to each of the impact metrics should be entered into the worksheet. The majority of the metrics are scored based on a comparison of baseline or pre-event levels with hazard-related indices.

For the quantitative assessment to work, baseline data must have been entered into the “Baseline Health, Services, and Infrastructure” worksheet.

To enter the hazard-specific severity data for each hazard, scroll to the purple boxes within the hazard worksheet. Data can be entered in the white space provided.

For some metrics, the impact should be entered directly, and for others it should be selected from a drop-down menu, as shown in Figure 11.

Figure 11. Hazard Worksheet: Select Duration of Impact from Drop-Down Menu



After data is entered in the appropriate spaces, a score will be automatically generated based on the scoring scale shown. For many metrics, a separate **Magnitude Score** and **Duration Score** will be generated. The overall score for that metric is then automatically calculated as the average of the two scores. In Figure 11 above, the Magnitude Score for Mortality is two, and the Duration Score is one. The Mortality Score, shown at the bottom, is then automatically generated as the average of the two scores, or 1.5.

For some metrics, data must be entered regarding hazard-related interruption as well as hazard related demand. Interruption refers to how much of that metric will be unavailable in a hazard scenario, e.g. Emergency Department beds that are unusable due to damage (as in an earthquake or tornado that renders an emergency department unusable), or due to staffing shortages (as in a pandemic that depletes the healthcare workforce).

Demand refers to the total amount of surge capacity necessary for the hazard scenario. For example, a jurisdiction may have 1,000 hospital beds as a baseline. If a tornado strikes one hospital, rendering it unstable, the region may lose 200 hospital beds. Therefore, 200 should be entered in the space provided for Hazard-Related Loss of Hospital Beds. Due to injuries caused by the tornado, they may have a surge requirement of 40 hospital beds (above baseline); therefore, 40 should be entered in the space provided for Hazard-Related Increase in Demand for Hospital Beds. The worksheet will then automatically calculate a score based on the scale shown.

If you would like, space is provided to enter an explanation/justification for your impact prediction/estimate, or the source of your data. Entering this information is optional, but may help you when completing future assessments.

2. Qualitative Severity Assessment Completion

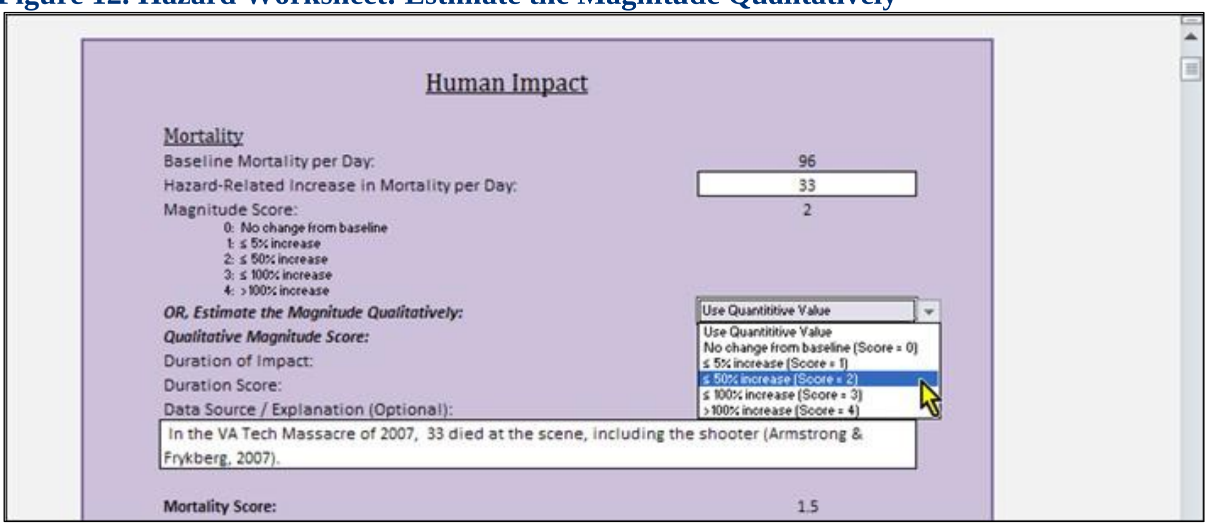
Some planners may not be able to locate data for their jurisdiction, or prefer to assign severity scores using a more **qualitative** approach, drawing upon expert opinion and experience. The MOPHRAT can accommodate that approach.

Planners who choose not to score events using quantitative comparisons of pre-event with post-event data can leave the space provided for specific data entry empty. For many of the metrics, the tool provides an option for you to enter a data range instead of an actual estimate. The data range drop-down menu appears next to the words **OR, Estimate the Magnitude Qualitatively**. If you have selected an option from the qualitative drop-down menu, the tool will automatically use that selection to calculate the score for that metric.

To use the quantitative value instead, either select **Use Quantitative Value** or simply delete the entry in the qualitative cell.

Figure 12 shows how to select an option from the qualitative drop-down menu.

Figure 12. Hazard Worksheet: Estimate the Magnitude Qualitatively



It is recommended that planners who choose to complete the tool qualitatively record the justification for their estimates and the agencies involved in arriving at those estimates in the "Data Source / Explanation" space provided. This is optional, but it will help you when completing future assessments or when evaluating this assessment.

Automatic Risk Calculations

The **Risk Score** will be calculated automatically in the red box labeled "Risk" after the severity section of the hazard worksheet has been completed, as shown in Figure 13. It is automatically calculated using the Probability Score and the Severity Score, using the following equation:

$$\text{Risk Score} = (\text{Probability Score} \times \text{Severity Score})/16 \times 100$$

The Public Health System Risk Score and the Healthcare System Risk Score are calculated using the Public Health System Severity Score and the Healthcare System Severity Score, respectively.

Figure 13. Hazard Worksheet: Severity and Risk Calculated Automatically

Severity

Severity Score: 0.74
(Human, Healthcare Service, Healthcare Infrastructure, Community, Public Health)

Public Health System Severity Score: 0.87
(Human, Healthcare Service, Community, Public Health)

Healthcare System Severity Score: 1.00
(Human, Healthcare Service, Healthcare Infrastructure)

Risk

Risk Score: 13.93
Overall Risk = 100 × (Probability × Overall Severity) / 16

Public Health System Risk Score: 16.24
Public Health Risk = 100 × (Probability × Public Health Severity) / 16

Healthcare System Risk Score: 18.75
Healthcare Risk = 100 × (Probability × Healthcare Severity) / 16

If the Risk Score is defined as **Not Calculated**, check that data has been entered/selected for every severity metric. You may have to alter the scores of certain metrics if your jurisdiction has a baseline of zero in any metrics. For example, if the jurisdiction has zero hospital beds, the hospital bed metric will be scored as "Not Calculated," because division by zero is impossible.

In this zero-entry scenario, select an option from the qualitative drop-down menu to score the metric. Rather than considering the increased demand on resources that exist in the jurisdiction, consider the increased demand on resources that are typically available to the jurisdiction (i.e., in neighboring jurisdictions). A score of Not Calculated in any one severity metric will result in overall Severity and Risk Scores of Not Calculated.

At-Risk Population Data

Next, complete the **At-Risk Populations** section of each worksheet by scrolling to the **blue** box labeled "At-Risk Populations" in the hazard worksheet.

The **At-Risk Populations Score** reflects a jurisdiction's unique planning requirements to ensure universal access to emergency response resources by all populations. It is used to weight or adjust the Risk Score so that it also demonstrates the disproportionate impact that a hazard might have on populations with unique or special needs in disasters.

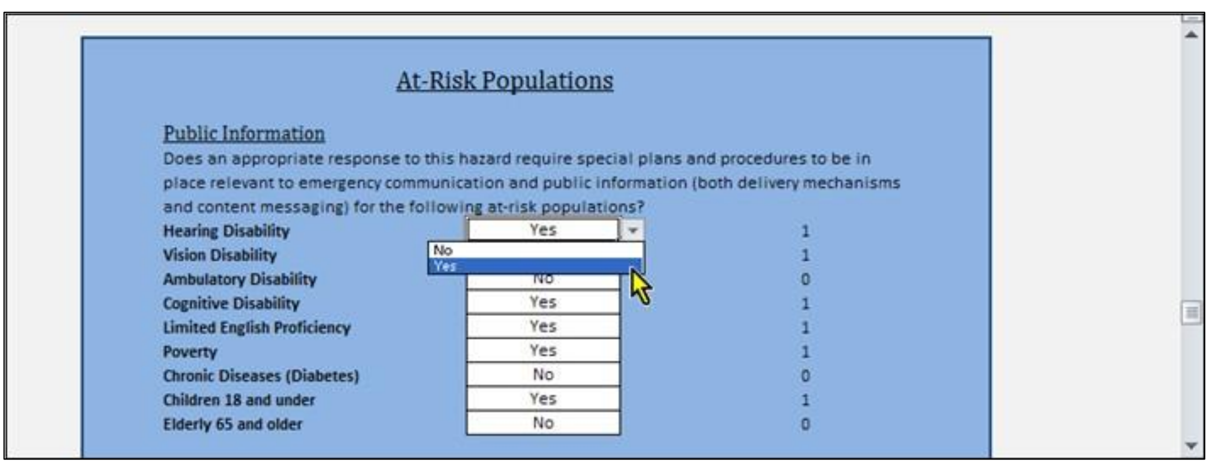
The At-Risk Populations Score is calculated from both the Population Size Score, which is calculated in the "Baseline At-Risk Populations" worksheet, and an **Access Planning Score** that reflects the unique planning and response needs of each of the nine selected at-risk populations in a given disaster scenario.

The Access Planning Score was adapted from FEMA's Interim Emergency Management Planning Guide for Special Needs Populations. The score is based on a sum of the points assigned to four categories of emergency planning. One point was assigned for each of the following population needs for a given hazard:

- An appropriate response to this hazard requires special plans and procedures to be in place relevant to emergency communication and public information (both delivery mechanisms and content messaging).
- An appropriate response to this hazard requires special plans and procedures to be in place relevant to sheltering and mass care in shelters.
- An appropriate response to this hazard requires special plans and procedures to be in place relevant to evacuation or evacuation-related transportation.
- An appropriate response to this hazard requires special plans and procedures to be in place relevant to human services and medical management.

To complete this section of the tool, you must make a selection of either yes or no, regarding whether or not special plans and procedures in each category must be in place for the listed at-risk populations as part of a complete public health response to the given hazard. Answer each question as shown in Figure 14.

Figure 14. Hazard Worksheet: Enter Information for At-Risk Populations



A Population Impact Score is calculated for each at-risk population using the following equation:

$$\text{Population Impact Score} = (\text{Population Size Score} \times \text{Access Planning Score})/4$$

The overall At-Risk Population Score for each hazard is the average of the nine Population Impact Scores. The overall At-Risk Population Score is automatically calculated in the tool.

Adjusted Risk Calculated Automatically

The **Adjusted Risk Score** reflects the contribution of additional planning requirements for at-risk or vulnerable populations for specific hazards or disasters. The maximum At-Risk Populations Score of four can have the effect of doubling the original Risk Score for a hazard, whereas a minimum At-Risk Populations Score of zero will not change the Risk Score. The following equation is used to calculate the Adjusted Risk Score:

$$\text{Adjusted Risk Score} = \text{Risk Score} \times (\text{At-Risk Populations Score}/4+1)$$

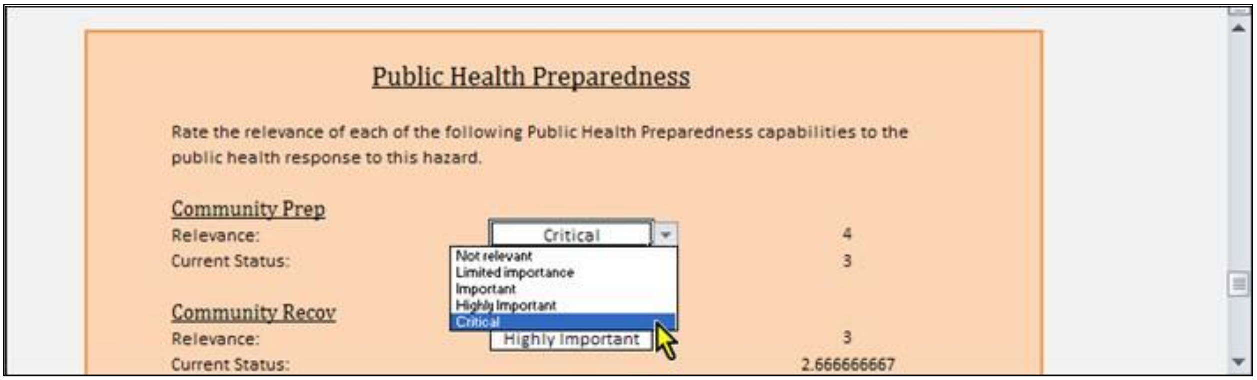
The Public Health System Adjusted Risk Score and the Healthcare System Adjusted Risk Score are calculated using the Public Health System Risk Score and the Healthcare System Risk Score, respectively. These scores and the Adjusted Risk Score will be calculated automatically as shown in Figure 15.

Figure 15. Hazard Worksheet: Adjusted Risk Calculated Automatically

Entering Preparedness Data

Finally, complete the **Preparedness Section** of each worksheet by selecting how relevant each of the Public Health Preparedness and Healthcare Preparedness capabilities is to the response to the given hazard. For reference, all of the functions that make up each capability are elaborated in the Baseline Public Health Preparedness Capability Status and Baseline Healthcare Preparedness Capability Status worksheets. You can navigate to these sheets by returning to the Main Menu and selecting the orange buttons in the "Step 1. Baseline Data" box in the Main Menu. Select the relevance of each capability by using the drop-down menus as shown in Figure 16.

Figure 16. Hazard Worksheet: Select Relevance of Preparedness Capabilities to this Hazard



The Public Health Preparedness and Healthcare Preparedness Scores are the weighted average of the capability Status Scores, weighted by relevance to the hazard under consideration. The Public Health Preparedness Score and Healthcare Preparedness Score are automatically calculated using the following equations:

$$\text{Public Health Preparedness Score} = \frac{\sum_{n=1}^{15} (\text{Capability } n \text{ Score} \times \text{Capability } n \text{ Relevance Score})}{\sum_{n=1}^{15} \text{Capability } n \text{ Relevance Score}}$$

$$\text{Healthcare Preparedness Score} = \frac{\sum_{n=1}^{8} (\text{Capability } n \text{ Score} \times \text{Capability } n \text{ Relevance Score})}{\sum_{n=1}^{8} \text{Capability } n \text{ Relevance Score}}$$

The **Preparedness Score** is the average of the Public Health Preparedness Score and the Healthcare Preparedness Score. The score is automatically calculated in the tool.

Planning Priority Score Calculated Automatically

Unlike other tools that integrate an assessment of preparedness into the assessment of risk, the MOPHRAT does not make the assumption that a certain degree of preparedness mitigates or diminishes risk in knowable or predictable ways. Instead, the tool generates a **Planning Priority Score** that allows planners to identify hazards that may require additional preparedness efforts on the part of the jurisdiction, especially for the degree of risk posed by that hazard.

A **Planning Priority Indicator** is calculated automatically in the gray box labeled "Planning Priority," as shown in Figure 17, when the baseline and hazard worksheets have been completed, using the following equation:

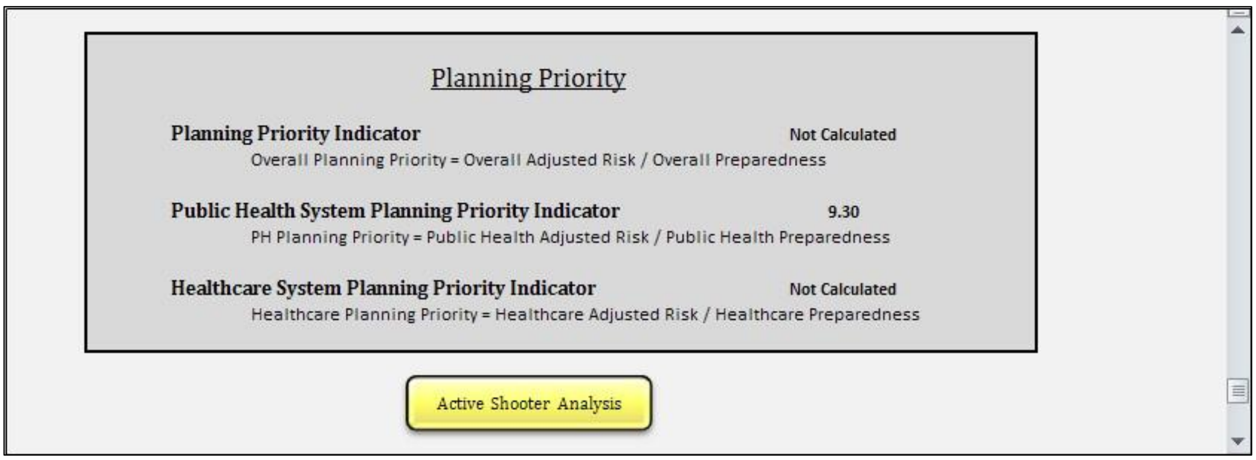
$$\text{Planning Priority Indicator} = \text{Adjusted Risk Score}/\text{Preparedness Score}$$

The Public Health System Planning Priority Indicator is calculated using the Public Health System Adjusted Risk Score and the Public Health Preparedness Score. The Healthcare System Planning Priority Indicator is calculated using the Healthcare System Adjusted Risk Score and the Healthcare Preparedness Score.

These indicators are then ranked, producing a Planning Priority Score. These ranks appear automatically in the **Summary of Scores** worksheet.

In Figure 17, only the Public Health System Planning Priority Indicator is displayed. The Planning Priority Indicator and the Healthcare System Planning Priority Indicator are both listed as Not Calculated. This is because the Healthcare Preparedness Capability status worksheet was not completed in the worksheet.

Figure 17. Hazard Worksheet: Planning Priority Indicators Calculated Automatically



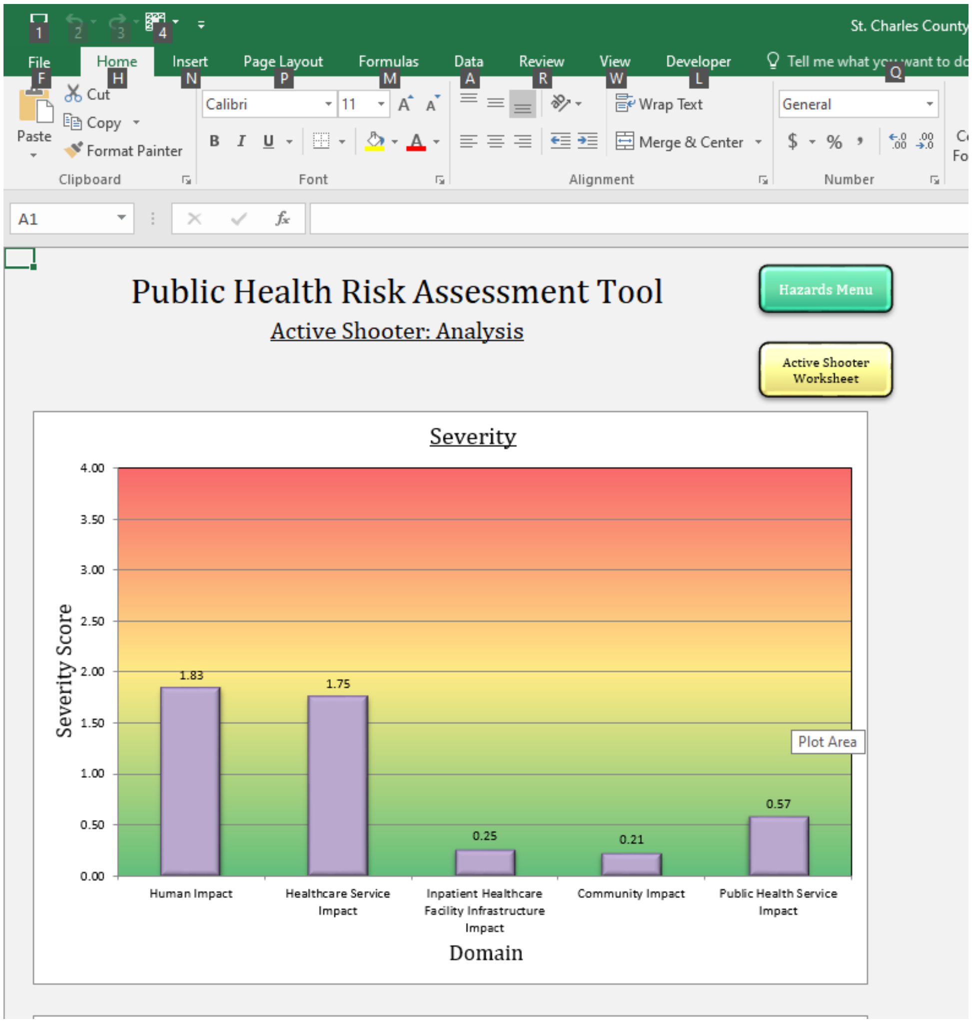
At the bottom of the worksheet, as shown in Figure 17, is a yellow button linking to the hazard's analysis. After the worksheet is completed, click on this button to see a visual analysis of the information entered for the hazard. The analysis will not display correctly if the hazard worksheet has not been completed.

Hazard Analysis Worksheets

A hazard analysis worksheet exists for each hazard. These worksheets will not display correctly until the hazard worksheets have been completed. You can navigate to these individual hazard worksheets by clicking on the **yellow** button at the bottom of each hazard worksheet, or by navigating to the "Individual Hazard Analyses" menu by clicking on the yellow "Individual Hazard Analyses" button in the Main Menu in the box labeled "Step 3. Analysis." From the Individual Hazard Analyses Menu, click on the name of any hazard to see the analysis for that hazard.

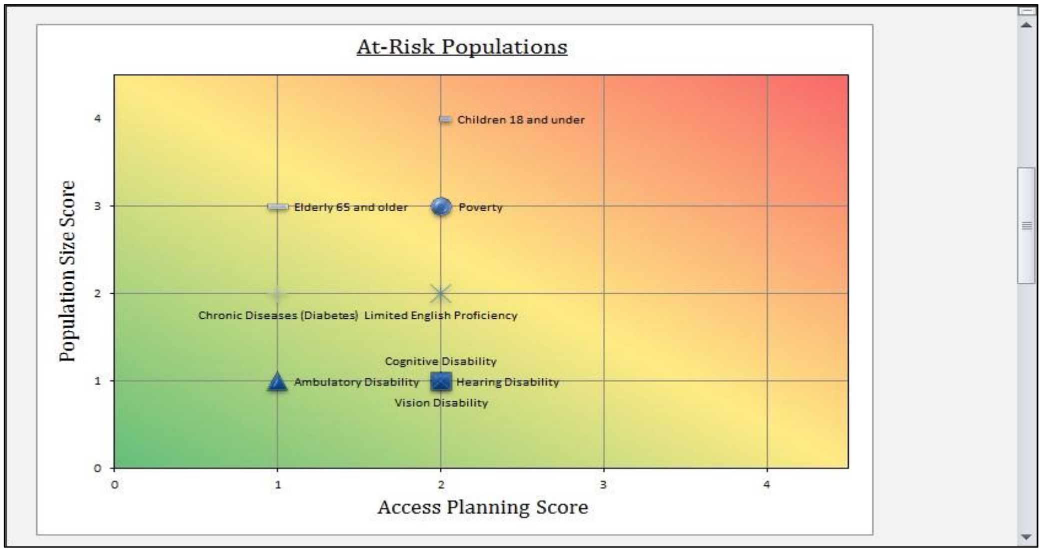
The hazard analysis worksheet contains four graphs. The first is a graph of severity by domain, as shown in Figure 18. This shows the five severity domains: Human Impact, Healthcare Service Impact, Inpatient Healthcare Facility Infrastructure Impact, Community Impact, and Public Health Service Impact. The severity of each of the five domains is displayed, allowing you to see which domains will be most heavily affected by the hazard.

Figure 18. Hazard Analysis Worksheet: Severity by Domain



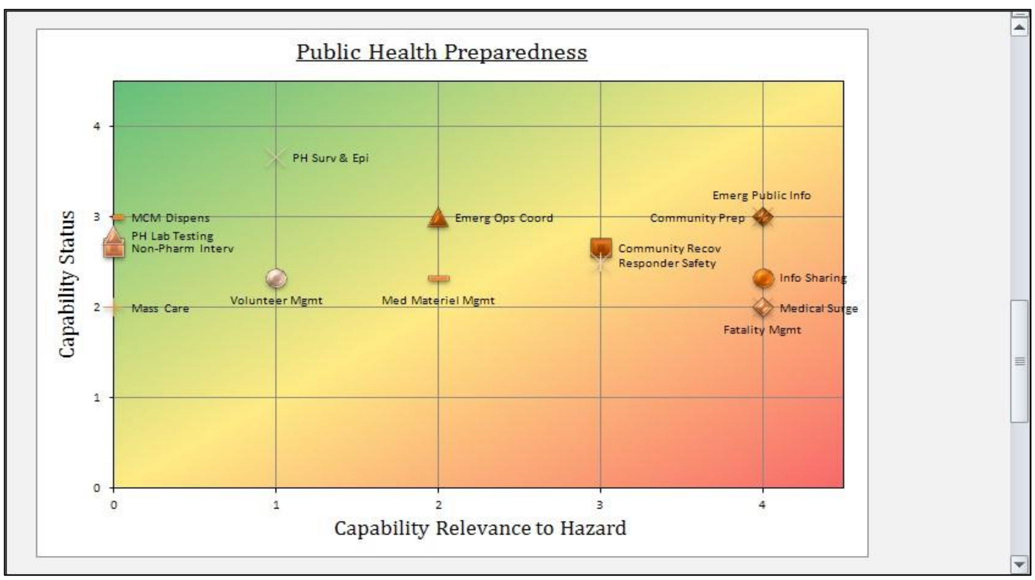
The next graph is a breakdown of the At-Risk Populations Score. To calculate the At-Risk Populations Score, each population is assigned a Population Size Score and an Access Planning Score. In the At-Risk Populations graph, the Population Size Score is represented on the y-axis, and the Access Planning Score is represented on the x-axis. Populations that appear in the upper-right quadrant are both large populations by size and population that require a large number of plans and procedures to be in place. Figure 19 shows an example of this graph.

Figure 19. Hazard Analysis Worksheet: Access Planning Score vs. Population Size Score



The final two graphs illustrate the status and relevance of the Public Health Preparedness and Healthcare Preparedness capabilities respectively. Figure 20 illustrates an example of one of these graphs. The relevance of the capabilities is represented on the x-axis, and the status of the capabilities is on the y-axis. Therefore, capabilities that appear in the lower-right quadrant are highly relevant to the hazard but have a low status. These are the capabilities that should be enhanced to most improve preparedness for the given hazard.

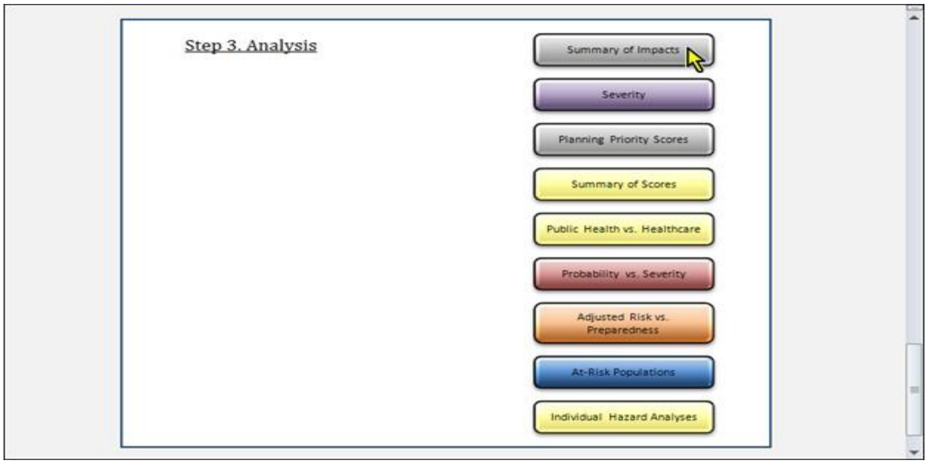
Figure 20. Hazard Analysis Worksheet: Preparedness Capability Relevance vs. Status



Step 3. Analysis

When all of the hazard worksheets have been completed, the tool generates a number of different charts and graphs that will help you analyze the hazards relative to each other. These sections can be viewed by scrolling to the "Step 3. Analysis" box in the Main Menu and selecting the various buttons, as shown in Figure 21.

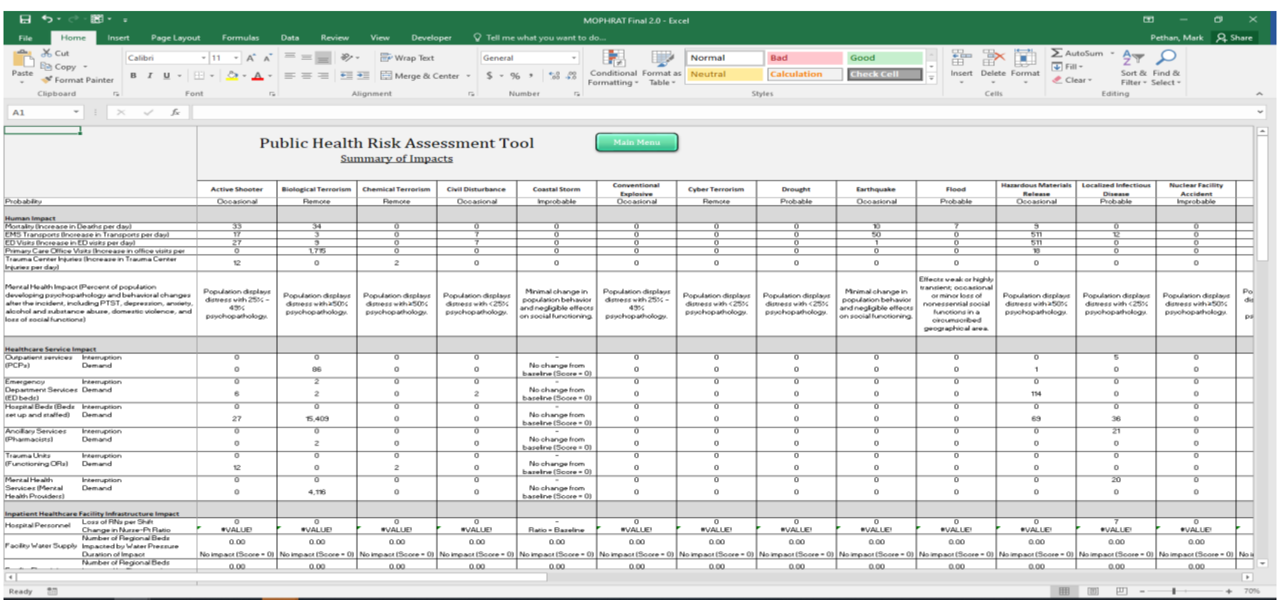
Figure21. Step 3:



Summary of Impacts

The **Summary of Impacts** summarizes all of the data that has been entered for all of the hazards and is designed to be printed on legal-sized paper. The demands and critical service interruptions summarized in this sheet can potentially be used to develop benchmarks and directly guide preparedness planning. This worksheet is illustrated below:

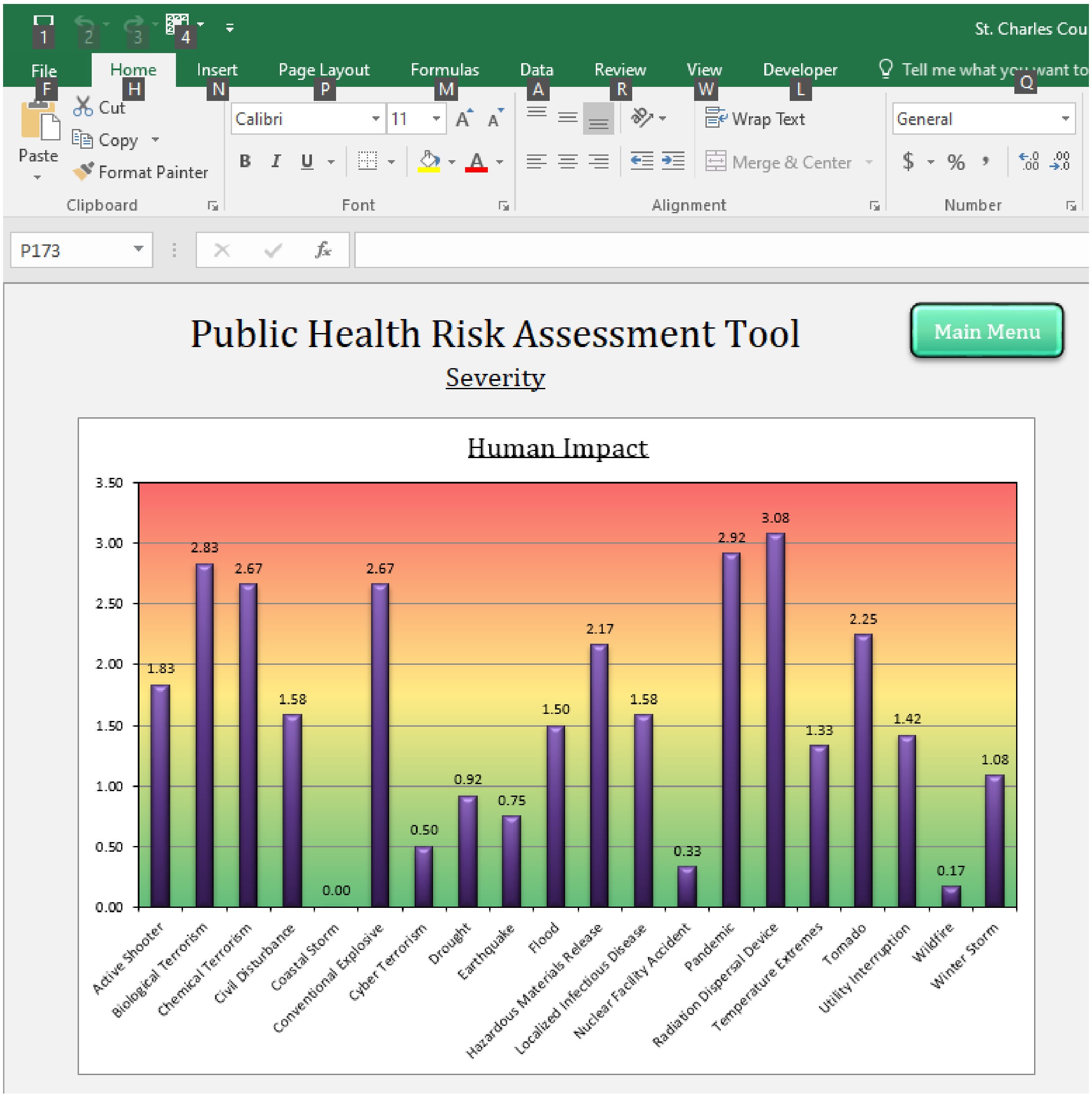
Figure 22. Summary of Impacts



Severity

This worksheet compares the **severity** of all hazards in each domain. Figure 23, for example, shows the impact of all hazards in the Human Impact domain. By examining these graphs, you can determine which hazards have the greatest impact on each of the five domains. The worksheet is illustrated below.

Figure 23. Severity

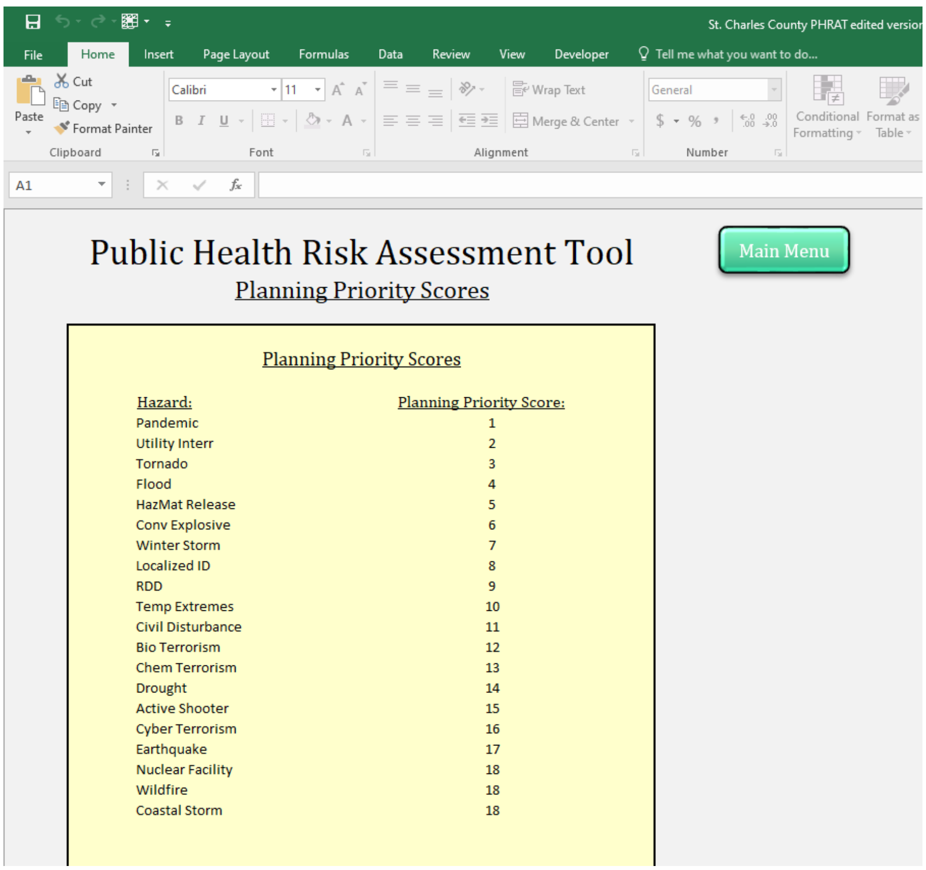


Planning Priority Scores

The Planning Priority Scores sheet, as shown in Figure 24, is a simple rank-order list of the hazards in order from highest to lowest Planning Priority. All of the individual Hazard worksheets must have been completed for this sheet to display correctly, and macros MUST be enabled.

Three different lists are displayed on this worksheet: the Planning Priority Scores from the primary analysis, and the scores from each of the two sub-analyses: the Public Health System Planning Priority Scores and the Healthcare System Planning Priority Scores. Illustrated below:

Figure 24. Planning Priority Scores



Public Health Risk Assessment Tool

Planning Priority Scores

Planning Priority Scores

Hazard:	Planning Priority Score:
Pandemic	1
Utility Interr	2
Tornado	3
Flood	4
HazMat Release	5
Conv Explosive	6
Winter Storm	7
Localized ID	8
RDD	9
Temp Extremes	10
Civil Disturbance	11
Bio Terrorism	12
Chem Terrorism	13
Drought	14
Active Shooter	15
Cyber Terrorism	16
Earthquake	17
Nuclear Facility	18
Wildfire	18
Coastal Storm	18

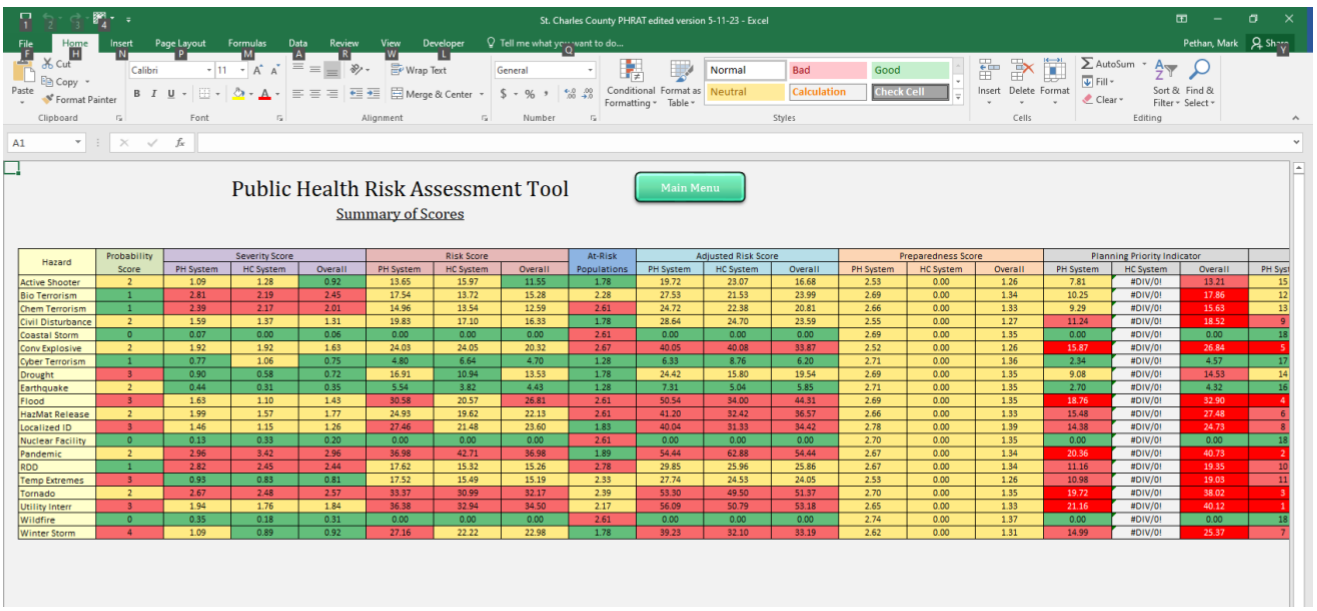
Summary of Scores

The **Summary** worksheet displays the scores of all of the hazards, including the Planning Priority Score. The scores are automatically transferred from the hazard worksheets.

The **Summary of Scores** worksheet displays the Probability Score, Severity Score, Risk Score, At-Risk Populations Score, Adjusted Risk Score, Preparedness Score, and Planning Priority Score for each of the hazards analyzed. The **Overall Score** is displayed, as well as the scores from each of the two sub-analyses: the Public Health System and the Healthcare System.

The cells in this worksheet are color-coded, so the most severe values are shown in red and the least severe are displayed in green. All of the individual Hazard worksheets must have been completed for this sheet to display correctly. Figure 25 displays the Summary of Scores.

Figure 25. Public Health System Adjusted Risk vs. Public Health Preparedness



Public Health Risk Assessment Tool

Summary of Scores

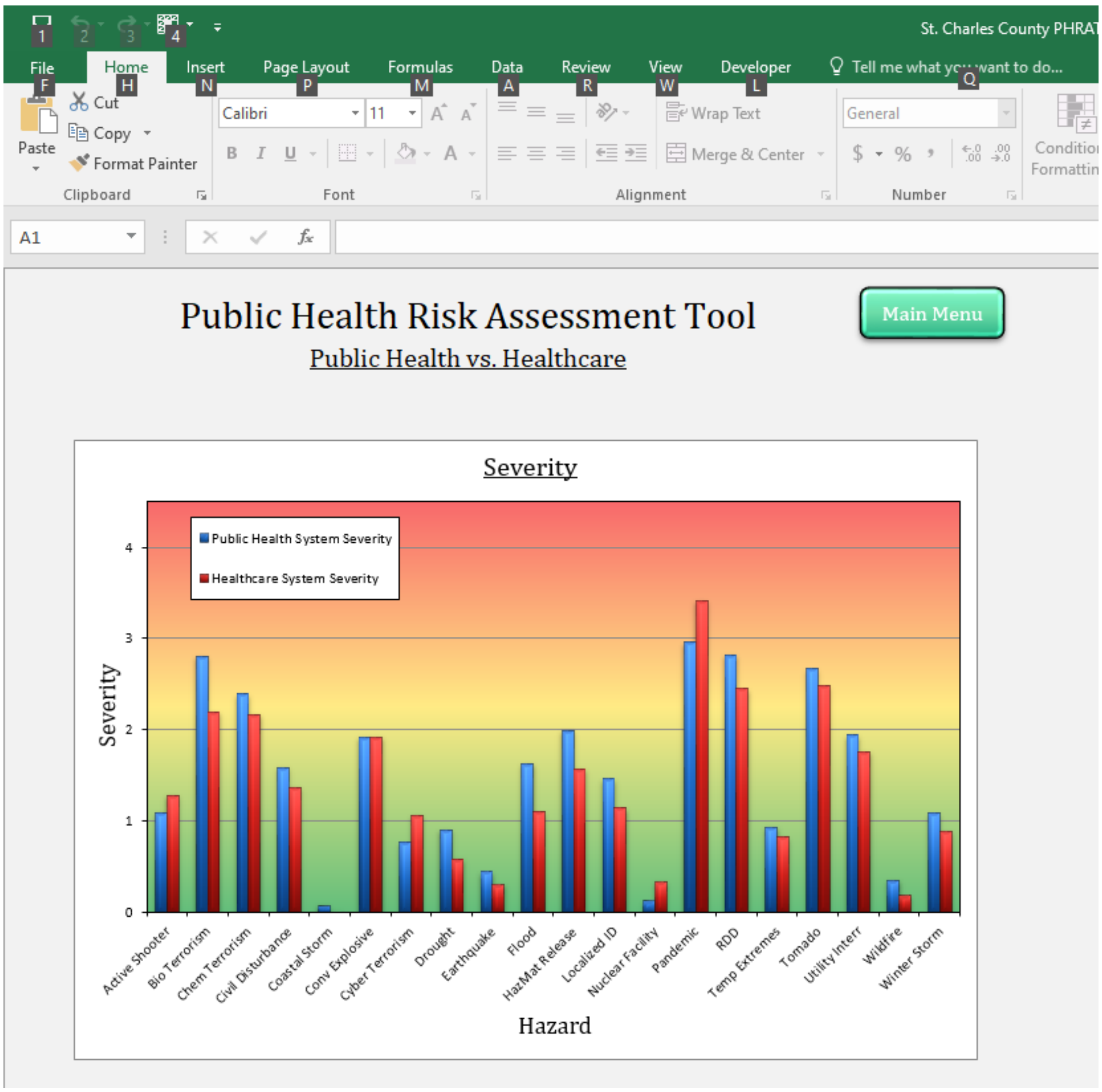
Hazard	Probability Score	Severity Score			Risk Score			At-Risk Populations
		PH System	HC System	Overall	PH System	HC System	Overall	
Active Shooter	2	1.09	1.28	0.92	13.65	15.97	11.55	1.78
Bio Terrorism	1	2.81	2.19	2.45	17.54	13.72	15.28	2.28
Chem Terrorism	1	2.39	2.17	2.01	14.96	13.54	12.59	2.61
Civil Disturbance	2	1.59	1.37	1.31	19.83	17.10	16.33	1.78
Coastal Storm	0	0.07	0.00	0.06	0.00	0.00	0.00	2.61
Conv Explosive	2	1.92	1.92	1.63	24.03	24.05	20.32	2.67
Cyber Terrorism	1	0.77	1.06	0.75	4.80	6.64	4.70	1.28
Drought	3	0.90	0.58	0.72	16.91	10.94	13.53	1.78
Earthquake	2	0.44	0.31	0.35	5.54	3.82	4.43	1.28
Flood	3	1.63	1.10	1.43	30.58	20.57	26.81	2.61
HazMat Release	2	1.99	1.57	1.77	24.93	19.62	22.13	2.61
Localized ID	3	1.46	1.15	1.26	27.46	21.48	23.60	1.83
Nuclear Facility	0	0.13	0.33	0.20	0.00	0.00	0.00	2.61
Pandemic	2	2.96	3.42	2.96	36.98	42.71	36.98	1.89
RDD	1	2.82	2.45	2.44	17.62	15.32	15.26	2.78
Temp Extremes	3	0.93	0.83	0.81	17.52	15.49	15.19	2.33
Tornado	2	2.67	2.48	2.57	33.37	30.99	32.17	2.39
Utility Interr	3	1.94	1.76	1.84	36.38	32.94	34.50	2.17
Wildfire	0	0.35	0.18	0.31	0.00	0.00	0.00	2.61
Winter Storm	4	1.09	0.89	0.92	27.16	22.22	22.98	1.78

Hazard	Adjusted Risk Score			Preparedness Score			Planning Priority Indicator			
	PH System	HC System	Overall	PH System	HC System	Overall	PH System	HC System	Overall	PH Syst
Active Shooter	19.72	23.07	16.68	2.53	0.00	1.26	7.81	#DIV/0!	13.21	15
Bio Terrorism	27.53	21.53	23.99	2.69	0.00	1.34	10.25	#DIV/0!	17.86	12
Chem Terrorism	24.72	22.38	20.81	2.66	0.00	1.33	9.29	#DIV/0!	15.63	13
Civil Disturbance	28.64	24.70	23.59	2.55	0.00	1.27	11.24	#DIV/0!	18.52	9
Coastal Storm	0.00	0.00	0.00	2.69	0.00	1.35	0.00	#DIV/0!	0.00	18
Conv Explosive	40.05	40.08	33.87	2.52	0.00	1.26	15.87	#DIV/0!	26.84	5
Cyber Terrorism	6.33	8.76	6.20	2.71	0.00	1.36	2.34	#DIV/0!	4.57	17
Drought	24.42	15.80	19.54	2.69	0.00	1.35	9.08	#DIV/0!	14.53	14
Earthquake	7.31	5.04	5.85	2.71	0.00	1.35	2.70	#DIV/0!	4.32	16
Flood	50.54	34.00	44.31	2.69	0.00	1.35	18.76	#DIV/0!	32.90	4
HazMat Release	41.20	32.42	36.57	2.66	0.00	1.33	15.48	#DIV/0!	27.48	6
Localized ID	40.04	31.33	34.42	2.78	0.00	1.39	14.38	#DIV/0!	24.73	8
Nuclear Facility	0.00	0.00	0.00	2.70	0.00	1.35	0.00	#DIV/0!	0.00	18
Pandemic	54.44	62.88	54.44	2.67	0.00	1.34	20.36	#DIV/0!	40.73	2
RDD	29.85	25.96	25.86	2.67	0.00	1.34	11.16	#DIV/0!	19.35	10
Temp Extremes	27.74	24.53	24.05	2.53	0.00	1.26	10.98	#DIV/0!	19.03	11
Tornado	53.30	49.50	51.37	2.70	0.00	1.35	19.72	#DIV/0!	38.02	3
Utility Interr	56.09	50.79	53.18	2.65	0.00	1.33	21.16	#DIV/0!	40.12	1
Wildfire	0.00	0.00	0.00	2.74	0.00	1.37	0.00	#DIV/0!	0.00	18
Winter Storm	39.23	32.10	33.19	2.62	0.00	1.31	14.99	#DIV/0!	25.37	7

Public Health vs. Healthcare

From the Main Menu, click on the button that reads **Public Health vs. Healthcare** to navigate to a comparison of the overall analysis with the two sub-analyses: Public Health System and Healthcare System. In this worksheet, graphs compare the three analyses for each different score, allowing you to identify hazards that have a greater effect on the healthcare system than the public health system and vice versa. The graph of Severity Scores is shown below:

Figure 26. Public Health vs. Healthcare

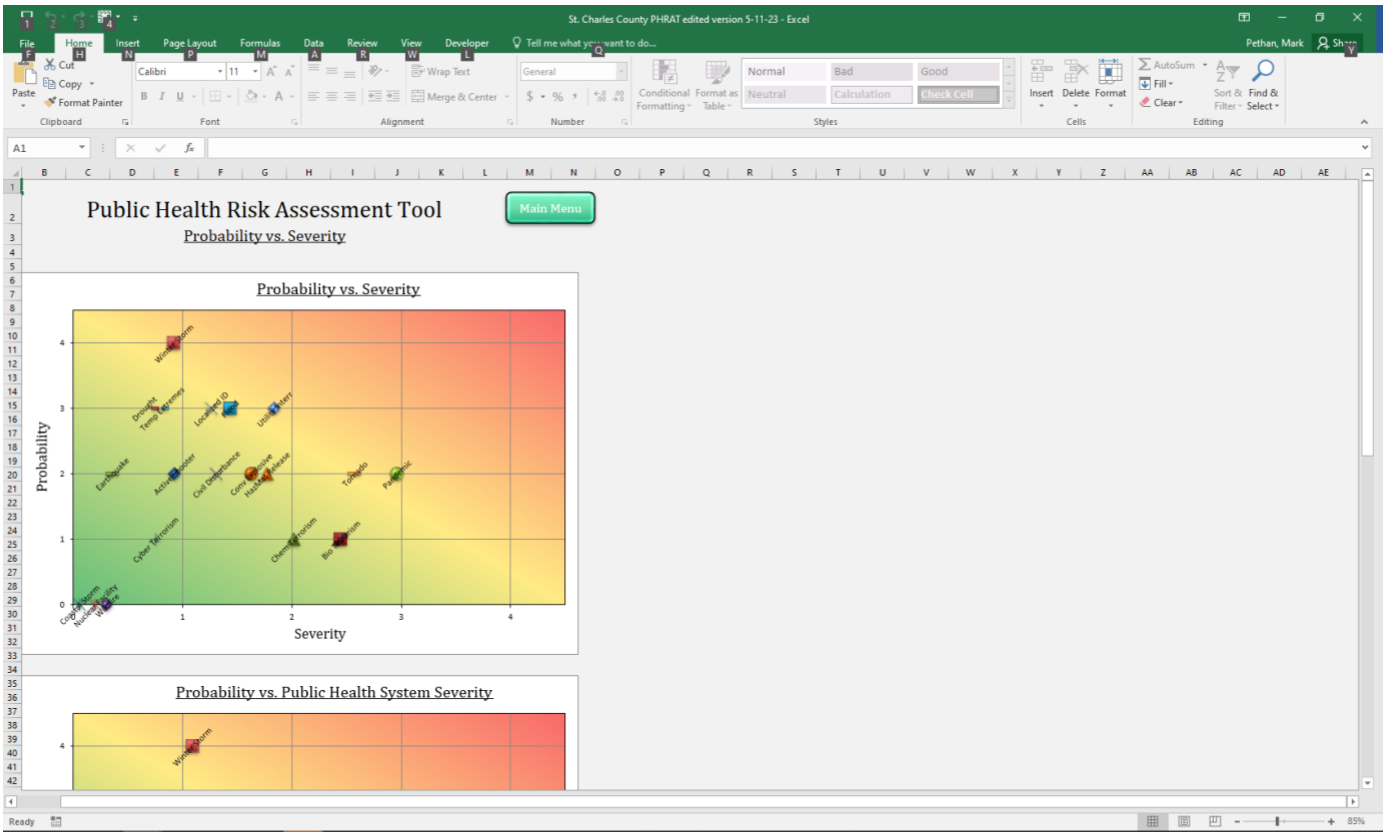


Probability vs. Severity

The **Probability vs. Severity** sheet displays graphs of the probability and severity for all hazards. All of the individual Hazard worksheets must have been completed for this sheet to display correctly.

The graphs are automatically generated, and label positions may have to be changed in order for the figures to be easily readable. To do this, right-click on the label and select “Format Data Labels…” The Probability vs. Severity graph is shown below:

Figure 27. Public Health System Adjusted Risk vs. Public Health Preparedness



On this worksheet, graphs are also displayed for each of the two sub-analyses, comparing Probability to the Public Health System Severity and the Healthcare System Severity, respectively.

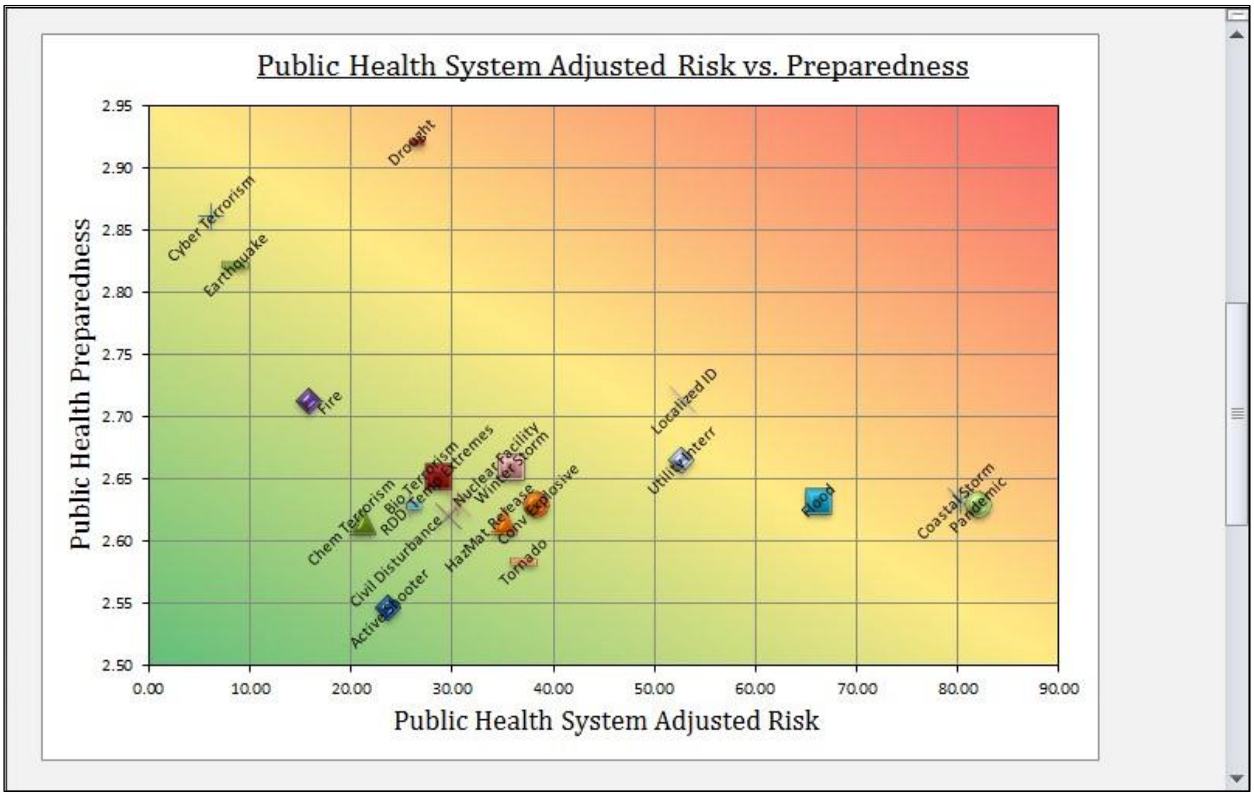
Adjusted Risk vs. Preparedness

The **Adjusted Risk vs. Preparedness** worksheet displays graphs of the adjusted risk and preparedness for all hazards. All of the individual Hazard worksheets must have been completed for this sheet to display correctly.

The graphs are automatically generated, and label positions may have to be changed in order for the figures to be easily readable. To do this, right-click on the label and select “Format Data Labels…” You may have to adjust the range of the y-axis to properly display the results. To this this, right-click on the y-axis and select "Format axis..." Set the Axis Options to reflect a narrow range that includes all values.

This worksheet also produces a graph for each of the sub-analyses. One compares the Public Health System Adjusted Risk to Public Health Preparedness (shown in Figure 28), and another compares Healthcare System Adjusted Risk to Healthcare Preparedness.

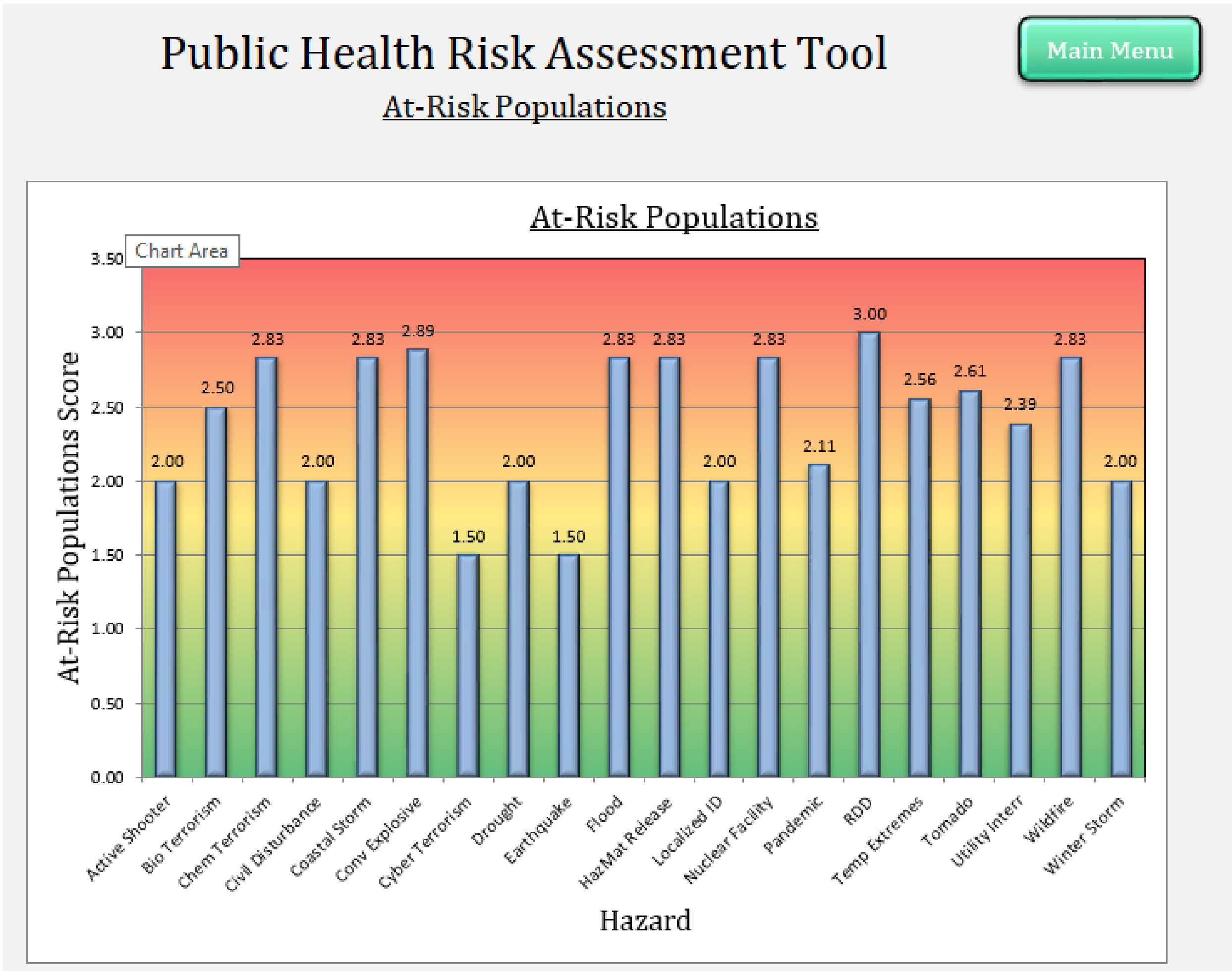
Figure 28. Public Health System Adjusted Risk vs. Public Health Preparedness



At-Risk Populations

The "At-Risk Populations" worksheet displays a graph of the At-Risk Populations Scores of all hazards, as shown in Figure 29. All of the individual Hazard worksheets must have been completed for this sheet to display correctly.

Figure 29. Public Health System Adjusted Risk vs. Public Health Preparedness



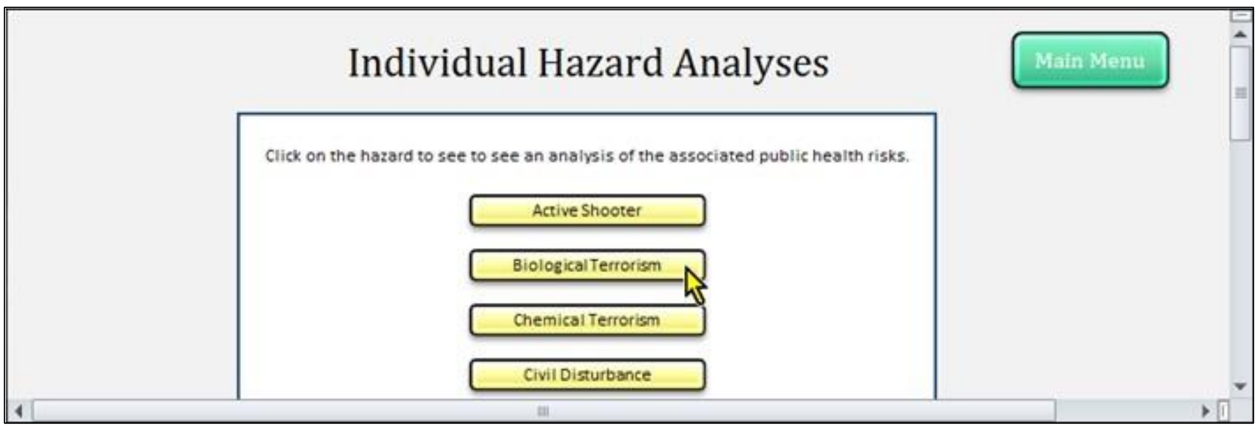
Individual Hazard Analyses

The **Individual Hazard Analyses** sheet is a menu that links to an in-depth analysis of each hazard, based on the information provided in the Hazard worksheets. These analyses include a graph of the five severity domains, an assessment of the needs and the sizes of at-risk populations, and a graph of the status of each the 15 Public Health Preparedness capabilities and the eight Healthcare Preparedness capabilities and its relevance to the specific hazard.

The graphs on these sheets are automatically generated, and label positions may have to be changed in order for the figures to be easily readable. To do this, right-click on the label and select "Format Data Labels…" These worksheets can also be accessed by clicking on the button at the bottom of each Hazard worksheet.

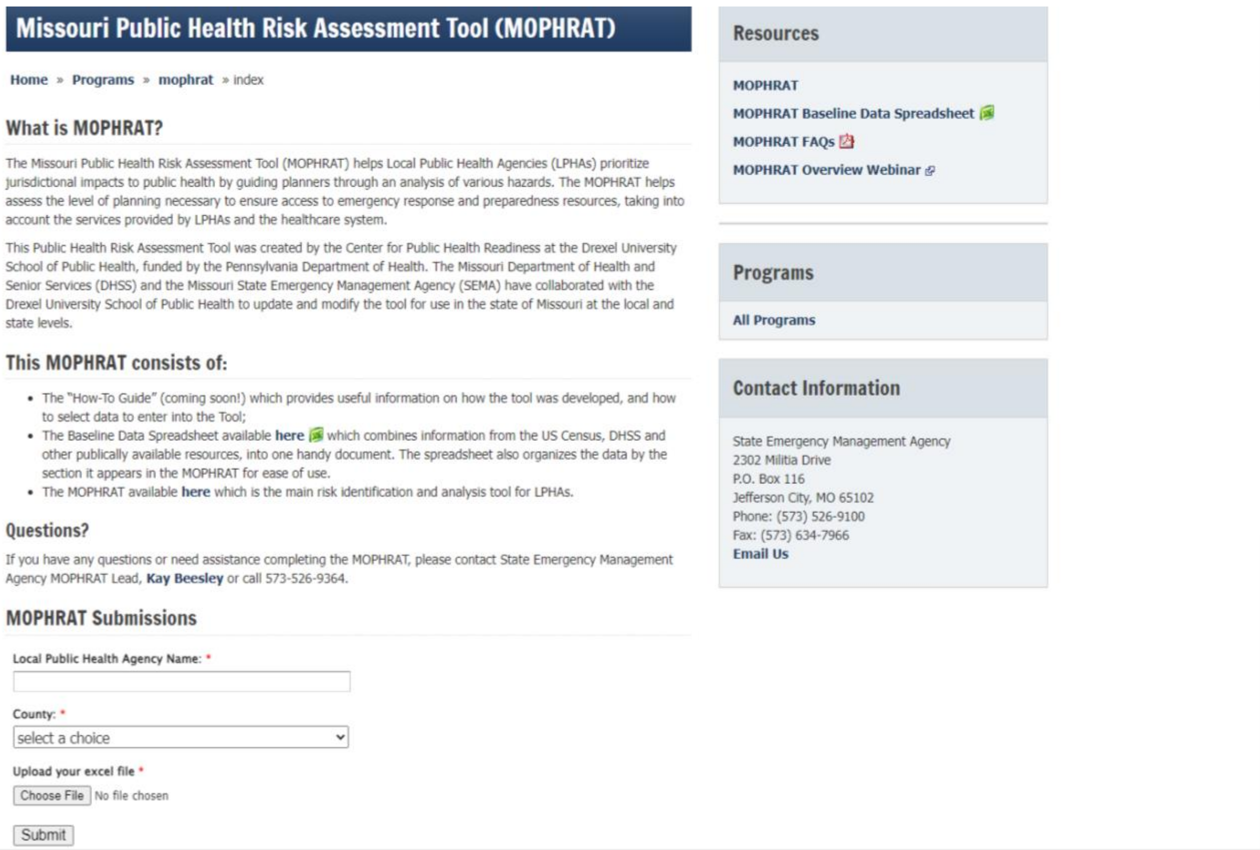
The menu of individual hazard analyses is shown in Figure 30. More information about these worksheets can be found in the section "Hazard Analysis Worksheets" above.

Figure 30. Public Health System Adjusted Risk vs. Public Health Preparedness



Downloading Information & Uploading Completed Assessments

On the MOPHRAT page of the SEMA site, you will find an area titled MOPHRAT Submissions. You will enter your Local Public Health Agency Name and select your county from the drop down selection. Click on Choose File, locate your completed version of the tool, and finally Submit.



Missouri Public Health Risk Assessment Tool (MOPHRAT)

Home » Programs » mophrat » index

What is MOPHRAT?

The Missouri Public Health Risk Assessment Tool (MOPHRAT) helps Local Public Health Agencies (LPHAs) prioritize jurisdictional impacts to public health by guiding planners through an analysis of various hazards. The MOPHRAT helps assess the level of planning necessary to ensure access to emergency response and preparedness resources, taking into account the services provided by LPHAs and the healthcare system.

This Public Health Risk Assessment Tool was created by the Center for Public Health Readiness at the Drexel University School of Public Health, funded by the Pennsylvania Department of Health. The Missouri Department of Health and Senior Services (DHSS) and the Missouri State Emergency Management Agency (SEMA) have collaborated with the Drexel University School of Public Health to update and modify the tool for use in the state of Missouri at the local and state levels.

This MOPHRAT consists of:

- The "How-To Guide" (coming soon!) which provides useful information on how the tool was developed, and how to select data to enter into the Tool;
- The Baseline Data Spreadsheet available **here** which combines information from the US Census, DHSS and other publically available resources, into one handy document. The spreadsheet also organizes the data by the section it appears in the MOPHRAT for ease of use.
- The MOPHRAT available **here** which is the main risk identification and analysis tool for LPHAs.

Questions?

If you have any questions or need assistance completing the MOPHRAT, please contact State Emergency Management Agency MOPHRAT Lead, **Kay Beesley** or call 573-526-9364.

MOPHRAT Submissions

Local Public Health Agency Name: *

County: *

select a choice

Upload your excel file *

Choose File No file chosen

Submit

Resources

MOPHRAT

MOPHRAT Baseline Data Spreadsheet

MOPHRAT FAQs

MOPHRAT Overview Webinar

Programs

All Programs

Contact Information

State Emergency Management Agency
2302 Militia Drive
P.O. Box 116
Jefferson City, MO 65102
Phone: (573) 526-9100
Fax: (573) 634-7966
Email Us

References

Assistant Secretary for Preparedness and Response (ASPR), Healthcare Preparedness Capabilities: National Guidance for Healthcare System Preparedness, January 2012.

Centers for Disease Control and Prevention (CDC), Public Health Preparedness Capabilities: National Standards for State and Local Planning, March 2011.

Federal Emergency Management Agency (FEMA), Interim Emergency Management Planning Guide for Special Needs Populations, Version 1.0, August 15, 2008, University of Kansas Website. Accessed via http://www2.ku.edu/~rrtcpbs/resources/pdf/FEMA_CPG301.pdf.

Kaiser Foundation Health Plan, Inc., Medical Center Hazard and Vulnerability Analysis, 2001. New Jersey Hospital Association Website. Accessed via http://www.njha.com/ep/pdf/627200834041PM.pdf.

Regional Catastrophic Planning Team, NEW YORK CITY Health, Worksheet Instructions for the Public Heath Jurisdictional Risk Assessment Tool, BETA Version, December 19, 2011.

UCLA Center for Public Health and Disasters (CPHD), Hazard Risk Assessment Instrument, First edition, January 2006. Accessed via http://www.cphd.ecla.edu/.