

# The Pennsylvania Public Health Risk Assessment Tool

Created by  
The Drexel University School of Public Health  
Center for Public Health Readiness and Communication

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# Instructions for Using the Pennsylvania Public Health Risk Assessment Tool Workbook

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## Preface

The Pennsylvania Public Health Risk Assessment Tool (PHRAT) was developed by the Center for Public Health Readiness at the Drexel University School of Public Health. The project was 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.

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## Overview of the Pennsylvania Public Health Risk Assessment Tool

The Pennsylvania Public Health Risk Assessment Tool (PHRAT) was developed to help public health planners prioritize their planning efforts for emergencies that impact the health of the public. In order to inform these decisions, the Pennsylvania PHRAT guides planners through an analysis of the health-related impacts of various hazards that can occur in their jurisdictions. It assesses the planning that is necessary to ensure access to emergency response and preparedness resources, taking into account the services provided by public health agencies and the healthcare system.

The term *risk*, as it is 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 that results from a specific hazard, severity is measured in five major domains: human health, healthcare services, inpatient healthcare infrastructure, community health, and public health services. This tool 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). 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 or 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.

This tool can be used to generate a composite risk to the overall health of the entire jurisdiction, or it can be used to 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. This tool 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 Pennsylvania PHRAT 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. This tool attempts to generate a Planning Priority Score for specific hazards by including a quantified assessment of preparedness into the analysis. The Pennsylvania PHRAT uses the 15 Public Health Emergency Preparedness (PHEP) capabilities enumerated by the Centers for Disease Control and Prevention (CDC 2011) and the eight Healthcare Preparedness Program (HPP) capabilities from the 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 Pennsylvania PHRAT, 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 8 Healthcare Preparedness capabilities. In the Public Health System Risk Assessment sub-analysis, only the 15 PHEP capabilities are used to calculate preparedness. In the Healthcare System Risk Assessment, the 8 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 planners wish to "buy down" actual risk with specific hazard mitigation or preparedness activities, this tool can be used to measure that by reducing 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 this tool. The severity and probability analyses used in the Pennsylvania PHRAT 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 Health 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 tool, and Figures 2 and 3 illustrate the sub-analyses.

Figure 1. Pennsylvania Public Health Risk Assessment Conceptual Overview

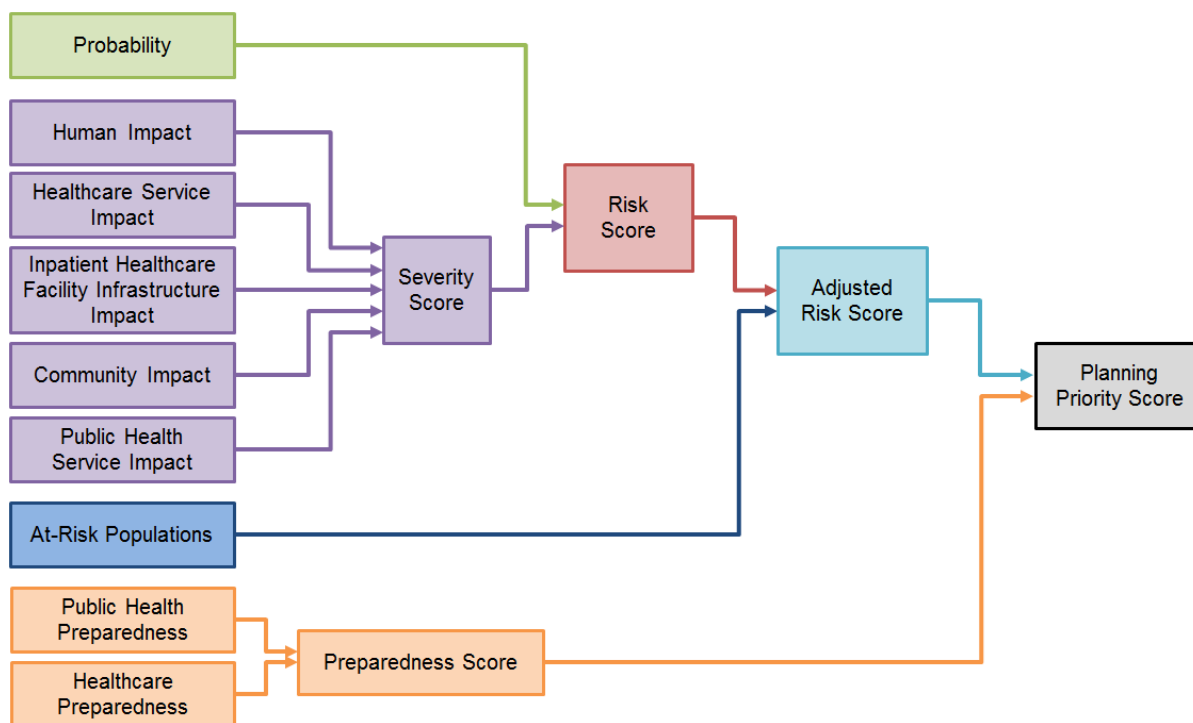


Figure 2. Subanalysis: Public Health System Risk Assessment Conceptual Overview

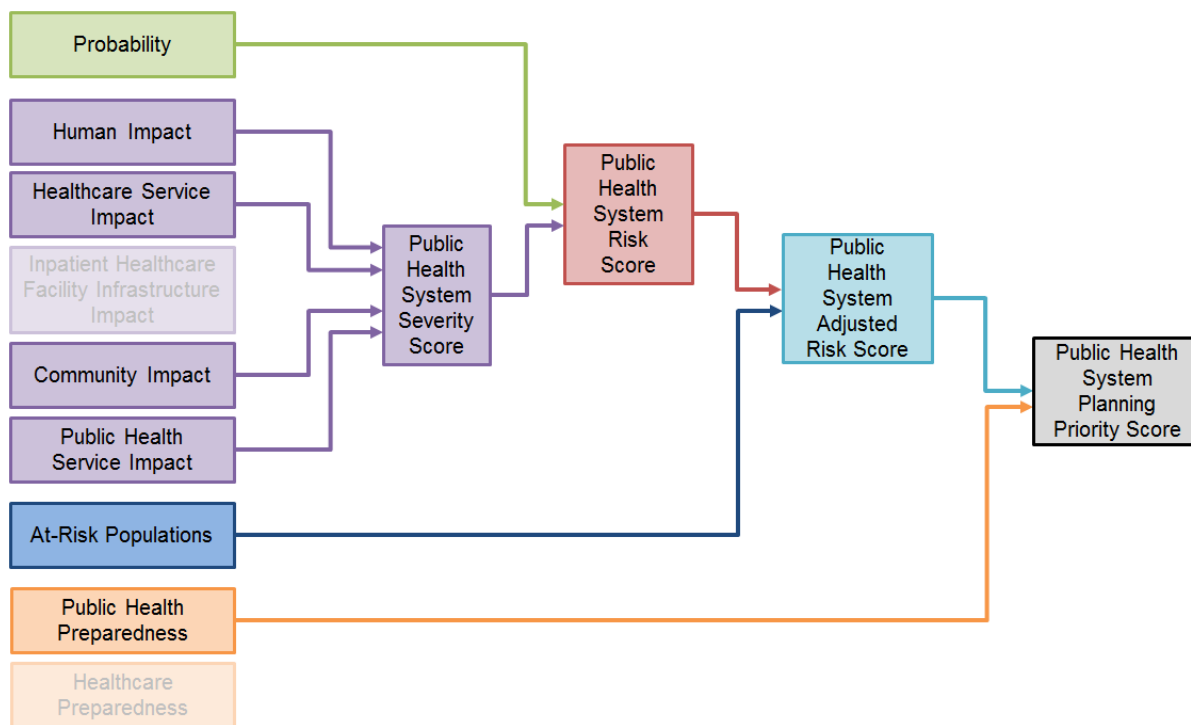
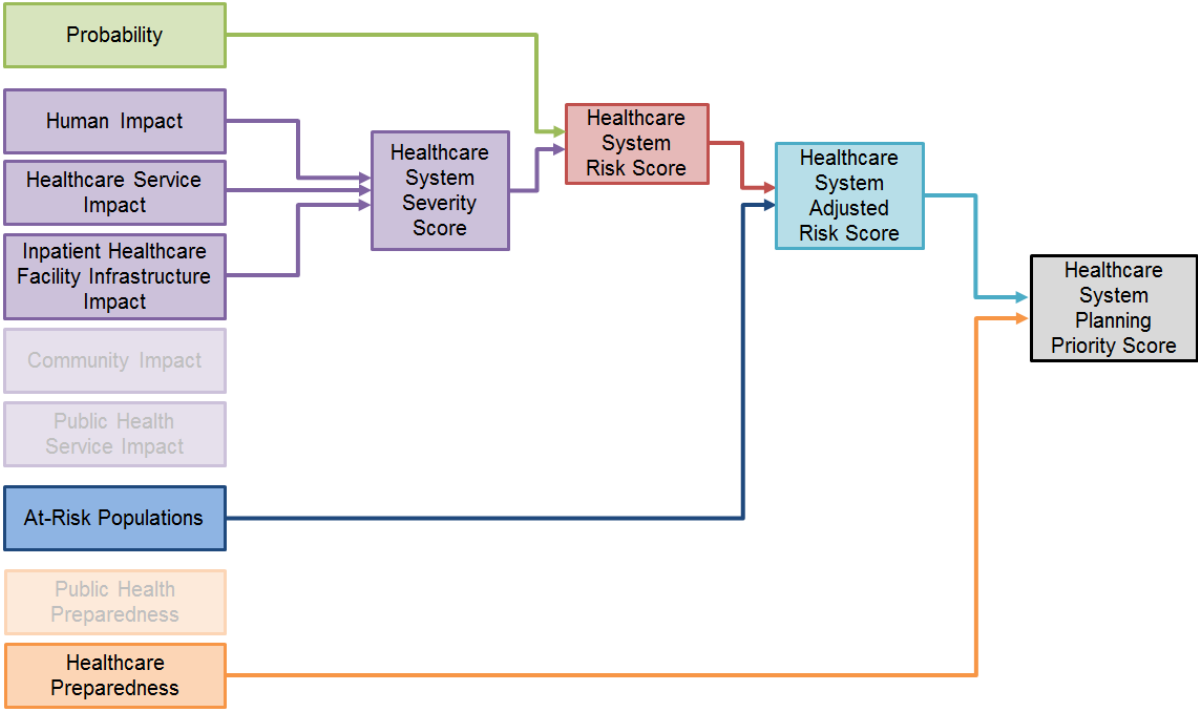


Figure 3. Subanalysis: Healthcare System Risk Assessment Conceptual Overview

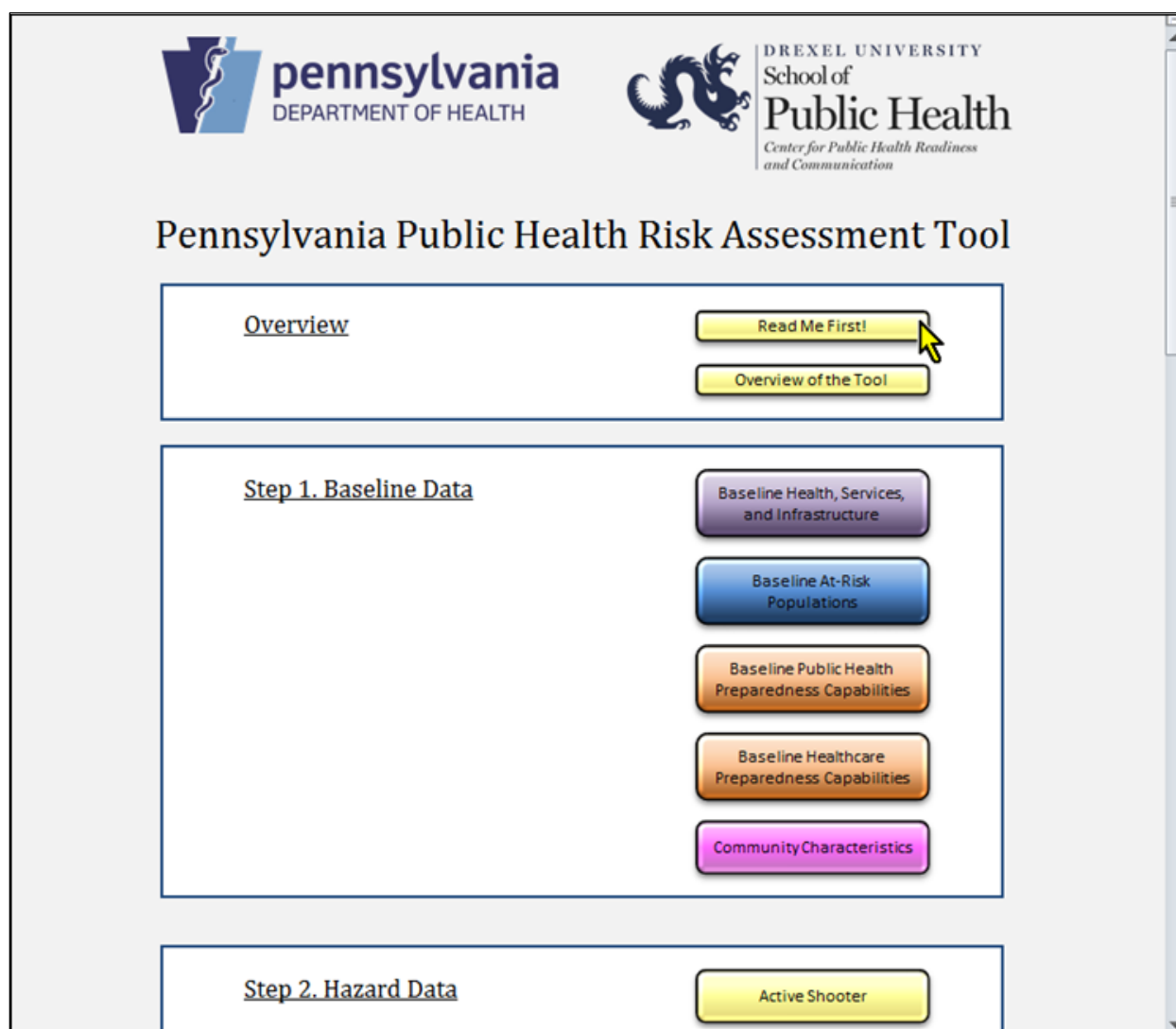


### The Workbook

This document will guide public health planners through the use of the Pennsylvania Public Health Risk Assessment Tool (PHRAT). The Pennsylvania PHRAT is a workbook developed in Microsoft® Excel. 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.

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 “Read Me First!” 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. Pennsylvania PHRAT Main Menu



## Step 1: Enter Baseline Data

Before entering information about the specific hazards being analyzed, you must enter certain "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

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.



It is 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 utilize 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 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*

The screenshot shows a web-based form titled "Pennsylvania Public Health Risk Assessment Tool" with a sub-header "Baseline Health, Services, and Infrastructure". A green "Main Menu" button is located in the top right corner. The form contains several input fields:

- Total Population in Jurisdiction:** 4008994
- Human Impact** (Section Header)
- Mortality** (Section Header)
- Total Deaths Per Day:** 96
- Deaths per 100,000 Per Day:** 2.39
- Data source:** Commonwealth of Pennsylvania, Department of Health, Health Statistics

For each metric, there is space to enter a "Data source." Entering this information is optional, and may be helpful to you when conducting future analyses. If you do not wish to enter a data source, simply leave these spaces empty.

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

### Baseline At-Risk Populations

The tool assesses the need for plans addressing at-risk populations by examining both the special needs of at-risk populations (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. The worksheet is illustrated in Figure 6.

Figure 6. Baseline At-Risk Populations Worksheet

**Pennsylvania Public Health Risk Assessment Tool** Main Menu

Baseline At-Risk Populations

Hearing Disability  
 Percent of Population with a Hearing Disability:   
 Population Size Score:   
 Data Source:

Vision Disability  
 Percent of Population with a Vision Disability:   
 Population Size Score:

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 US Census, County Health Profiles, countyhealthranking.org, or CDC’s Behavioral Risk Factor Surveillance System (BRFSS) data. Potential Sources of demographic data are listed in Table 1.

Table 1. Potential Sources for Population Size Data

| Population                                   | Potential Source of Population Size Data   |
|--|--|
| Hearing Disability                           | US Census ACS: Total civilian non-institutionalized population with a hearing difficulty                     |
| Vision Disability                            | US Census ACS: Total civilian non-institutionalized population with a vision difficulty                      |
| Ambulatory Disability                        | US Census ACS: Total civilian non-institutionalized population 5 years and over with a ambulatory difficulty |
| Cognitive Disability                         | US Census ACS: Total civilian non-institutionalized population 5 years and over with a cognitive difficulty  |
| Limited English Proficiency                  | Countyhealthrankings.org: % Not Proficient in English  |
| Poverty                                      | US Census ACS: Below poverty level   |
| Chronic Diseases (use persons with Diabetes) | Countyhealthrankings.org: % Diabetic   |
| Children, 18 and under                       | US Census ACS: Under 18 years  |
| Elderly, 65 and older                        | US Census ACS: 65 years and over   |

If you wish, you may enter the data sources that you used in the space labeled "Data Source." This is optional, but may help you locate data when conducting future analyses.

A Population Size Score is generated automatically 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

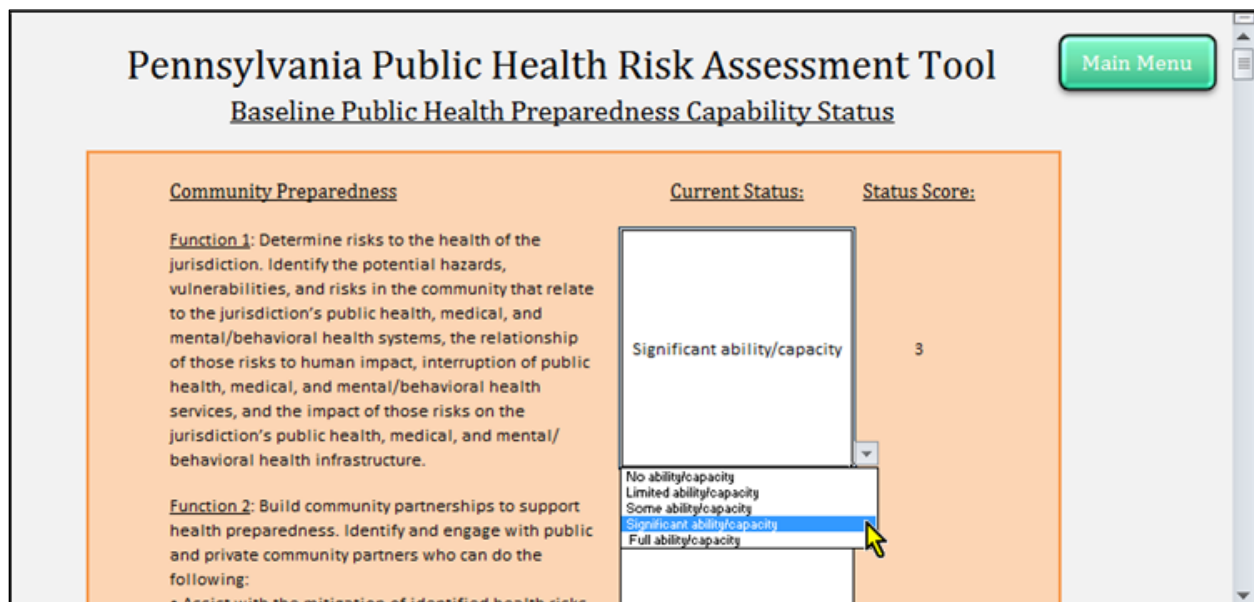
When completed, return to the Main Menu by clicking on the green "Main Menu" button in the upper right corner of the worksheet.

### 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.

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.

Figure 7. Baseline Public Health Preparedness Capability Status Worksheet



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 in order 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 Pennsylvania PHRAT uses certain community characteristics to estimate the impact of specific hazard scenarios. For example, the number of hospital beds located within ten 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. If you would like to change the hazard-specific estimates pre-entered into the hazard worksheets in the Pennsylvania PHRAT, 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 CPHRC 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.

### **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 entered by the CPHRC. The tool'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 apply to southeastern Pennsylvania and should not be applied to geographically distinct regions. For example, the impact of a coastal storm or tornado would likely be much more severe along the Gulf Coast or in the Great Plains, respectively.

If you would like to accept the assumptions made by the CPHRC, 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 made by the CPHRC and enter hazard-specific data that is more relevant to your unique jurisdiction, you can enter data directly into the hazard worksheets.

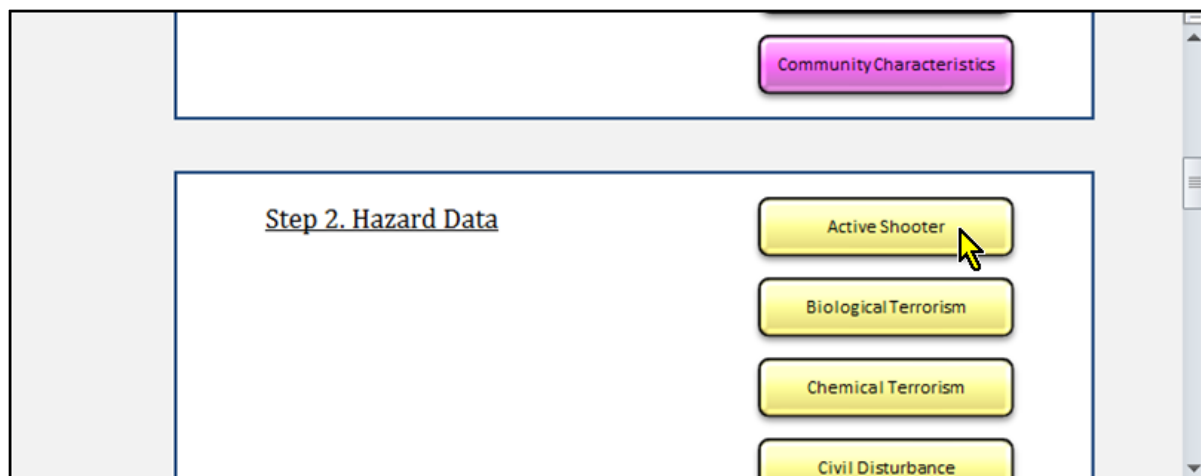
Even if you choose to accept the assumptions made by the CPHRC, you may have to alter the scores of certain metrics if your jurisdiction has a baseline of zero in any metric. For example, if the jurisdiction has zero hospital beds, the hospital bed metric will be scored as “Not Calculated,” because division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

The following instructions describe how to complete the hazard worksheets.

### [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*



### [Hazard Scenario](#)

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. However, for other hazards, such as a nuclear facility accident, the worst-case reasonable 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. Hazard Worksheet: Describe the Worst-Case Reasonable Scenario of this Hazard.

**Pennsylvania 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 (Ciottono, 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 in Southeastern Pennsylvania 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

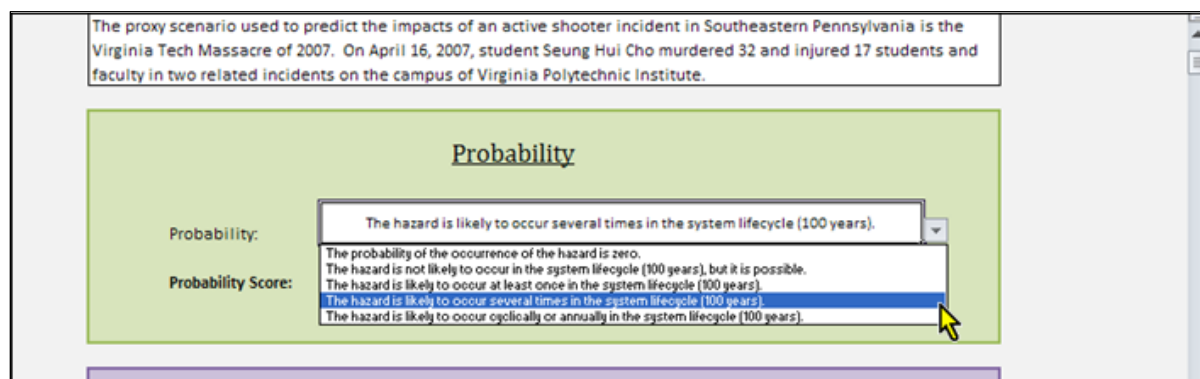
The first component of the Risk Score in this tool is an assessment of the probability that a given hazard will occur. The Pennsylvania PHRAT defines the probability of an incident as the likelihood that a hazard or threat will affect the jurisdiction within a system lifecycle of 100 years. One hundred 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     | The hazard is not likely to occur in the system lifecycle (100 years), but it is possible |
| 2 = Occasional | The hazard is likely to occur at least once in the system lifecycle                       |
| 3 = Probable   | The hazard is likely to occur several times in the system lifecycle.                      |
| 4 = Frequent   | The hazard is likely to occur cyclically or annually in the system lifecycle.             |

Figure 10. Hazard Worksheet: Enter Probability



### Enter Impact Data for Hazards for Severity Assessment

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  | Personnel   | Public health employee supply/demand                                  |



|                       |                         |  |
|-----------------------|-------------------------|--|
| Health Service Impact |                         | 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 this tool can be completed either quantitatively or qualitatively.

## Completing the Severity Assessment Quantitatively

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*

The screenshot shows a worksheet titled "Human Impact" with a purple background. It contains the following fields and data:

- Mortality**
  - Baseline Mortality per Day: 96
  - Hazard-Related Increase in Mortality per Day: 33
  - Magnitude Score: 2
- Qualitative Magnitude Score:**
  - Duration of Impact: A drop-down menu is open, showing options: "No impact (Score = 0)", "≤ 1 day (Score = 1)", "≤ 1 week (Score = 2)", "≤ 2 weeks (Score = 3)", and "> 2 weeks (Score = 4)". The "≤ 1 day (Score = 1)" option is selected.
  - Duration Score: 1.5
  - Data Source / Explanation (Optional): In the VA Tech Massacre of 2007, 33 died at the scene, including the Frykberg, 2007.
- Mortality Score:** 1.5

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 “2.” and the Duration Score is “1.” The Mortality Score, shown at the bottom, is then automatically generated as the average of the two scores, “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. “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); “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.

### Completing the Severity Assessment Qualitatively

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. This tool 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*

**Human Impact**

**Mortality**

Baseline Mortality per Day: 96

Hazard-Related Increase in Mortality per Day: 33

Magnitude Score: 2

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

**OR, Estimate the Magnitude Qualitatively:**

**Qualitative Magnitude Score:**

Duration of Impact:

Duration Score:

**Data Source / Explanation (Optional):**  
In the VA Tech Massacre of 2007, 33 died at the scene, including the shooter (Armstrong & Frykberg, 2007).

**Mortality Score:** 1.5

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.

### Risk Calculated Automatically

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*

The screenshot displays a digital form with two main sections: a purple box for 'Severity' and a red box for 'Risk'. The 'Severity' section includes three rows of data: 'Severity Score: 0.74' (with sub-metrics: Human, Healthcare Service, Healthcare Infrastructure, Community, Public Health), 'Public Health System Severity Score: 0.87' (with sub-metrics: Human, Healthcare Service, Community, Public Health), and 'Healthcare System Severity Score: 1.00' (with sub-metrics: Human, Healthcare Service, Healthcare Infrastructure). The 'Risk' section includes three rows: 'Risk Score: 13.93' (with formula: Overall Risk = 100 × (Probability × Overall Severity) / 16), 'Public Health System Risk Score: 16.24' (with formula: Public Health Risk = 100 × (Probability × Public Health Severity) / 16), and 'Healthcare System Risk Score: 18.75' (with formula: Healthcare Risk = 100 × (Probability × Healthcare Severity) / 16). A vertical scrollbar is visible on the right side of the form.

| <u>Severity</u>  |             |
|--|-------------|
| <b>Severity Score:</b><br>(Human, Healthcare Service, Healthcare Infrastructure, Community, Public Health) | <b>0.74</b> |
| <b>Public Health System Severity Score:</b><br>(Human, Healthcare Service, Community, Public Health)       | <b>0.87</b> |
| <b>Healthcare System Severity Score:</b><br>(Human, Healthcare Service, Healthcare Infrastructure)         | <b>1.00</b> |

| <u>Risk</u>   |              |
|---|--------------|
| <b>Risk Score:</b><br>Overall Risk = 100 × (Probability × Overall Severity) / 16                                  | <b>13.93</b> |
| <b>Public Health System Risk Score:</b><br>Public Health Risk = 100 × (Probability × Public Health Severity) / 16 | <b>16.24</b> |
| <b>Healthcare System Risk Score:</b><br>Healthcare Risk = 100 × (Probability × Healthcare Severity) / 16          | <b>18.75</b> |

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 scenario, select an option from the “Qualitative” drop-down menu to score the metric qualitatively. 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.”

### Enter Information for At-Risk Populations

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*

The screenshot shows a software interface titled "At-Risk Populations". Under the heading "Public Information", there is a question: "Does an appropriate response to this hazard require special plans and procedures to be in place relevant to emergency communication and public information (both delivery mechanisms and content messaging) for the following at-risk populations?". Below this question is a table with nine rows, each representing a population category and its corresponding score. A dropdown menu is open over the first row, showing "Yes" selected and "No" as an alternative option.

| Category                    | Score |
|-----------------------------|-------|
| Hearing Disability          | 1     |
| Vision Disability           | 1     |
| Ambulatory Disability       | 0     |
| Cognitive Disability        | 1     |
| Limited English Proficiency | 1     |
| Poverty                     | 1     |
| Chronic Diseases (Diabetes) | 0     |
| Children 18 and under       | 1     |
| Elderly 65 and older        | 0     |

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

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

The overall At-Risk Populations 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 (4) can have the effect of doubling the original Risk Score for a hazard, whereas a minimum At-Risk Populations Score (0) 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*

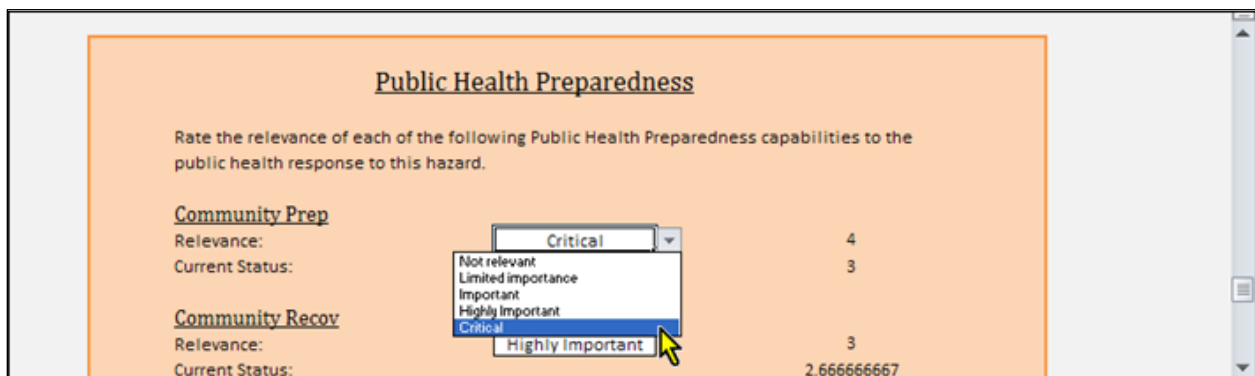


### Enter Preparedness Data

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, this tool 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:

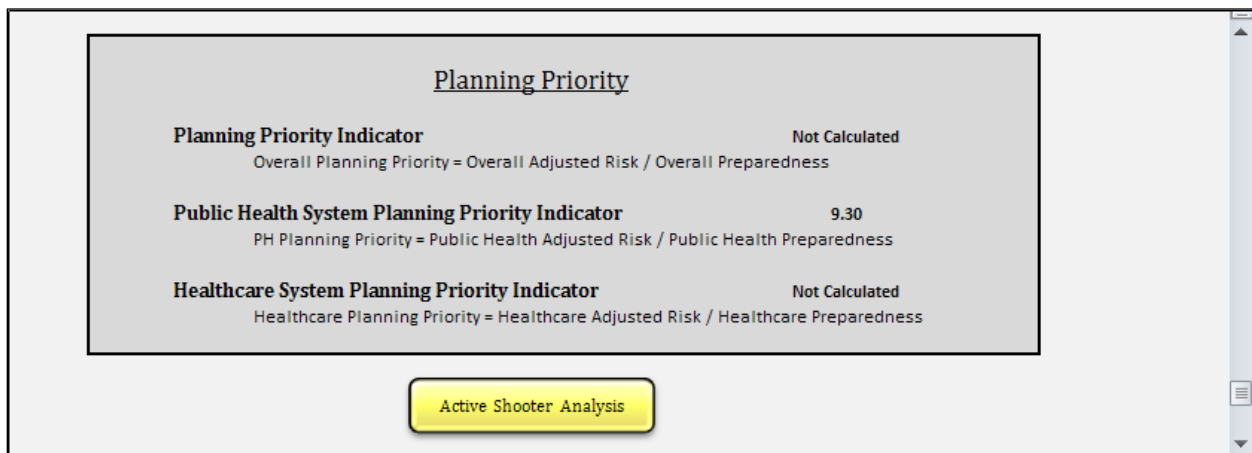
$$\text{Planning Priority Indicator} = \text{Adjusted Risk Score} / \text{Preparedness Score}$$

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 “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 “Analysis” of the hazard. 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.

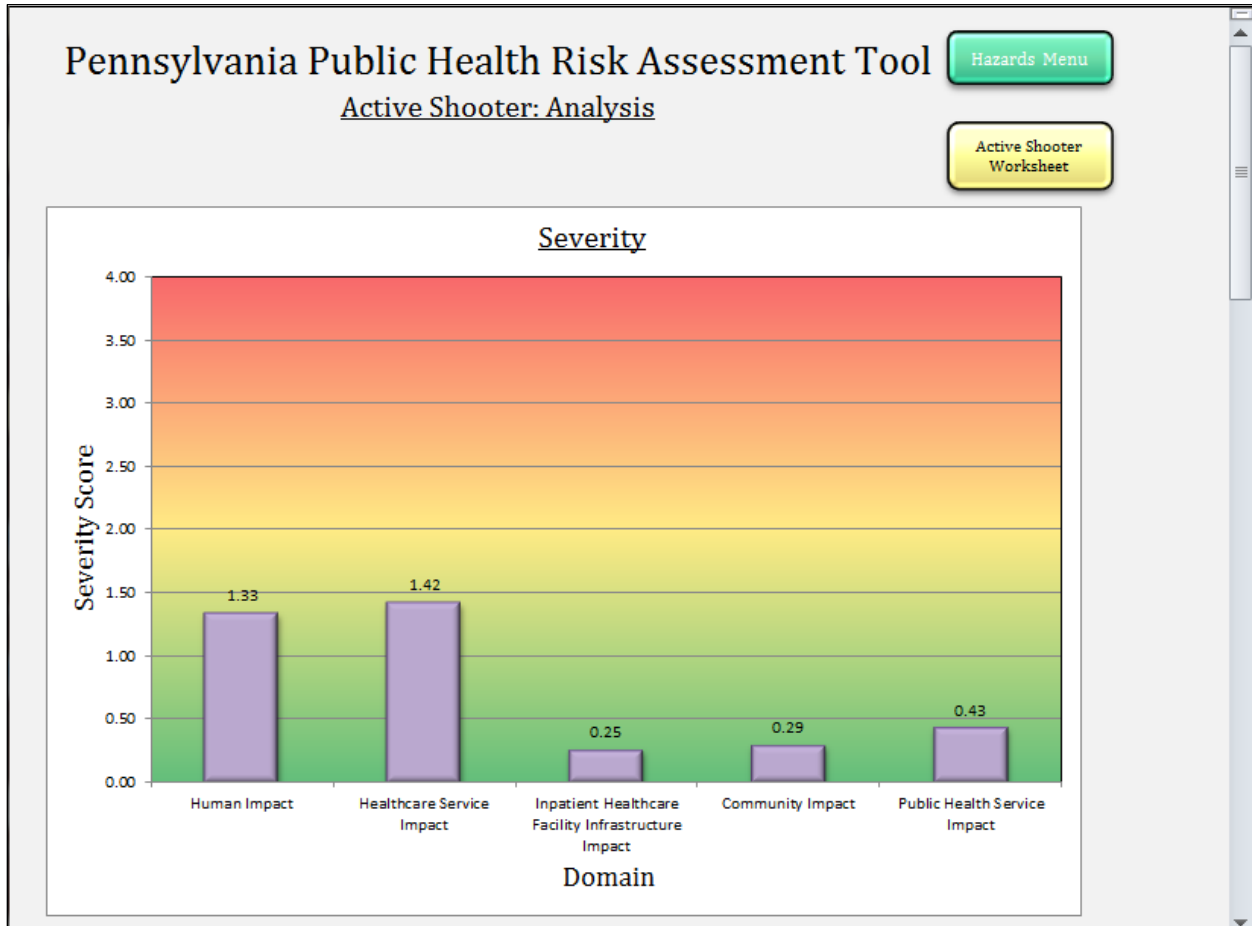
## Hazard Analysis Worksheets

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.



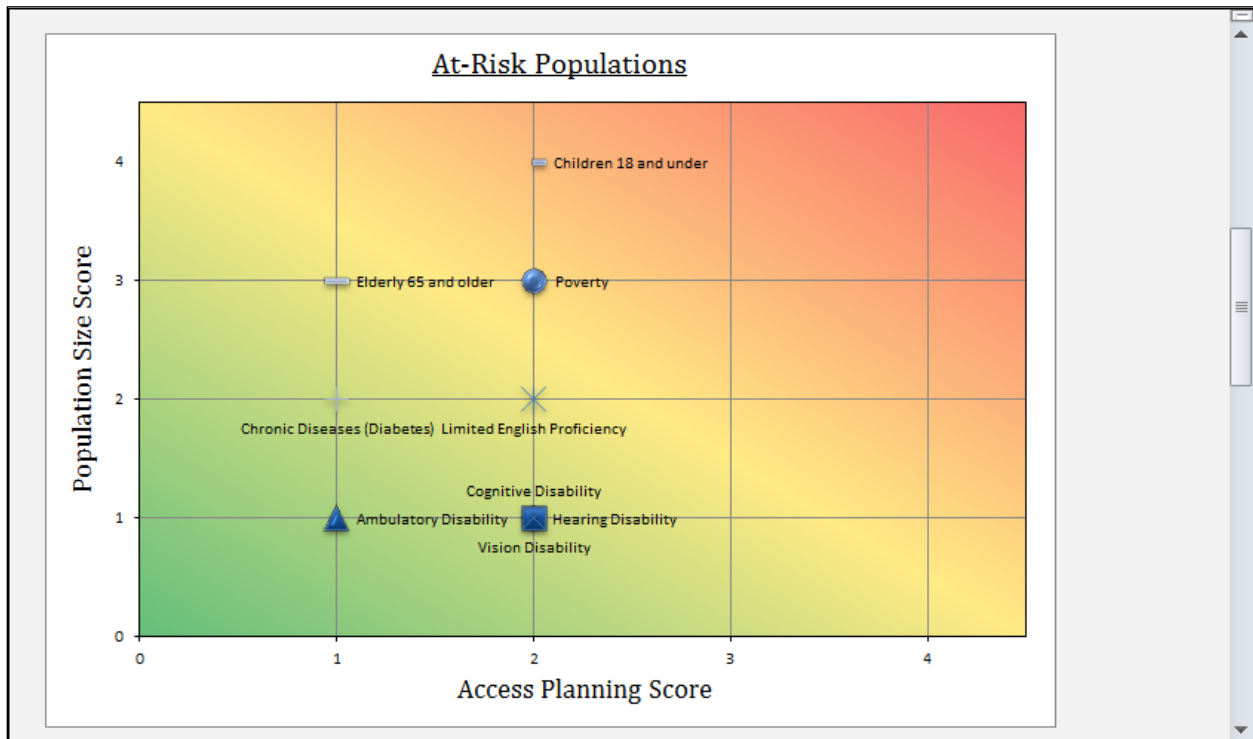
The hazard analysis worksheet contains four graphs. The first is a graph of severity by domain, as shown in Figure 18. This shows the five severity domains: Human Impact, Healthcare Service Impact, Inpatient Healthcare Facility Infrastructure Impact, Community Impact, and Public Health Service Impact. 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



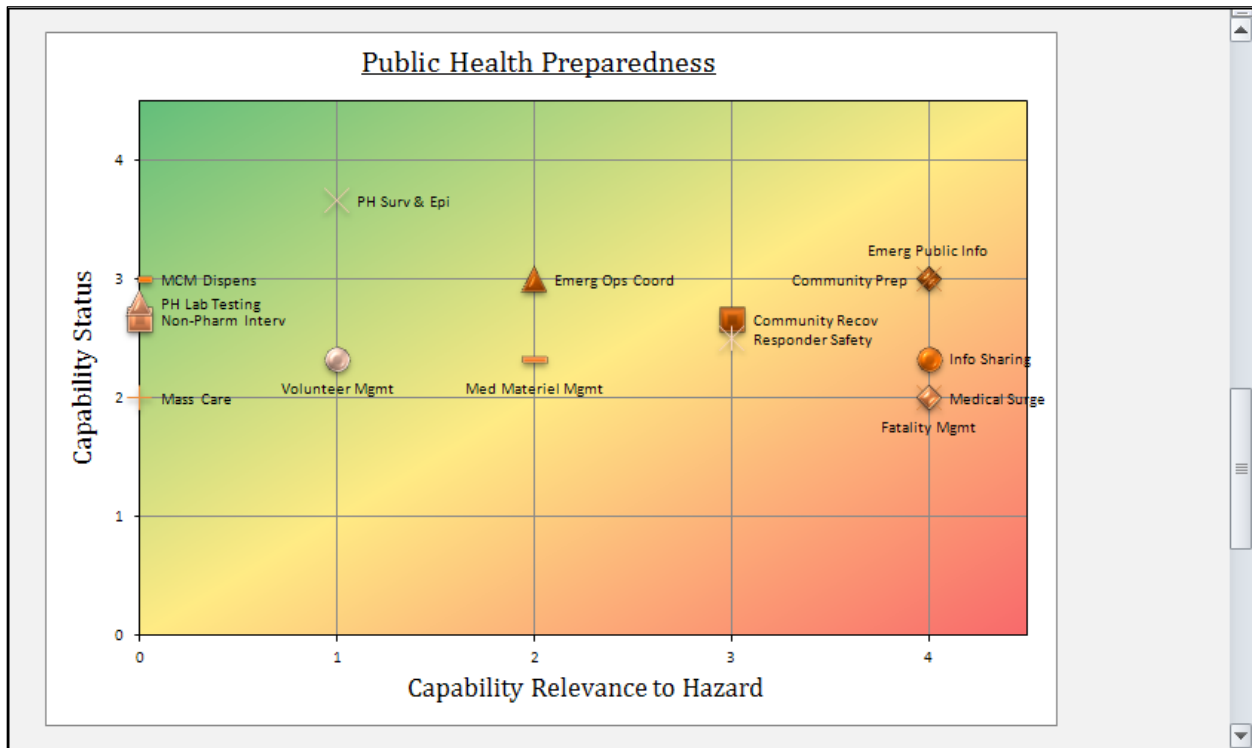
The next graph is a breakdown of the At-Risk Populations Score. To calculate the At-Risk Populations Score, each population is assigned a Population Size Score and an Access Planning Score. In the At-Risk Populations graph, the Population Size Score is represented on the y-axis, and the Access Planning 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.

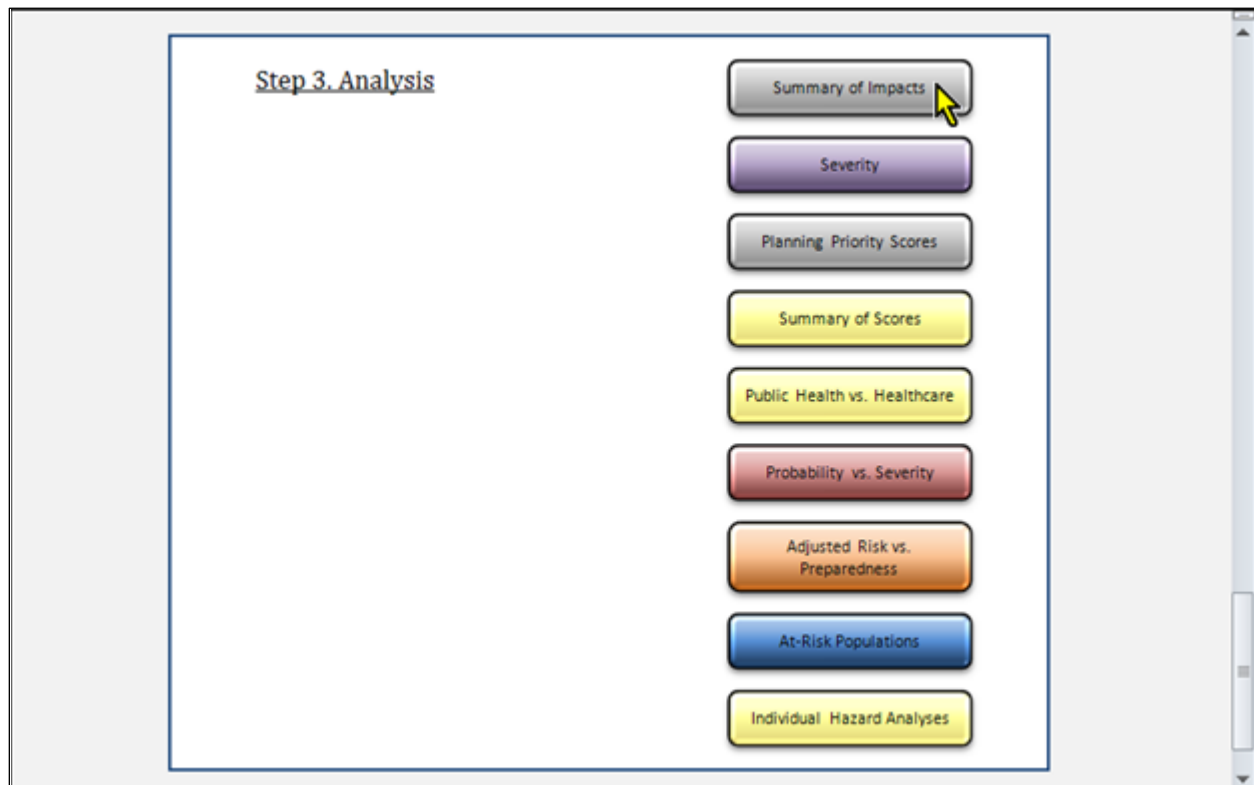
*Figure 20. Hazard Analysis Worksheet: Preparedness Capability Relevance vs. Status*



### 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.

*Figure 21. Main Menu: Analysis*



## Summary of Impacts

The “Summary of Impacts” is designed to be printed on legal-sized paper. This sheet summarizes all of the data that has been entered for all of the hazards. 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 in Figure 22.

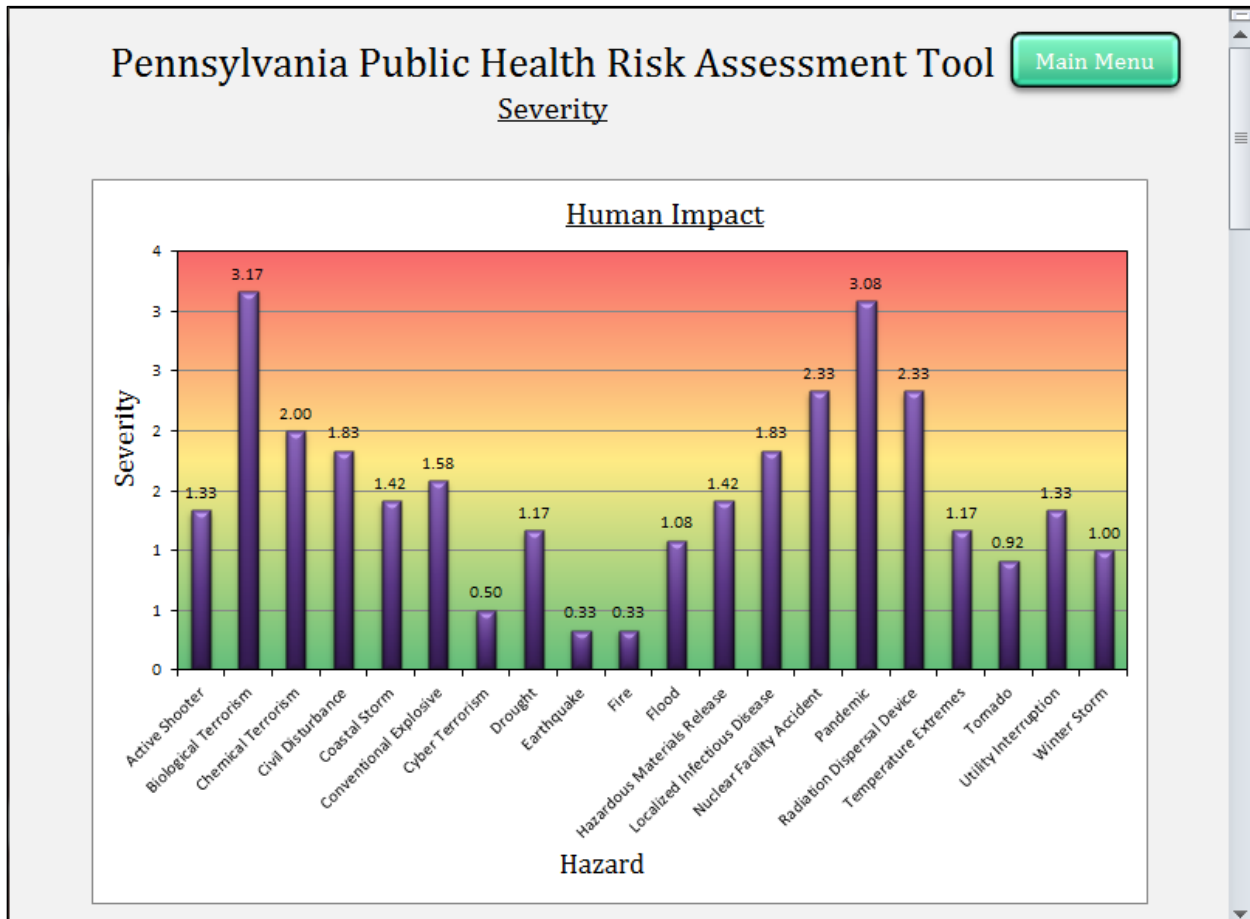
Figure 22: Summary of Impacts

| Pennsylvania Public Health Risk Assessment Tool<br>Summary of Impacts <span style="float: right; border: 1px solid black; padding: 2px 5px;">Main Menu</span>  |  |   |   |   |   |  |   |             |
|--|--|---|---|---|---|--|---|-------------|
|  | Active Shooter   | Biological Terrorism                                    | Chemical Terrorism                                      | Civil Disturbance                                       | Coastal Storm   | Conventional Explosive                                       | Cyber Terrorism   |             |
| Probability  | Probable   | Remote  | Remote  | Occasional  | Frequent  | Occasional   | Remote  |             |
| <b>Human Impact</b>  |  |   |   |   |   |  |   |             |
| Mortality (Increase in Deaths per day)   | 33   | 440   | 2,850   | 4   | 3   | 1,380  | 0   |             |
| EMS Transports (Increase in Transports per day)  | 17   | 30  | 150   | 53  | 833   | 1,140  | 0   |             |
| ED Visits (Increase in ED visits per day)  | 27   | 100   | 150   | 172   | 587   | 4,530  | 0   |             |
| Primary Care Office Visits (Increase in office visits per day)   | 0  | 21,899  | 24,591  | 0   | 0   | 1,920  | 0   |             |
| Trauma Center Injuries (Increase in Trauma Center Injuries per day)  | 12   | 0   | 2   | 12  | 3   | 690  | 0   |             |
| Mental Health Impact (Percent of population developing psychopathology and behavioral changes after the incident, including PTSD, depression, anxiety, alcohol and substance abuse, domestic violence, and loss of social functions) | Population displays distress with 25% - 43% psychopathology. | Population displays distress with ≥50% psychopathology. | Population displays distress with ≥50% psychopathology. | Population displays distress with <25% psychopathology. | Effects weak or highly transient; occasional or minor loss of nonessential social functions in a circumscribed geographical area. | Population displays distress with 25% - 43% psychopathology. | Population displays distress with <25% psychopathology. | Pop dis pss |
| <b>Healthcare Service Impact</b>   |  |   |   |   |   |  |   |             |
| Outpatient services (PCPs) Interruption  | 0  | 111   | 0   | 244   | 5,535   | 0  | 0   |             |
| Outpatient services (PCPs) Demand  | 0  | 1,095   | 1,230   | 0   | 0   | 96   | 0   |             |
| Emergency Department Services (ED beds) Interruption   | 0  | 23  | 0   | 0   | 0   | 0  | 230   |             |
| Emergency Department Services (ED beds) Demand   | 6  | 22  | 33  | 38  | 131   | 1,007  | 0   |             |
| Hospital Beds (Beds set up and staffed) Interruption   | 0  | 277   | 0   | 0   | 0   | 0  | 0   |             |
| Hospital Beds (Beds set up and staffed) Demand   | 27   | 15,409  | 150   | 111   | 0   | 750  | 2,769   |             |
| Ancillary Services (Pharmacists) Interruption  | 0  | 115   | 0   | 518   | 2,877   | 0  | 0   |             |
| Ancillary Services (Pharmacists) Demand  | 0  | 23  | 2,877   | 0   | 0   | 0  | 1,151   |             |
| Trauma Units (Functioning ORs) Interruption  | 0  | 0   | 0   | 0   | 0   | 0  | 0   |             |
| Trauma Units (Functioning ORs) Demand  | 12   | 0   | 2   | 12  | 3   | 690  | 0   |             |
| Mental Health Services (Mental Health Providers) Interruption  | 0  | 74  | 0   | 363   | 1,844   | 0  | 0   |             |
| Mental Health Services (Mental Health Providers) Demand  | 1,920  | 52,557  | 384,863   | 28  | -1,844  | 240,000  | 369   |             |
| <b>Inpatient Healthcare Facility Infrastructure Impact</b>   |  |   |   |   |   |  |   |             |
| Hospital Personnel Loss of RNs per Shift   | 0  | 98  | 0   | 0   | 0   | 0  | 0   |             |
| Hospital Personnel Change in Nurse-Pt Ratio  | 1  | 3   | 1   | 1   | 1   | 1  | 1   |             |

## 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.

Figure 23: Severity

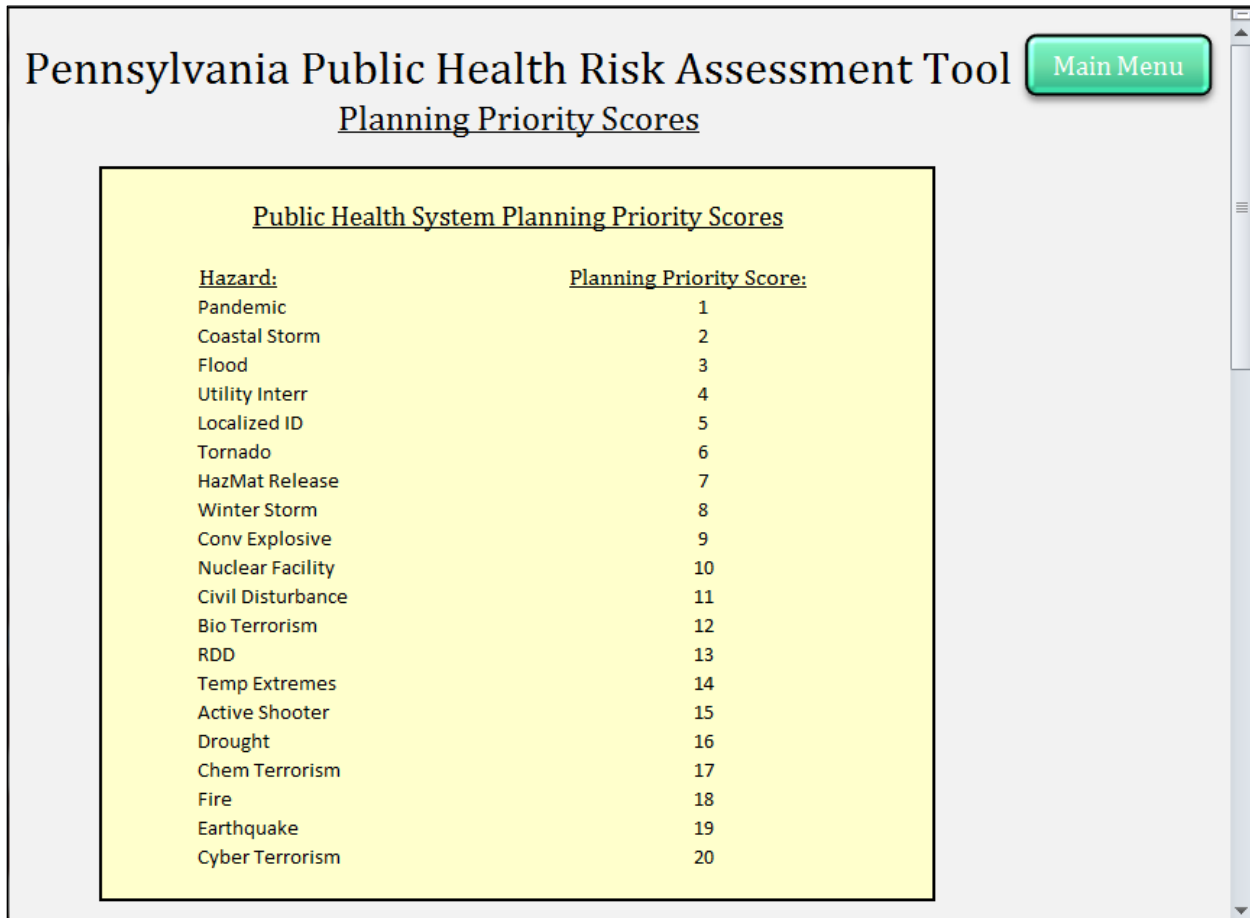


## Planning Priority Scores

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.

*Figure 24. Planning Priority Scores*



The screenshot shows a software interface titled "Pennsylvania Public Health Risk Assessment Tool" with a "Main Menu" button. Below the title is the section "Planning Priority Scores". A yellow box contains the "Public Health System Planning Priority Scores" table, which lists 20 hazards ranked from 1 to 20.

| <u>Hazard:</u>    | <u>Planning Priority Score:</u> |
|-------------------|---------------------------------|
| Pandemic          | 1                               |
| Coastal Storm     | 2                               |
| Flood             | 3                               |
| Utility Interr    | 4                               |
| Localized ID      | 5                               |
| Tornado           | 6                               |
| HazMat Release    | 7                               |
| Winter Storm      | 8                               |
| Conv Explosive    | 9                               |
| Nuclear Facility  | 10                              |
| Civil Disturbance | 11                              |
| Bio Terrorism     | 12                              |
| RDD               | 13                              |
| Temp Extremes     | 14                              |
| Active Shooter    | 15                              |
| Drought           | 16                              |
| Chem Terrorism    | 17                              |
| Fire              | 18                              |
| Earthquake        | 19                              |
| Cyber Terrorism   | 20                              |

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. Summary of Scores*

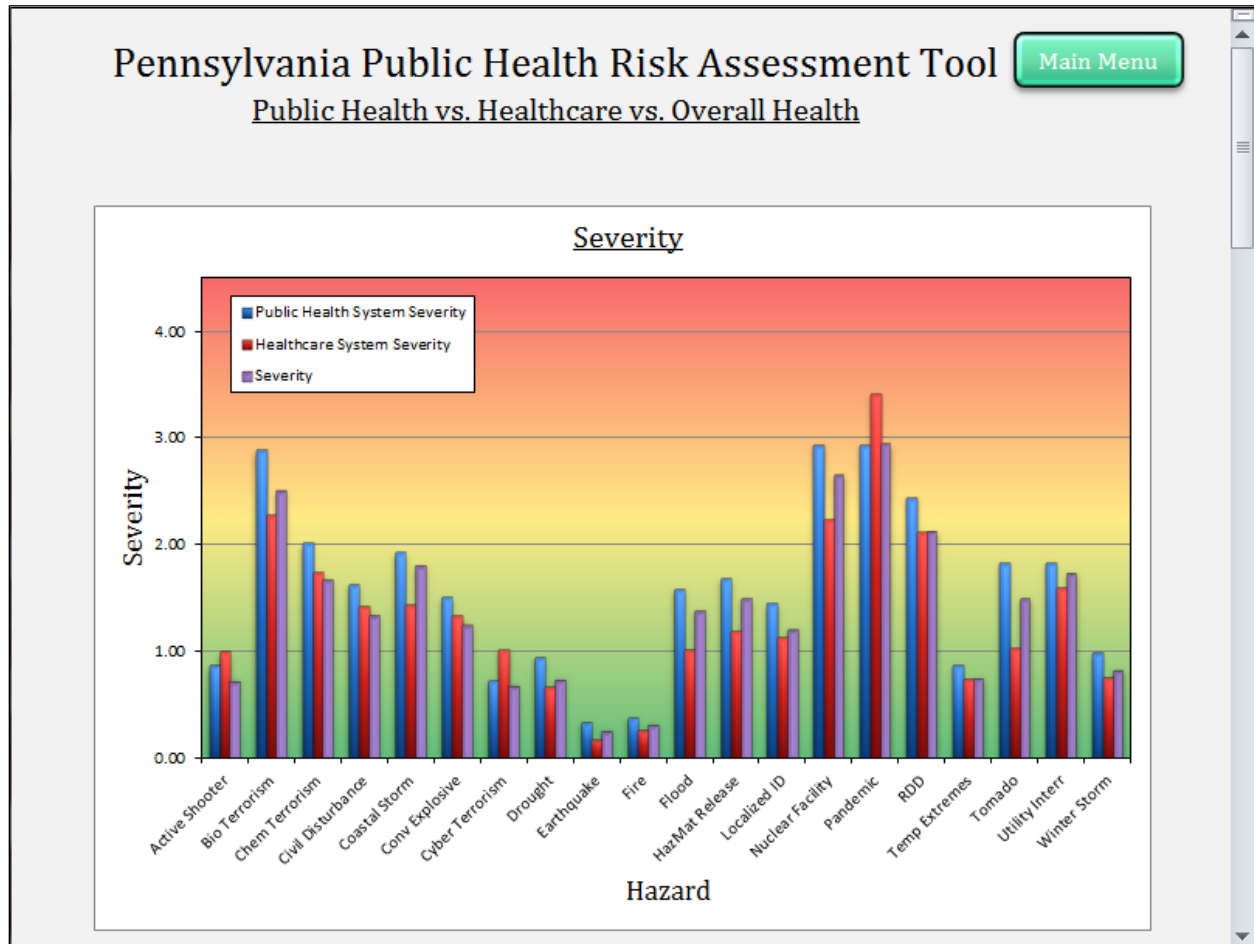
| Pennsylvania Public Health Risk Assessment Tool |                   |                |           |         |            |           |         |                     |                     |           |         |
|---|-------------------|----------------|-----------|---------|------------|-----------|---------|---------------------|---------------------|-----------|---------|
| Summary of Scores                               |                   |                |           |         |            |           |         |                     |                     |           |         |
| Hazard  | Probability Score | Severity Score |           |         | Risk Score |           |         | At-Risk Populations | Adjusted Risk Score |           |         |
|   |                   | PH System      | HC System | Overall | PH System  | HC System | Overall |                     | PH System           | HC System | Overall |
| Active Shooter                                  | 3                 | 0.87           | 1.00      | 0.74    | 16.24      | 18.75     | 13.93   | 1.83                | 23.68               | 27.34     | 20.31   |
| Bio Terrorism                                   | 1                 | 2.89           | 2.28      | 2.51    | 18.04      | 14.24     | 15.68   | 2.33                | 28.57               | 22.54     | 24.83   |
| Chem Terrorism                                  | 1                 | 2.01           | 1.74      | 1.67    | 12.59      | 10.89     | 10.47   | 2.67                | 20.99               | 18.16     | 17.44   |
| Civil Disturbance                               | 2                 | 1.63           | 1.42      | 1.34    | 20.35      | 17.80     | 16.75   | 1.83                | 29.68               | 25.95     | 24.42   |
| Coastal Storm                                   | 4                 | 1.93           | 1.43      | 1.82    | 48.14      | 35.76     | 45.39   | 2.67                | 80.23               | 59.61     | 75.64   |
| Conv Explosive                                  | 2                 | 1.51           | 1.33      | 1.26    | 18.86      | 16.67     | 15.71   | 2.72                | 31.70               | 28.01     | 26.41   |
| Cyber Terrorism                                 | 1                 | 0.73           | 1.02      | 0.70    | 4.58       | 6.38      | 4.36    | 1.33                | 6.10                | 8.51      | 5.82    |
| Drought   | 3                 | 0.95           | 0.67      | 0.76    | 17.75      | 12.50     | 14.20   | 1.83                | 25.88               | 18.23     | 20.70   |
| Earthquake                                      | 3                 | 0.34           | 0.17      | 0.27    | 6.36       | 3.13      | 5.09    | 1.33                | 8.48                | 4.17      | 6.79    |
| Fire  | 4                 | 0.38           | 0.26      | 0.33    | 9.52       | 6.60      | 8.24    | 2.67                | 15.87               | 11.00     | 13.74   |
| Flood   | 4                 | 1.59           | 1.01      | 1.39    | 39.66      | 25.35     | 34.85   | 2.67                | 66.10               | 42.25     | 58.09   |
| HazMat Release                                  | 2                 | 1.69           | 1.19      | 1.50    | 21.13      | 14.93     | 18.78   | 2.67                | 35.22               | 24.88     | 31.30   |
| Localized ID                                    | 4                 | 1.45           | 1.13      | 1.22    | 36.24      | 28.30     | 30.55   | 1.83                | 52.84               | 41.27     | 44.55   |
| Nuclear Facility                                | 1                 | 2.93           | 2.24      | 2.66    | 18.34      | 14.02     | 16.63   | 2.67                | 30.57               | 23.37     | 27.71   |
| Pandemic  | 3                 | 2.94           | 3.42      | 2.94    | 55.13      | 64.06     | 55.13   | 1.94                | 81.94               | 95.20     | 81.94   |
| RDD   | 1                 | 2.45           | 2.13      | 2.13    | 15.29      | 13.28     | 13.33   | 2.83                | 26.12               | 22.69     | 22.77   |
| Temp Extremes                                   | 3                 | 0.87           | 0.74      | 0.76    | 16.35      | 13.93     | 14.25   | 2.28                | 25.66               | 21.87     | 22.37   |
| Tornado   | 2                 | 1.84           | 1.03      | 1.51    | 22.95      | 12.93     | 18.83   | 2.44                | 36.98               | 20.84     | 30.34   |
| Utility Interr                                  | 3                 | 1.84           | 1.60      | 1.74    | 34.43      | 29.95     | 32.70   | 2.11                | 52.60               | 45.75     | 49.96   |
| Winter Storm                                    | 4                 | 0.98           | 0.75      | 0.84    | 24.55      | 18.75     | 20.89   | 1.83                | 35.81               | 27.34     | 30.47   |



[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 in Figure 26.

*Figure 26. Public Health vs. Healthcare*

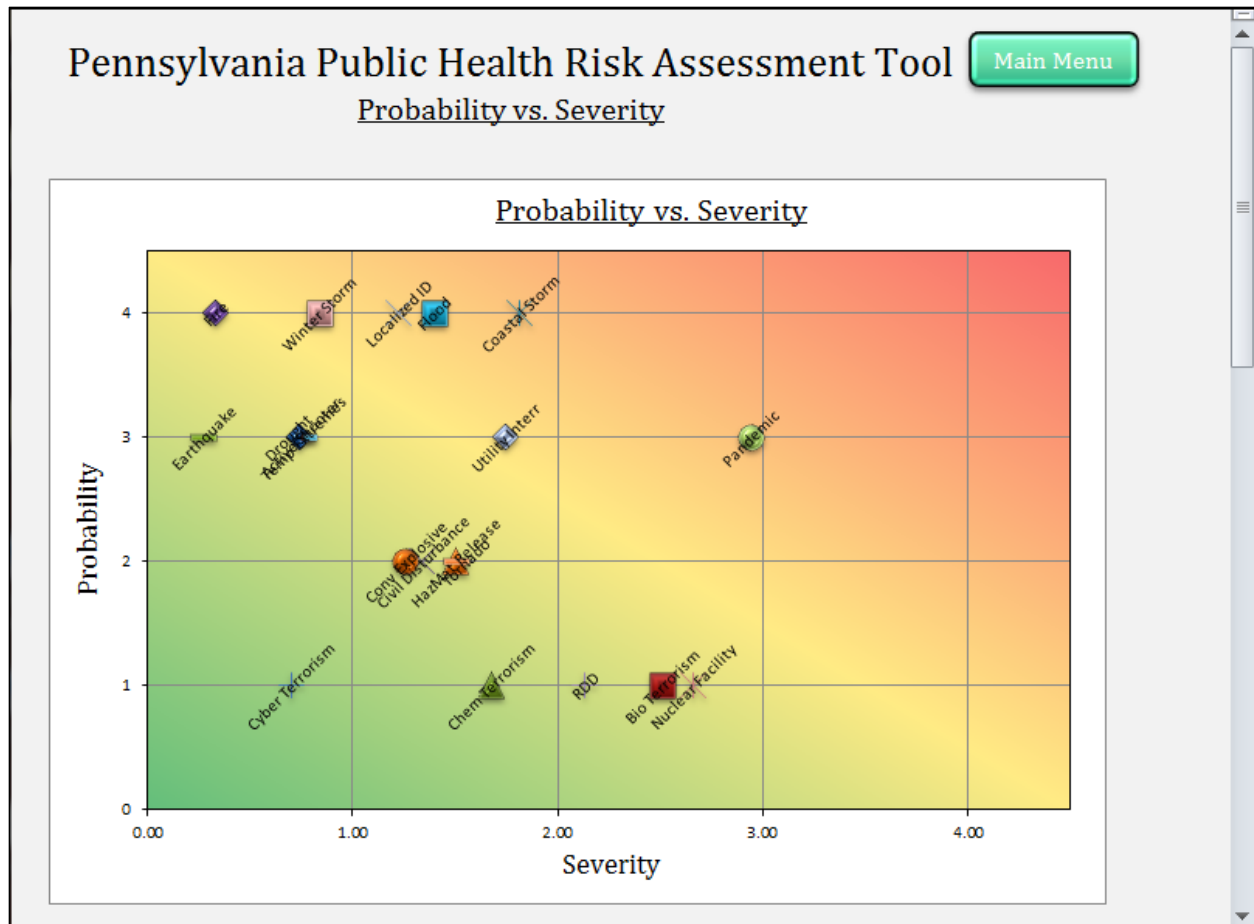


## Probability vs. Severity

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 in Figure 27.

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.

*Figure 27. Probability vs. Severity*

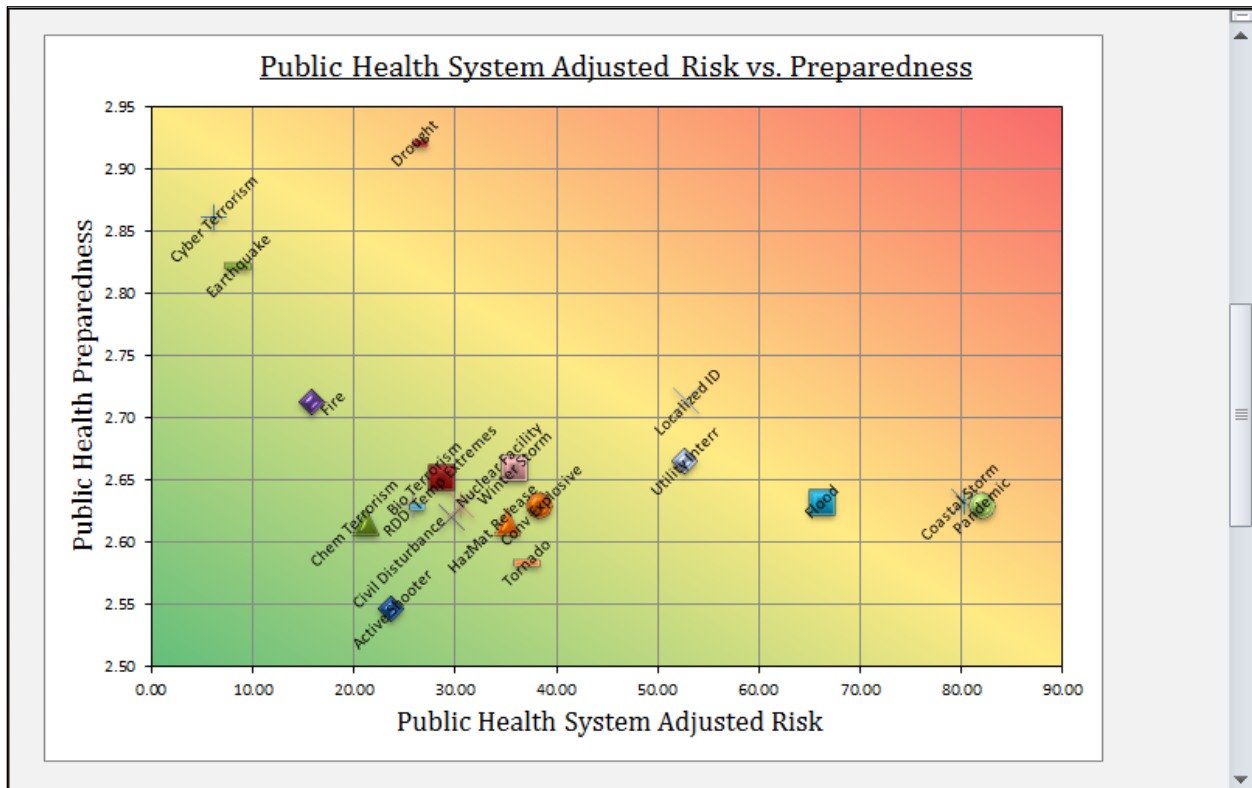


### Adjusted Risk vs. Preparedness

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 do 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.

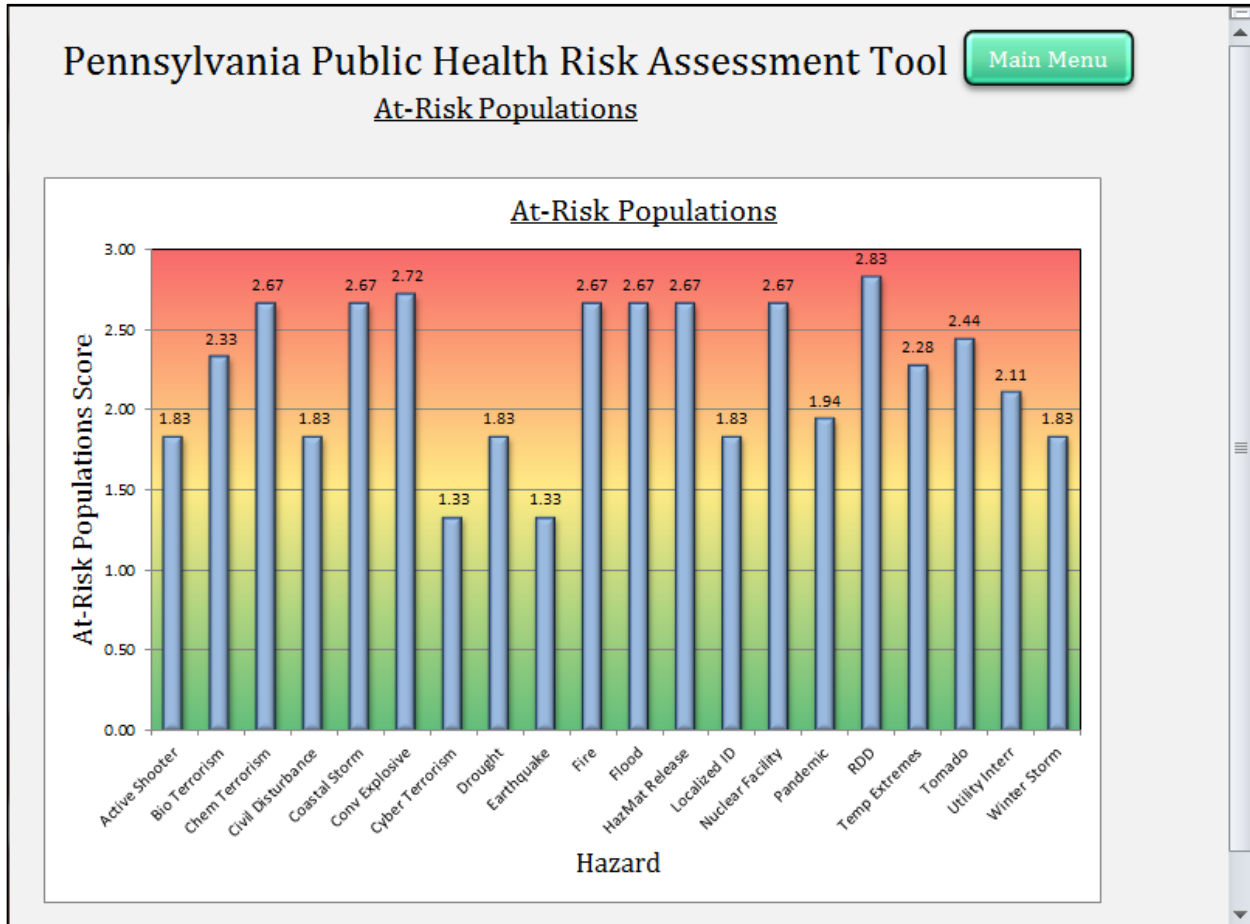
*Figure 28. Public Health System Adjusted Risk vs. Public Health Preparedness*



## 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. At-Risk Populations*

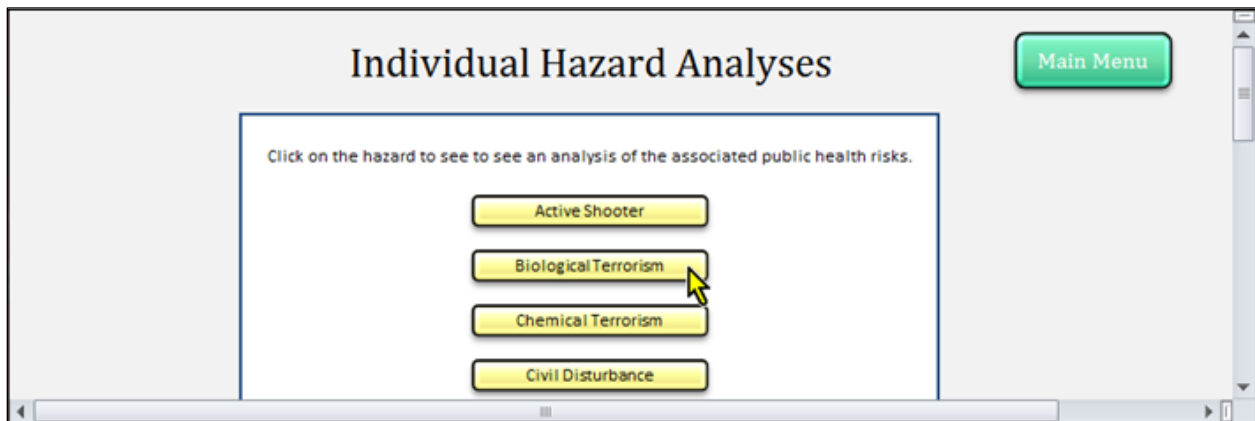


## Individual Hazard Analyses

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. Individual Hazard Analyses Menu*



## 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. Available at [http://www2.ku.edu/~rrtcpbs/resources/pdf/FEMA\\_CPG301.pdf](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. Available at <http://www.njha.com/ep/pdf/627200834041PM.pdf>.
- Regional Catastrophic Planning Team, NYC Health, Worksheet Instructions for the Public Health 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, (<http://www.cphd.ecla.edu/>)