DREXEL UNIVERSITY
School of
Public Health
Center for Public Health Readiness and Communication

Instructions for Using the Public Health Risk Assessment Tool Workbook

October 2022, revised version

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Overview of the Public Health Risk Assessment Tool

The Public Health Risk Assessment Tool (PHRAT) is intended to help public health planners prioritize their planning efforts for public health emergencies. To inform these decisions, the PHRAT guides planners through an analysis of the risks associated with various hazards that can occur in their jurisdictions. It assesses the planning that is necessary to ensure access to emergency response and preparedness resources for the whole community, including populations at risk for suffering severe consequences from disasters. The tool also helps planners assess the jurisdiction's level of preparedness for specific hazards.

The term *risk*, as it is used in this document, refers to the expectation of loss from a hazard 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 specific hazards, severity is measured in four major domains: human health, healthcare services, 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.

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 prioritization of planning is also driven by the jurisdiction's current status of preparedness for each hazard. The PHRAT uses CDC's Public Health Emergency Preparedness and Response (PHEP) Capabilities (CDC 2018) and determines a Status Score for each capability. In the PHRAT, each capability is also assigned a hazard-specific Relevance Score, based on the importance of each capability to the public health response for that hazard. The existing level of preparedness for each hazard is then calculated by using both the Status Scores and the Relevance Scores for all 15 PHEP capabilities, expressed as the Preparedness Score.

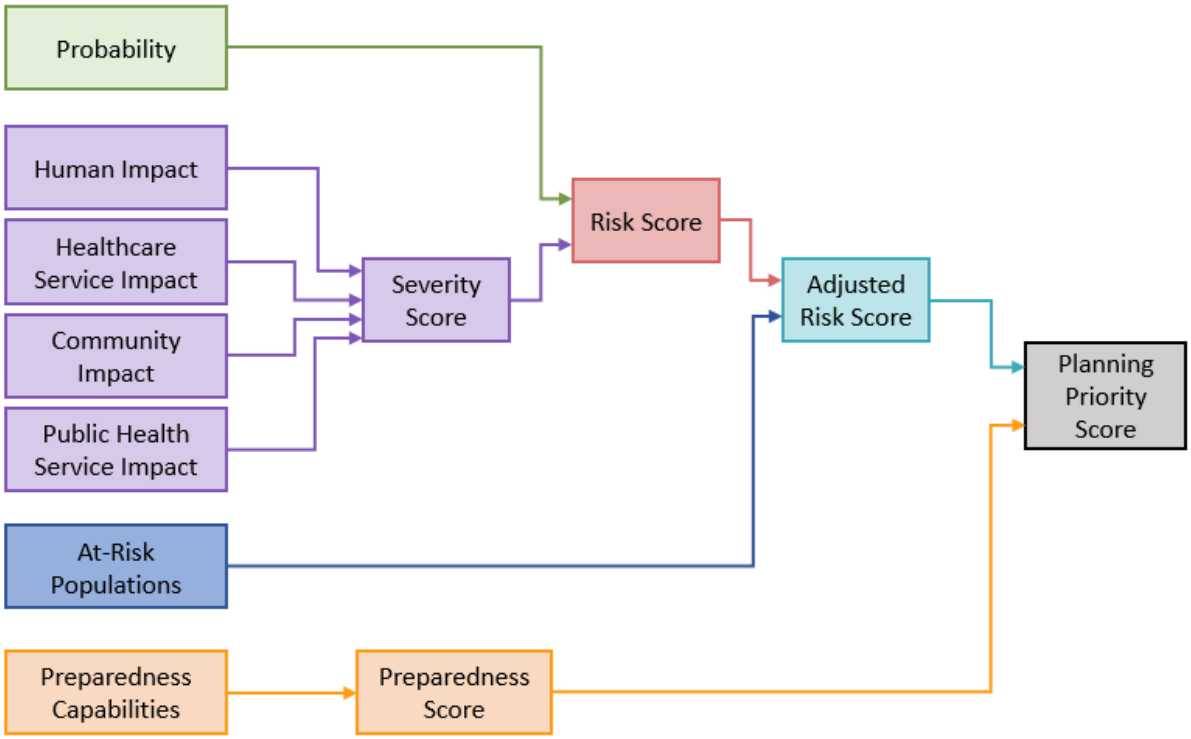
The adjusted risk for each hazard is then compared to the jurisdiction's overall level of preparedness for that hazard, which this tool calculates as the ratio of the Adjusted Risk Score to the Preparedness Score. This ratio is referred to as the Planning Priority Indicator. These indicators can then be ranked or placed into high, medium, and low priority categories to guide future planning activities.

We acknowledge several hazard vulnerability analysis and risk assessment instruments that have informed the development of this tool. The severity and probability analyses used in the 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 used 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 concept), 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.

Figure 1. Public Health Risk Assessment Conceptual Overview

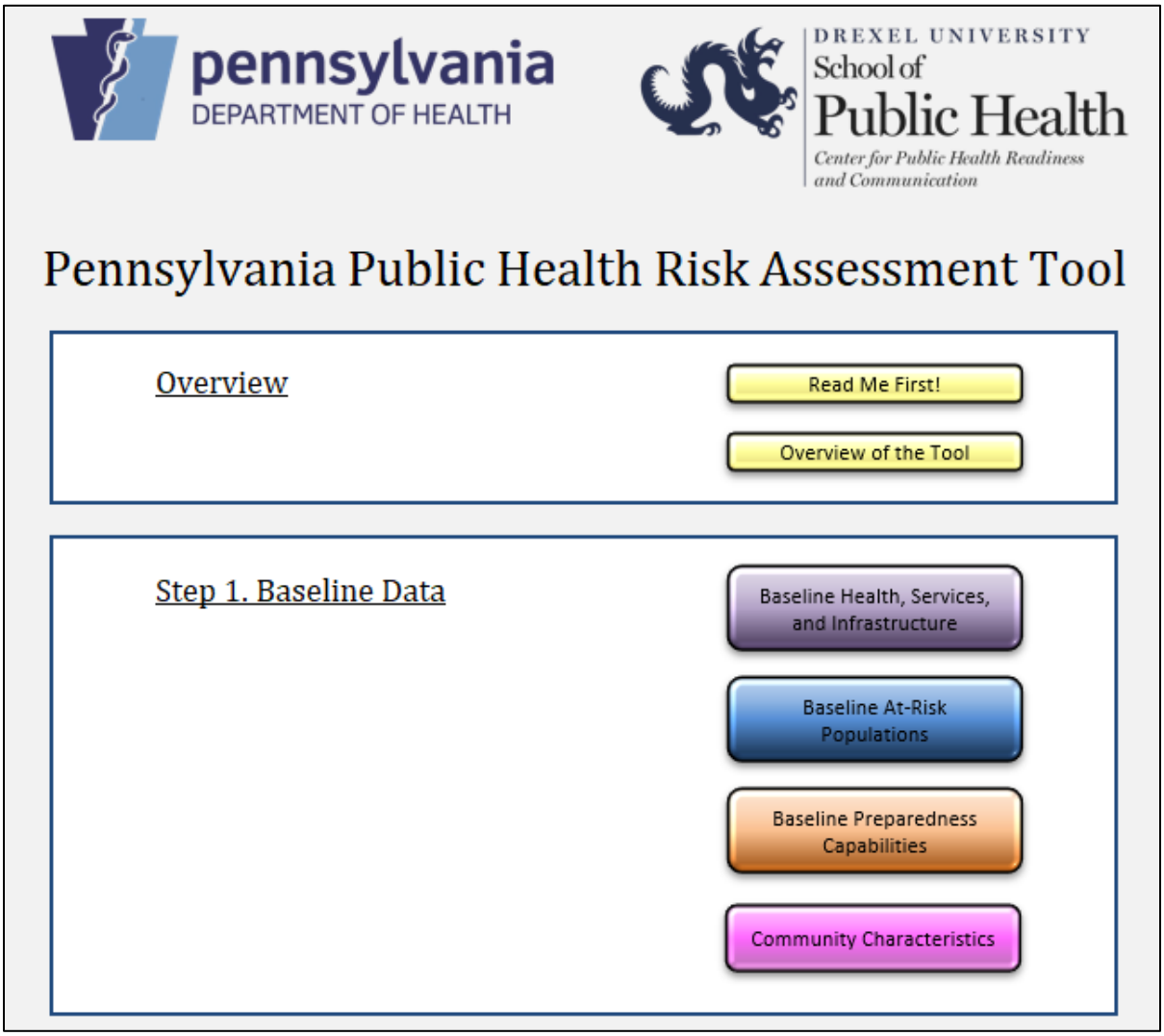


The Workbook

This document will guide public health planners using the Public Health Risk Assessment Tool (PHRAT). The PHRAT is a workbook developed in Microsoft® Excel. For the workbook to operate correctly, macros must be enabled. Enable content and macros when prompted.

When the workbook is opened, the "Main Menu" will appear, as shown in Figure 2. 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 worksheet by clicking on the green button that reads "Main Menu" in the upper right corner of the worksheet.

Figure 2. 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 four 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

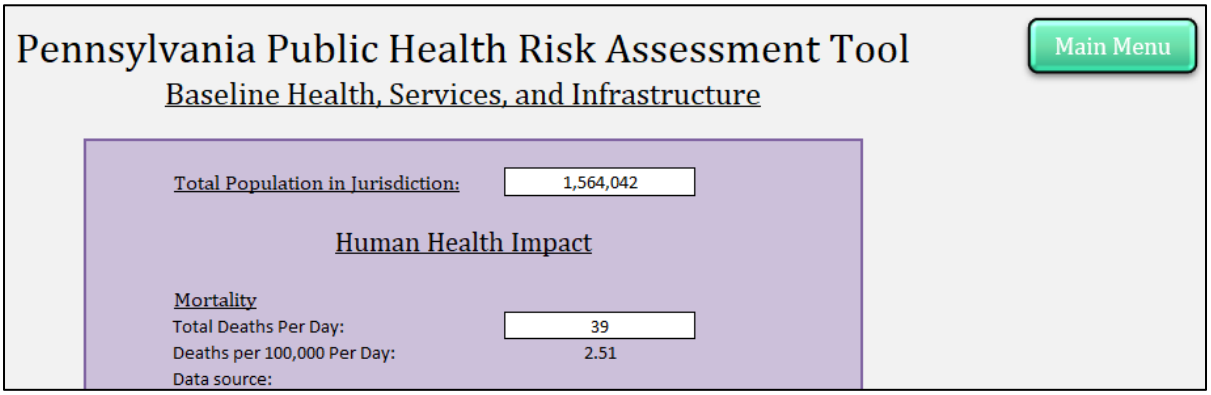
The tool calculates severity by comparing hazard-specific values to baseline values in several metrics. To do this, baseline information must be entered in the "Baseline Health, Services, and Infrastructure" worksheet. Navigate to this sheet using the purple button in the "Step 1. Baseline Data" box 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 experts. More information about this option can be found in the "Step 2: Hazard Data" section. 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 3. Enter values specific to your jurisdiction in the white cells outlined in black, as shown in the figure.

Figure 3. Baseline Health, Services, and Infrastructure Worksheet



For each metric, there is space to enter a "Data source." Entering this information is optional but 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 4.

Figure 4. Baseline At-Risk Populations Worksheet

The "Baseline At-Risk Populations" worksheet provides space for entering information about the percentage of individuals in your jurisdiction who are at higher risk for suffering severe consequences of disasters than the general population. For this analysis, 10 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 10 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, countyhealthrankings.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 an 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 (persons with diabetes as proxy)	Countyhealthrankings.org: % with diabetes
Children, 18 and under	US Census ACS: Under 18 years

Population	Potential Source of Population Size Data
Elderly, 65 and older	US Census ACS: 65 years and over
Limited Access to Technology	US Census ACS: Selected social characteristics in the United States

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

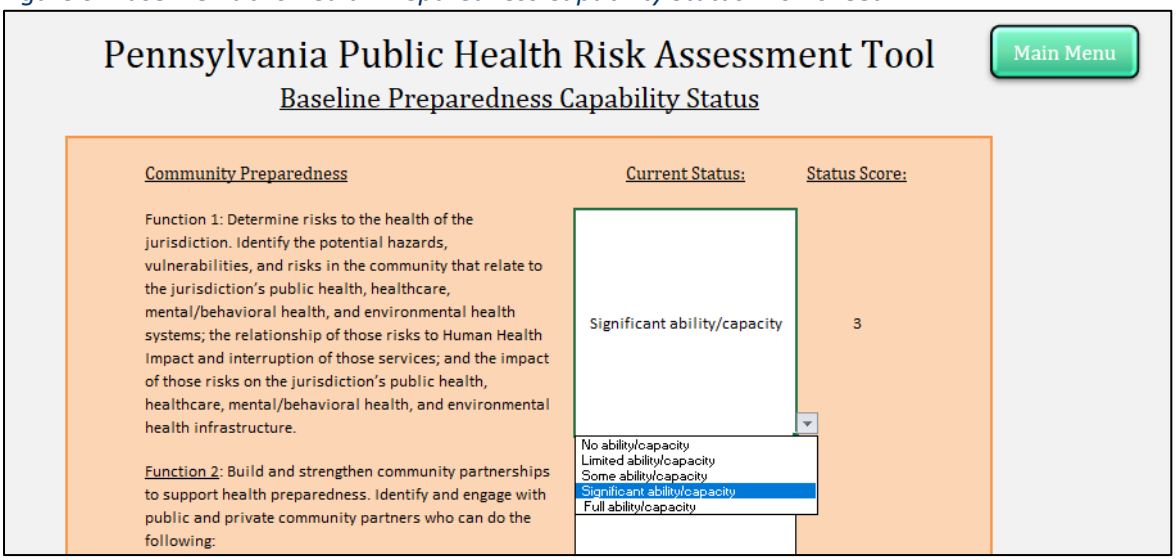
When completed, return to the Main Menu by clicking on the green "Main Menu" button in the upper right corner of the worksheet.

Baseline Preparedness Capabilities

To assess the level of preparedness in the jurisdiction, the current status of the 15 PHEP 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 Preparedness Capability Status" worksheet.

Figure 5 illustrates the Baseline Preparedness Capability Status worksheet and shows how the current status can be selected from the drop-down menu.

Figure 5. 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 for 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 worksheet, 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 PHRAT 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. If you would like to change the hazard-specific estimates pre-entered into the hazard worksheets in the 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 several 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 the Philadelphia Metropolitan Statistical Area (MSA) 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.

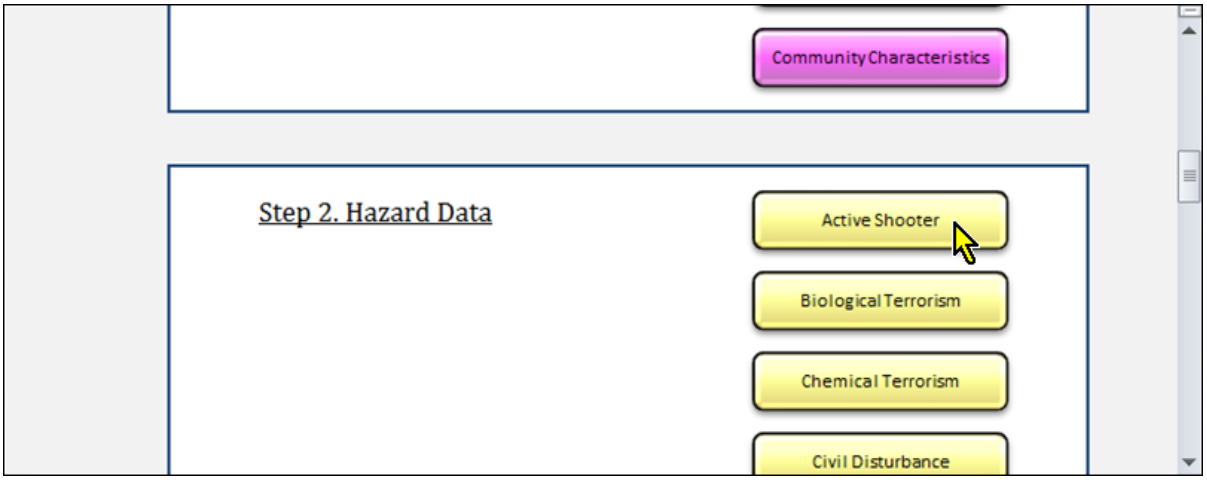
Even if you choose to accept the assumptions made by the CPHRC, you may have to alter the scores of certain metrics if your jurisdiction has a baseline of zero in any metrics. For example, if the jurisdiction has zero hospital beds, the hospital bed metric will be scored as "Not Calculated," because division by zero is impossible. In this scenario, 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 6.

Figure 6. Opening a Hazard Worksheet

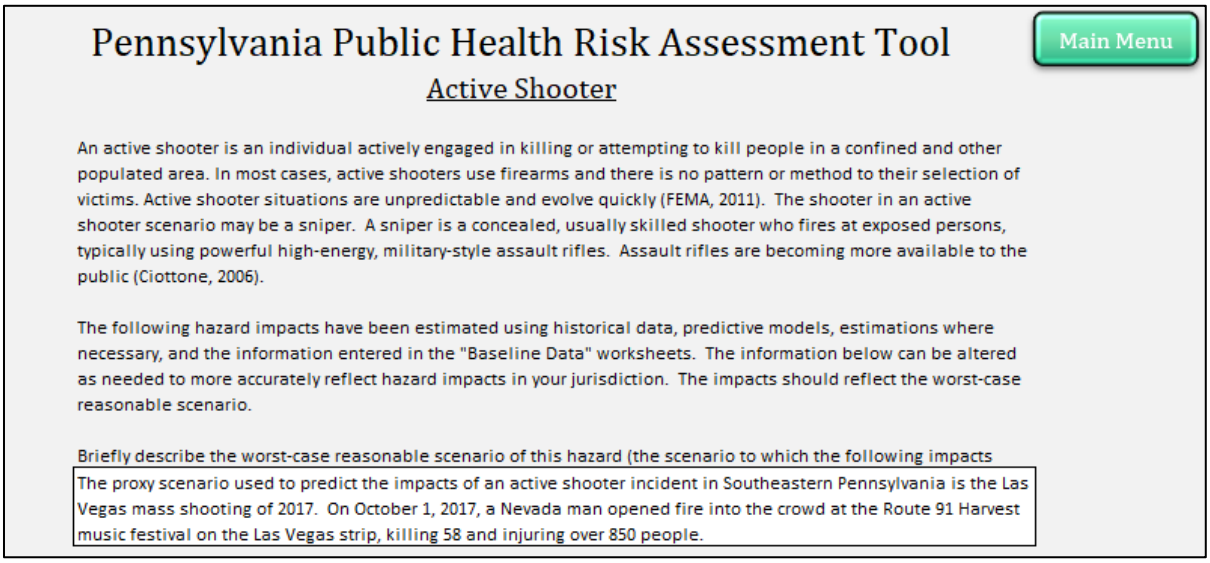


Hazard Scenario

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 7. All the data entered on the worksheet should refer to this worst-case scenario.

Figure 7. Hazard Worksheet: Describe the Reasonable Worst-Case Scenario of This Hazard



Probability

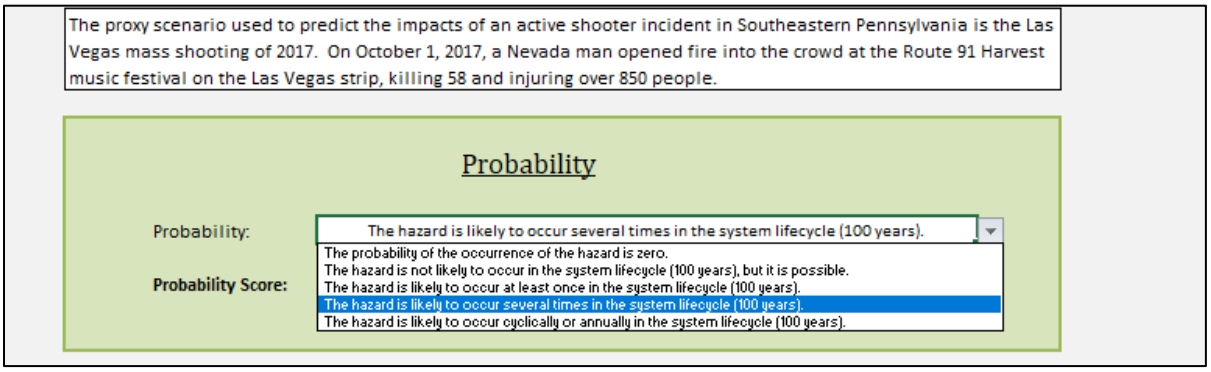
The first component of the Risk Score in this tool is an assessment of the probability that a given hazard will occur. The PHRAT defines the probability of an incident as the likelihood that a hazard or threat will affect the jurisdiction within a system lifecycle of 100 years. One hundred years was selected as the system lifecycle because many pandemics and serious public health threats would be excluded from an analysis that used a shorter lifecycle. In addition, this approach is consistent with the traditional method of estimating flooding risk. 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 8. 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 8. 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 four separate Impact Scores: Human Health Impact, Healthcare Service Impact, Community Operations Impact, and Public Health Service Impact. Each of these scores is derived from an assessment of 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 Impact Scores are shown in Table 2.

Table 2. Severity Metrics

Domain	Metric	Score Based On:
Human Health Impact	Mortality	Deaths/day
		Duration
	EMS Transports	Transports/day
		Duration
	ED Visits	ED visits/day
		Duration
	Hospitalizations	Hospitalizations/day

Domain	Metric	Score Based On:
		Duration
	Trauma Center Injuries	Trauma center injuries/day
		Duration
	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
		Duration
Healthcare Service Impact	Outpatient Services	PCPs supply/demand
		Duration
	Emergency Department (ED) 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
	Hospital Personnel	Patient to nurse ratio
		Duration
Community Operations 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

Domain	Metric	Score Based On:
		Duration
Public Health Service Impact	Public Health 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 Communications	Personnel hours per week needed to generate health communications to external partners or general public
		Duration
	Fatality Management	Morgue capacity supply/demand
		Duration

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

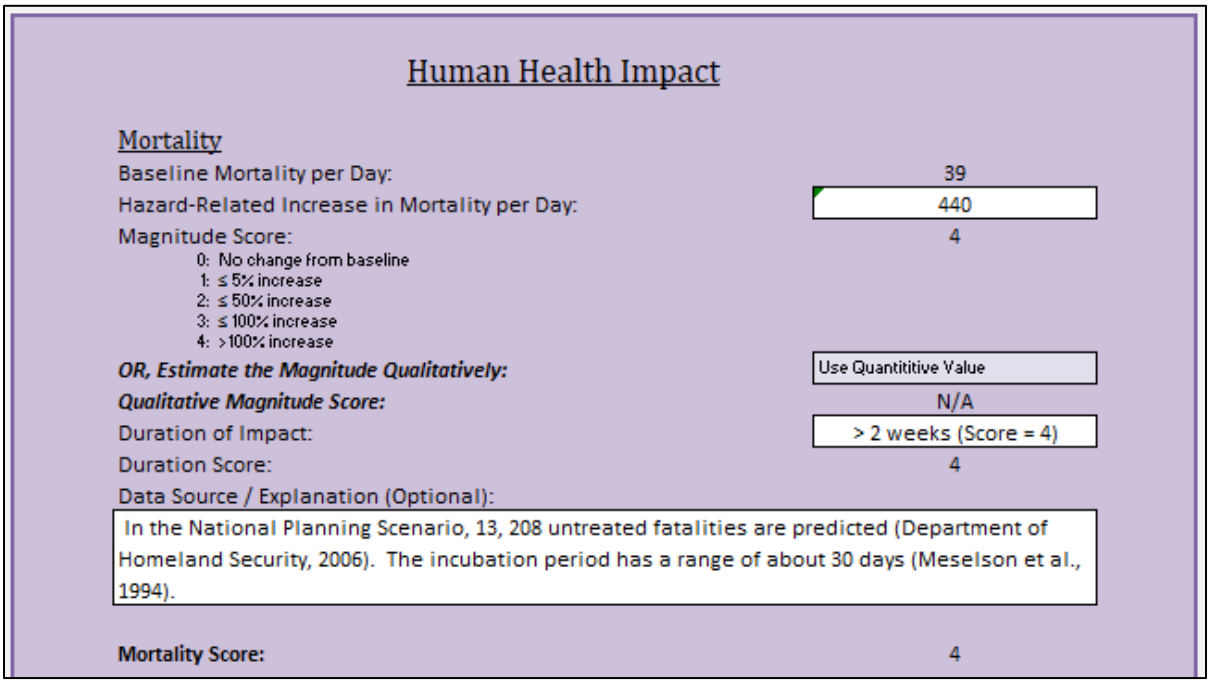
Completing the Severity Assessment Quantitatively

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. Most 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 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 9.

Figure 9. 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 9 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.

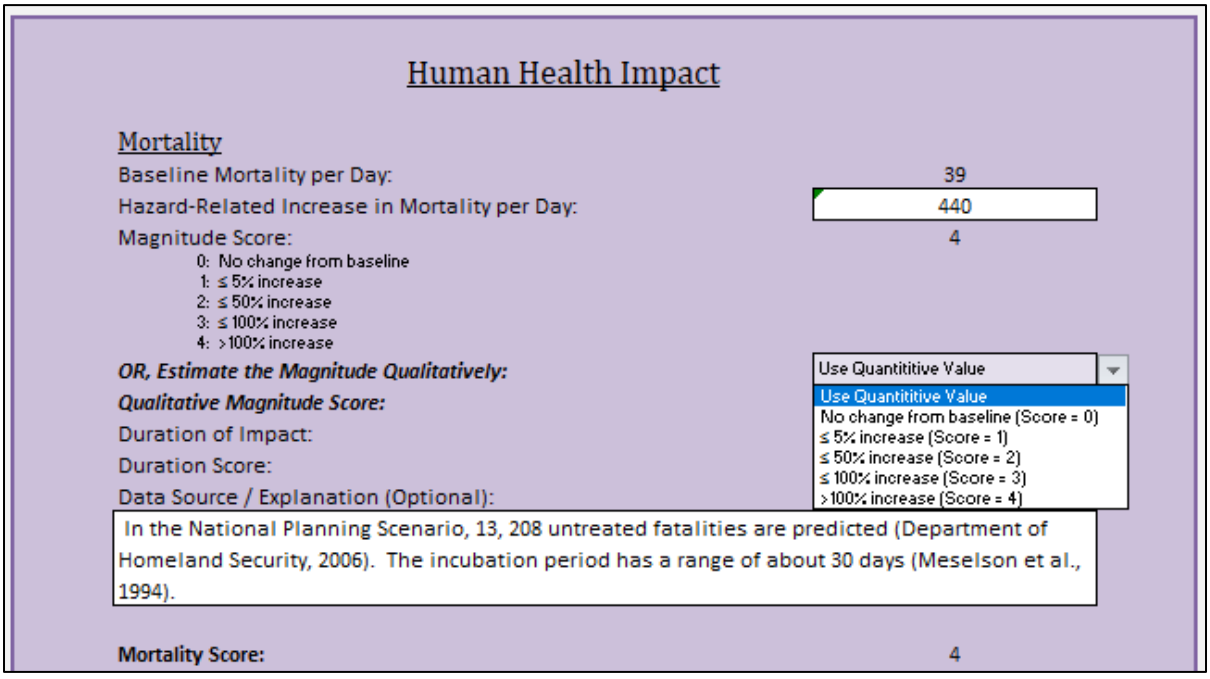
If you would like, space is provided to enter an explanation/justification for your impact prediction/estimate or the source of your data. Entering this information is optional but may help you when completing future assessments.

Completing the Severity Assessment Qualitatively

Some planners may not be able to locate data for their jurisdiction or may 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 10 shows how to select an option from the qualitative drop-down menu.

Figure 10. Hazard Worksheet: Estimate the Magnitude Qualitatively



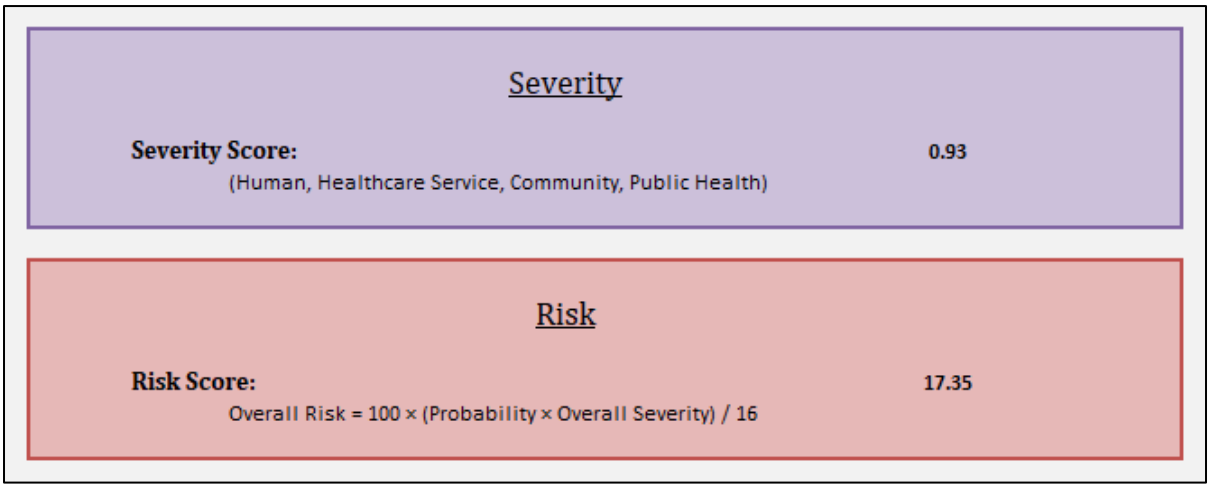
It is recommended that planners who choose to complete the tool qualitatively record the justification for their estimates and the agencies involved in arriving at those estimates in the "Data Source / Explanation" space provided. This is optional, but it will help you when completing future assessments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

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 11. It is automatically calculated using the Probability Score and the Severity Score.

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

Figure 11. Hazard Worksheet: Severity and Risk Calculated Automatically



If the Risk Score is defined as "Not Calculated," check that data have 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 that 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).

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

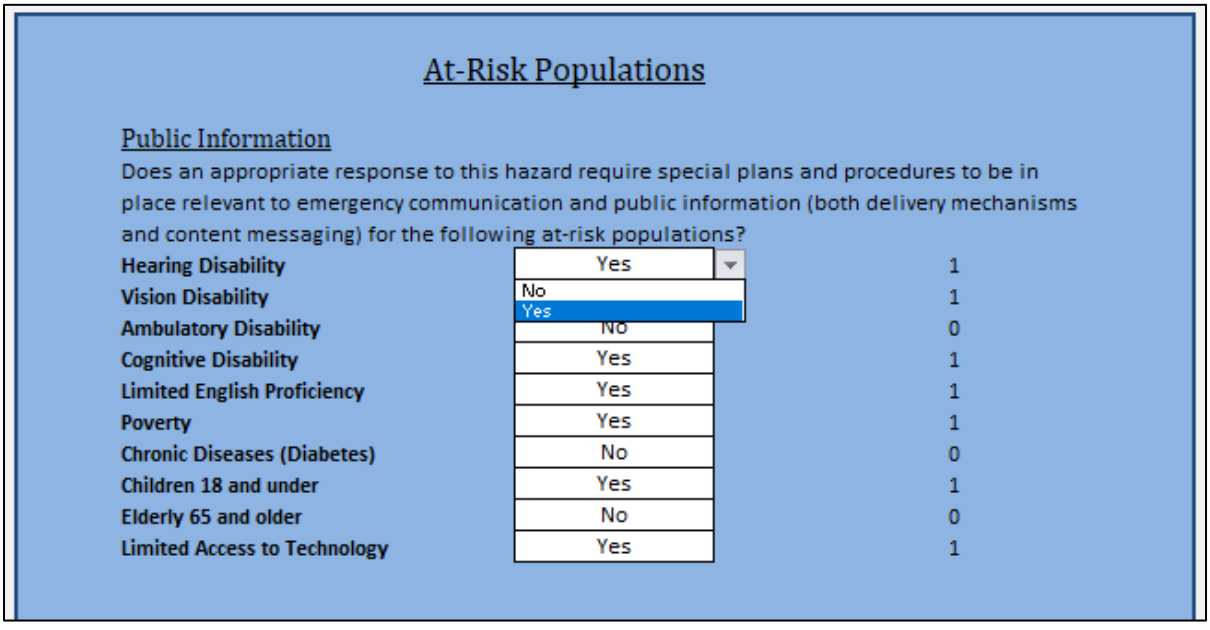
unique planning and response needs of each of the 10 selected at-risk populations in each disaster scenario.

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 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 12.

Figure 12. Hazard Worksheet: Enter Information for At-Risk Populations



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

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

The overall At-Risk Populations Score for each hazard is the average of the 10 Population Impact Scores. The overall At-Risk Population Score is automatically calculated in the tool.

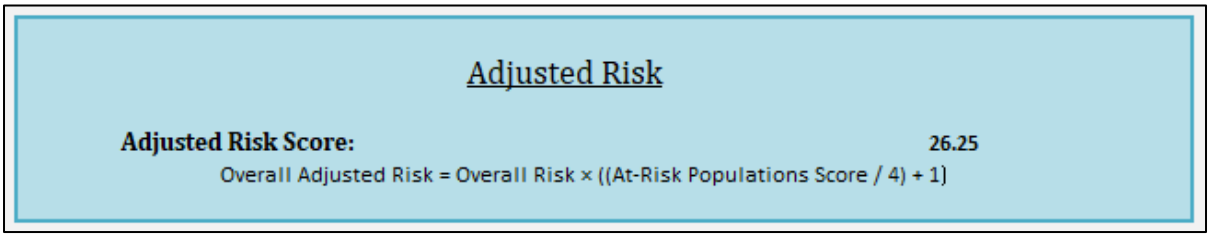
Adjusted Risk Calculated Automatically

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:

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

These scores and the Adjusted Risk Score will be calculated automatically as shown in Figure 13.

Figure 13. Hazard Worksheet: Adjsuted Risk Calculated Automatically

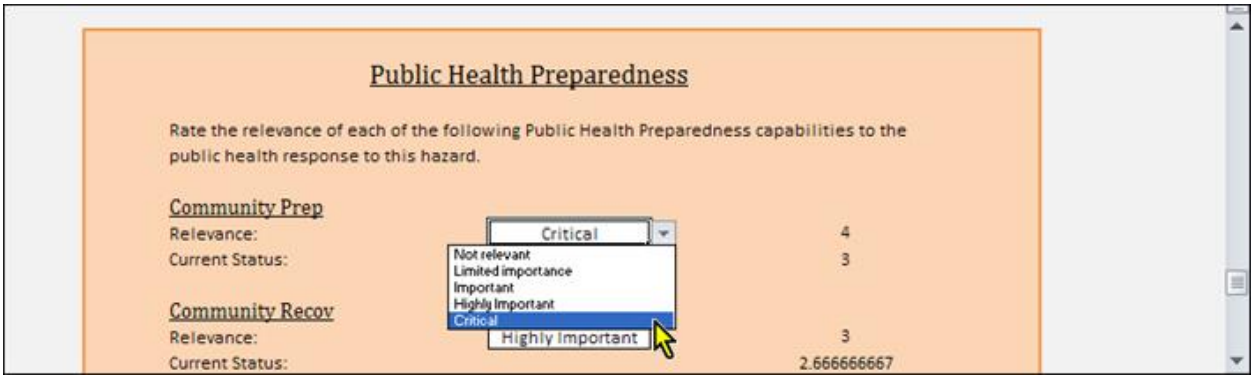


Enter Preparedness Data

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 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 14.

Figure 14. 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 Preparedness Score is automatically calculated using the following equation:

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

Planning Priority Score Calculated Automatically

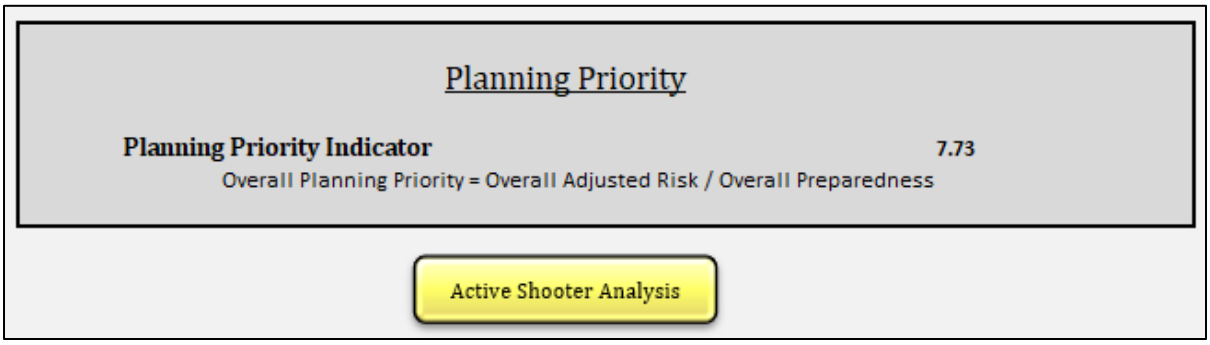
Unlike other tools that integrate an assessment of preparedness into the assessment of risk, this tool does not make the assumption that a certain degree of preparedness mitigates or diminishes risk in knowable or predictable ways. Instead, the tool generates a Planning Priority Score that allows planners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

A Planning Priority Indicator is calculated automatically in the gray box labeled "Planning Priority," as shown in Figure 15, when the baseline and hazard worksheets have been completed using the following equation:

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

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

Figure 15. Hazard Worksheet: Planning Priority Indicators Calculated Automatically



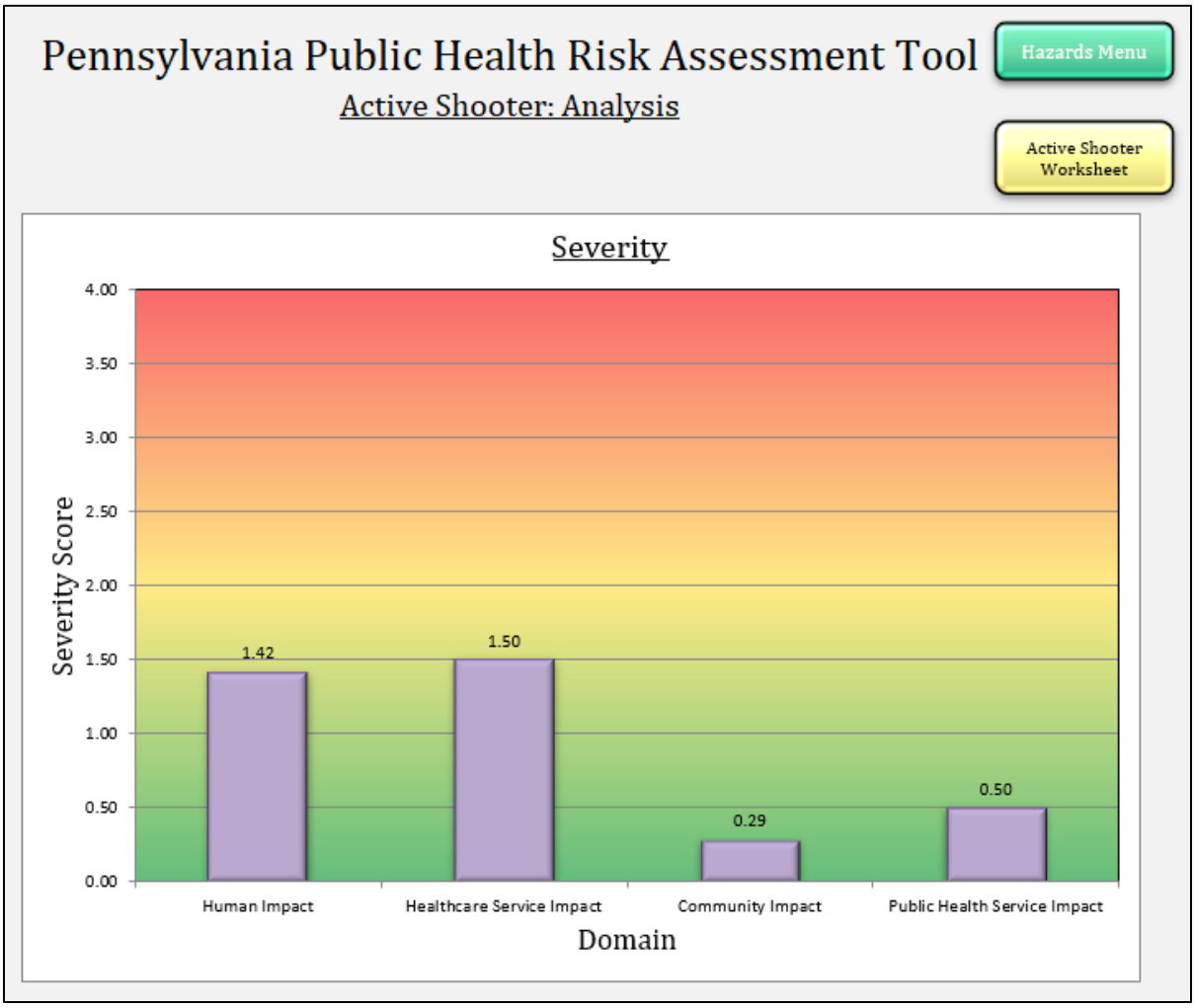
At the bottom of the worksheet, as shown in Figure 15, is a yellow button linking to the "Analysis" of the hazard. After the worksheet is completed, click on this button to see a visual analysis of the information entered for the hazard. The analysis will not display correctly if the hazard worksheet 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.

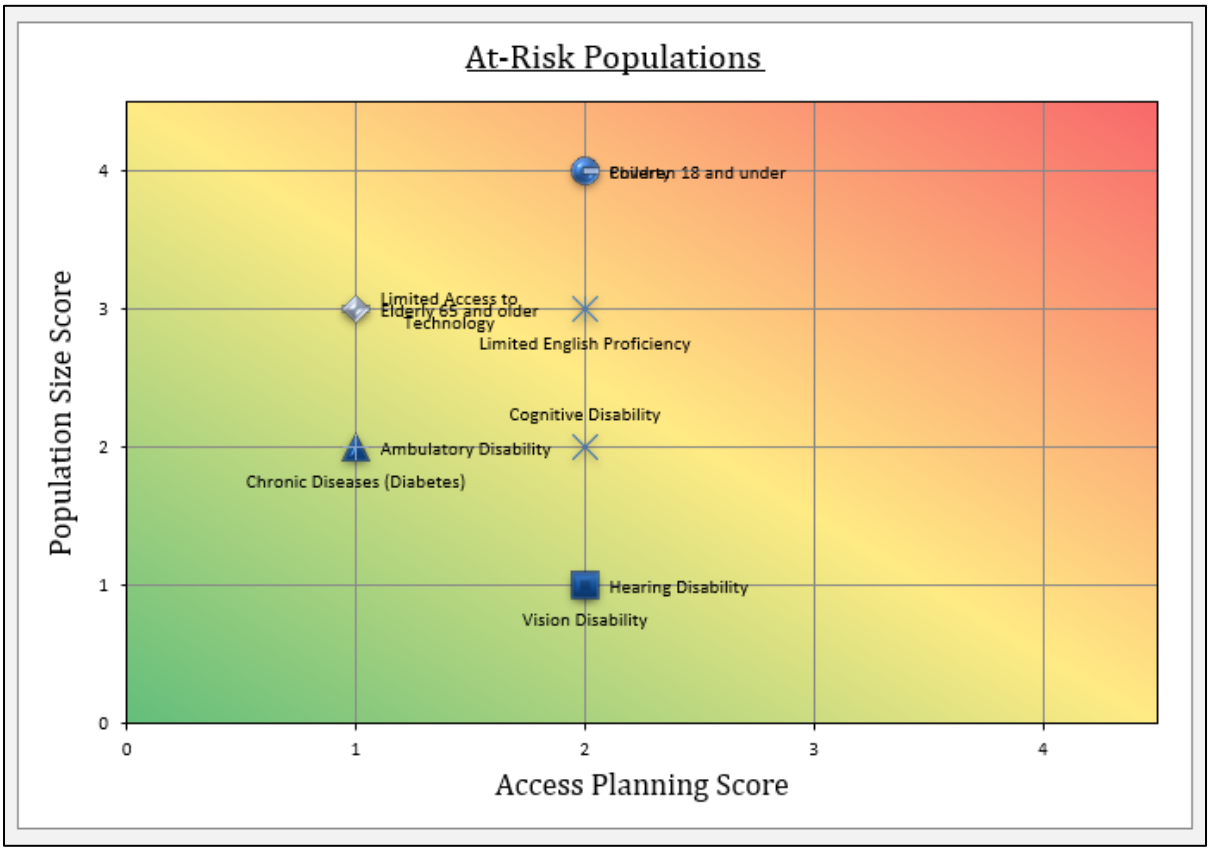
The hazard analysis worksheet contains three graphs. The first is a graph of severity by domain, as shown in Figure 16. This shows the four severity domains: Human Health Impact, Healthcare Service Impact, Community Operations Impact, and Public Health Service Impact. The severity of each of the four domains is displayed, allowing you to see which domains will be most heavily affected by the hazard.

Figure 16. Hazard Analysis Worksheet: Severity by Domain



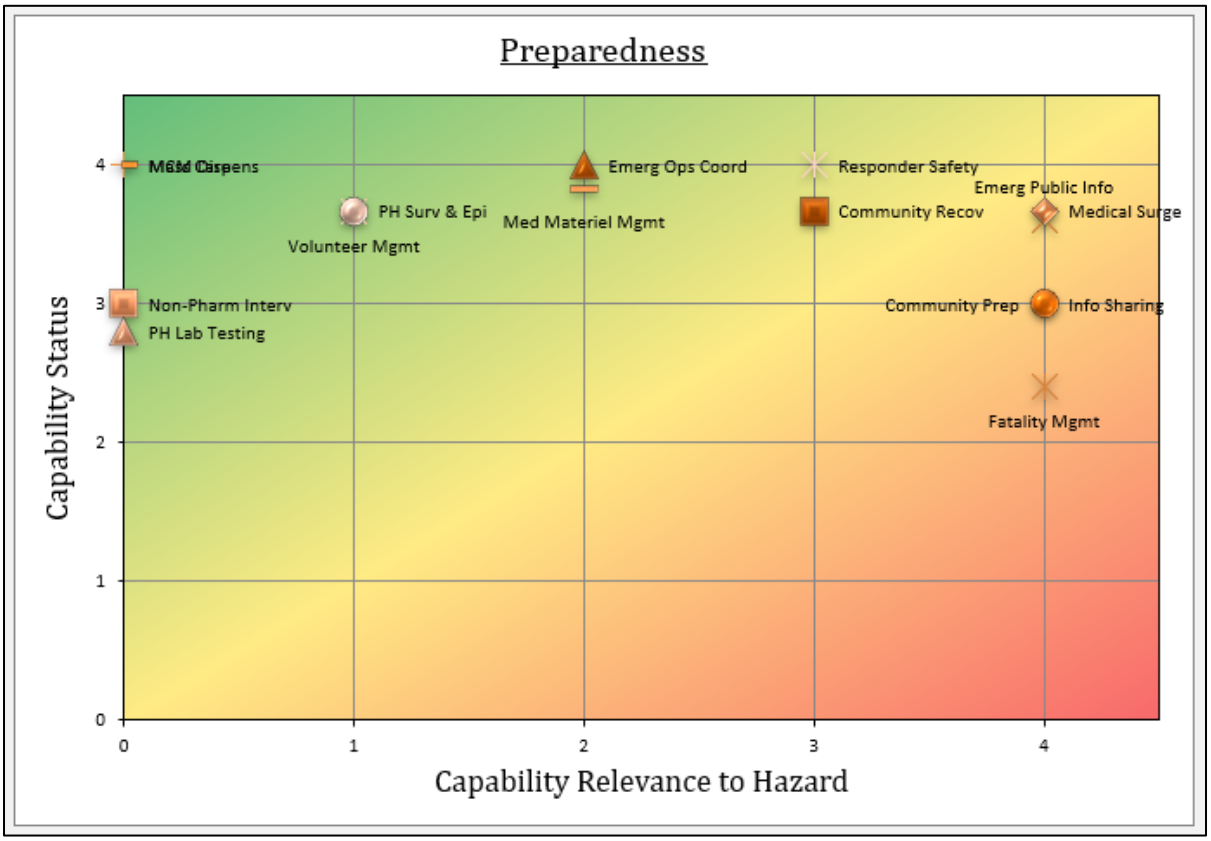
The next graph is a breakdown of the At-Risk Populations Score. To calculate the At-Risk Populations Score, each population is assigned a Population Size Score and an Access Planning Score. In the At-Risk Populations graph, the Population Size Score is represented on the y-axis, and the Access Planning 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 many plans and procedures to be in place. Figure 17 shows an example of this graph.

Figure 17. Hazard Analysis Worksheet: Access Planning Score vs. Population Size Score



The final graph illustrates the status and relevance of the Preparedness (PHEP) capabilities. Figure 18 illustrates an example of this graph. 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 18. Hazard Analysis Worksheet: Preparedness Capability Relevance vs. Status

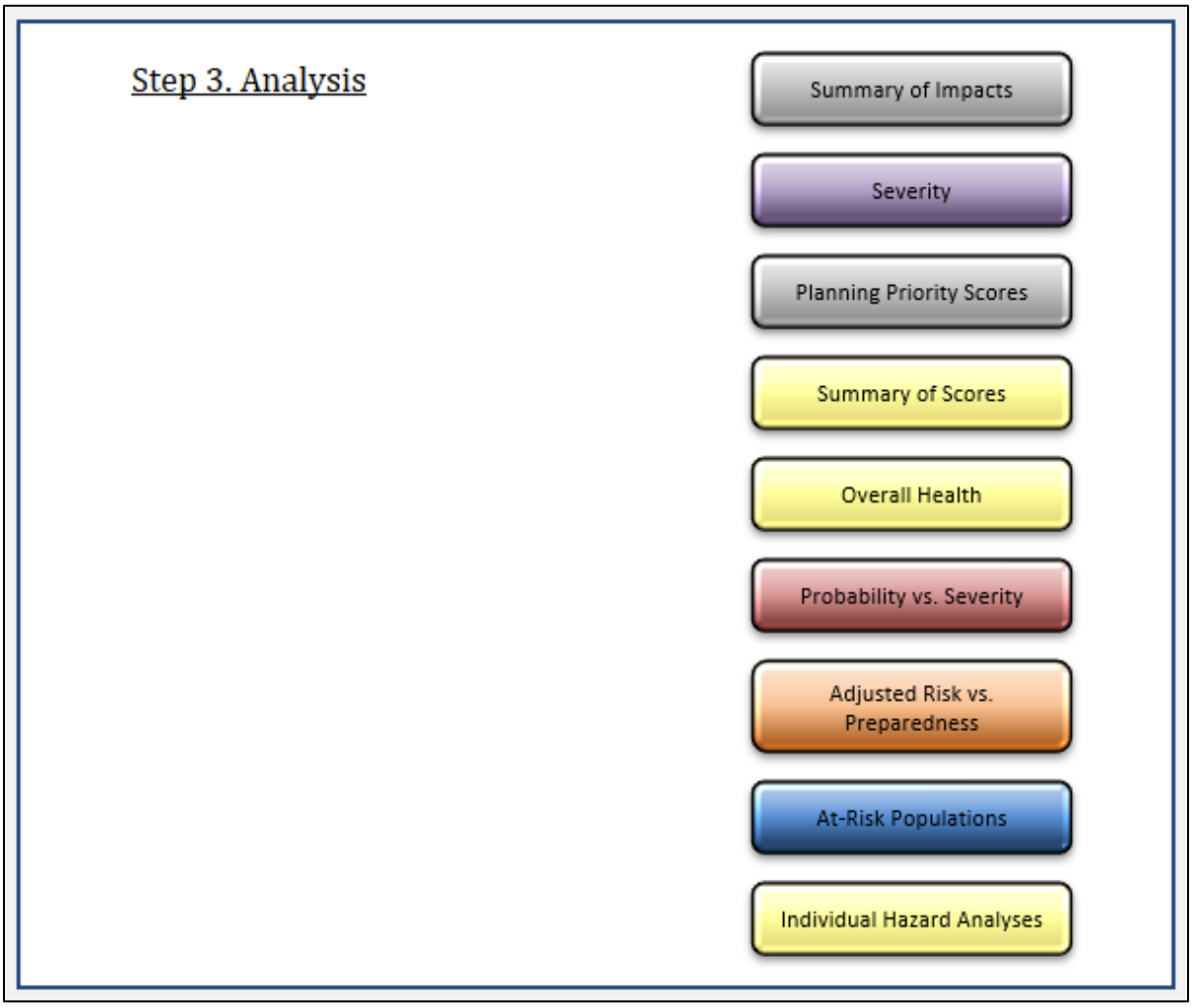


Step 3. Analysis

When all the hazard worksheets have been completed, the tool generates several 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 19.

Figure 19. Main Menu: Analysis



Summary of Impacts

The "Summary of Impacts" is designed to be printed on legal-sized paper. This sheet summarizes all 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 20.

Figure 20: Summary of Impacts

Pennsylvania Public Health Risk Assessment Tool

Main Menu

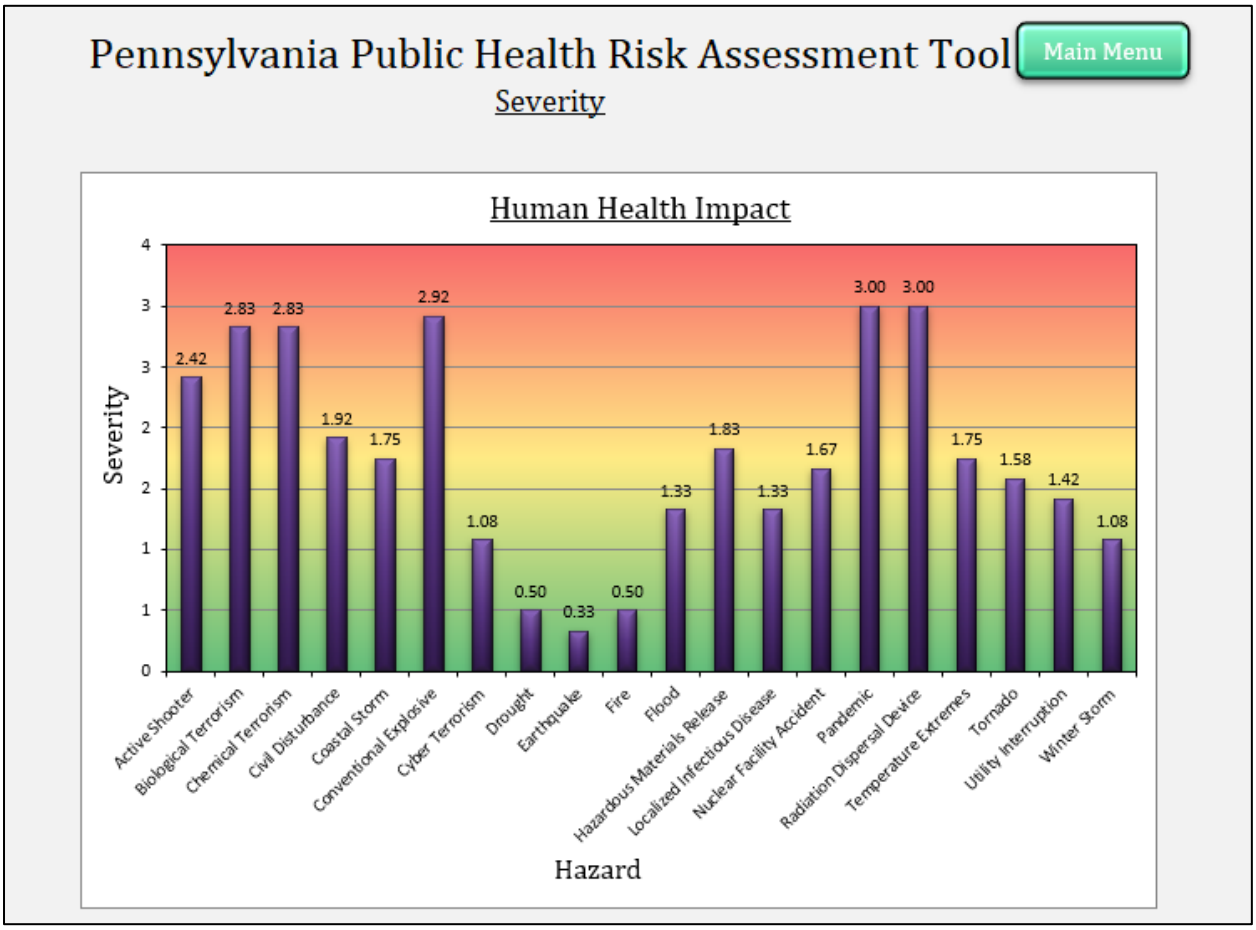
Summary of Impacts

		Active Shooter	Biological Terrorism	Chemical Terrorism	Civil Disturbance	Coastal Storm	Conventional Explosive	Cyber Terrorism
Probability		Probable	Remote	Remote	Occasional	Frequent	Occasional	Remote
Human Health Impact								
Mortality (Increase in Deaths per day)		33	440	65,105	2	3	31,525	0
EMS Transports (Increase in Transports per day)		17	30	3,427	23	1,421	26,042	0
ED Visits (Increase in ED visits per day)		27	100	3,427	67	973	103,483	0
Primary Care Office Visits (Increase in office visits per		0	21,899	1,004	0	0	43,860	0
Trauma Center Injuries (Increase in Trauma Center Injuries per day)		12	0	2	5	2	15,762	0
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)		Population displays distress with 25% - 49% 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% - 49% psychopathology.	Population displays distress with <25% psychopathology.
Healthcare Service Impact								
Outpatient services (PCPs)	Interruption	0	21	0	47	1,071	0	0
	Demand	0	1,095	50	0	0	2,193	0
Emergency Department Services (ED beds)	Interruption	0	10	0	0	0	0	96
	Demand	6	22	761	15	216	22,996	0
Hospital Beds (Beds set up and staffed)	Interruption	0	154	0	0	0	0	0
	Demand	27	15,409	3,427	43	0	17,133	1,536
Ancillary Services (Pharmacists)	Interruption	0	10	0	47	261	0	0
	Demand	0	23	261	0	0	0	104
Trauma Units (Functioning ORs)	Interruption	0	0	0	0	0	0	0
	Demand	12	0	2	5	2	15,762	0
Mental Health Services (Mental Health Providers)	Interruption	0	67	0	336	1,682	0	0
	Demand	974	52,557	150,148	11	-1,682	5,482,560	336
Hospital Personnel	Loss of RNs per Shift	0	58	0	0	0	0	0
	Change in Nurse-Pt Ratio	1	3	1	1	1	3	1

Severity

This worksheet compares the severity of all hazards in each domain. Figure 21, for example, shows the impact of all hazards in the "Human Health Impact" domain. By examining these graphs, you can determine which hazards have the greatest impact on each of the four domains.

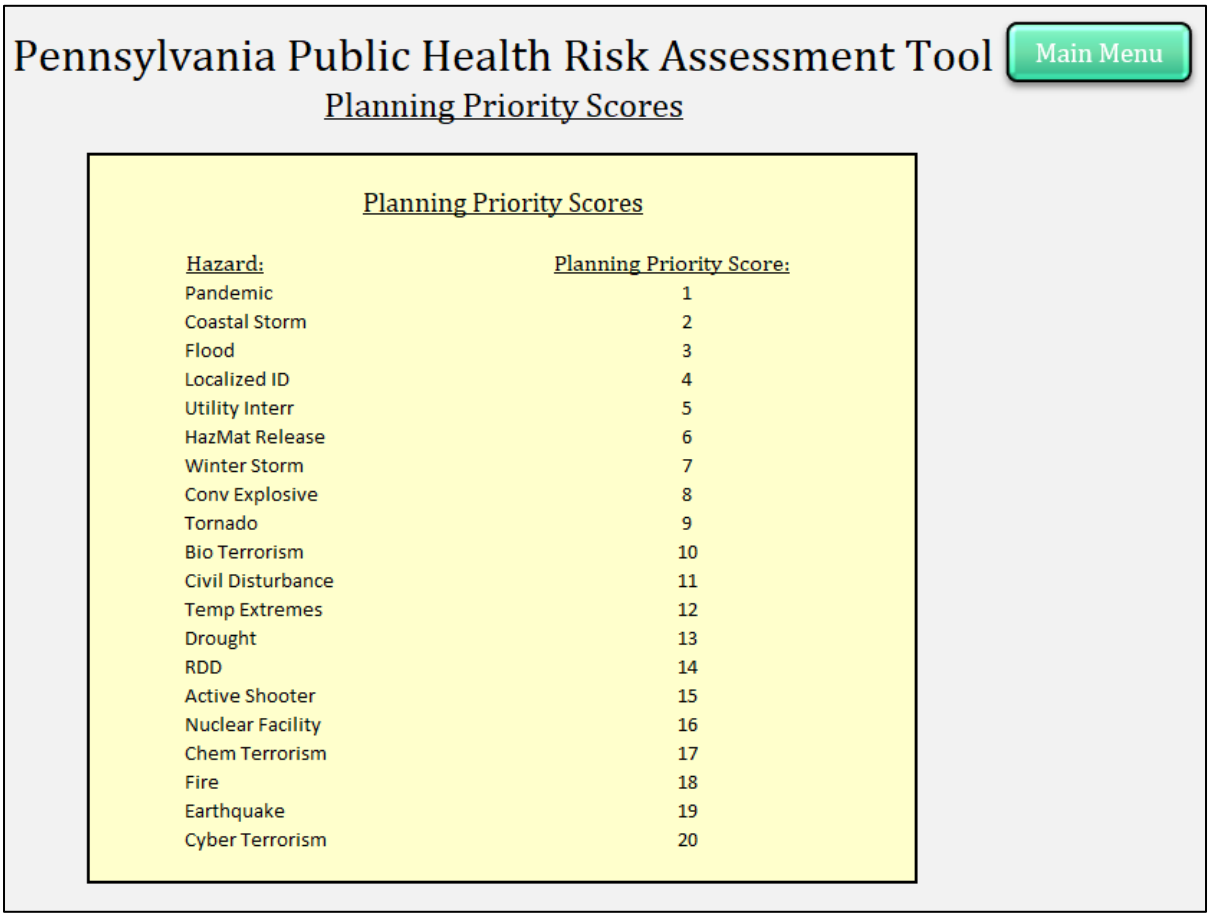
Figure 21: Severity



Planning Priority Scores

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

Figure 22. Planning Priority Scores



Pennsylvania Public Health Risk Assessment Tool

Main Menu

Planning Priority Scores

Planning Priority Scores

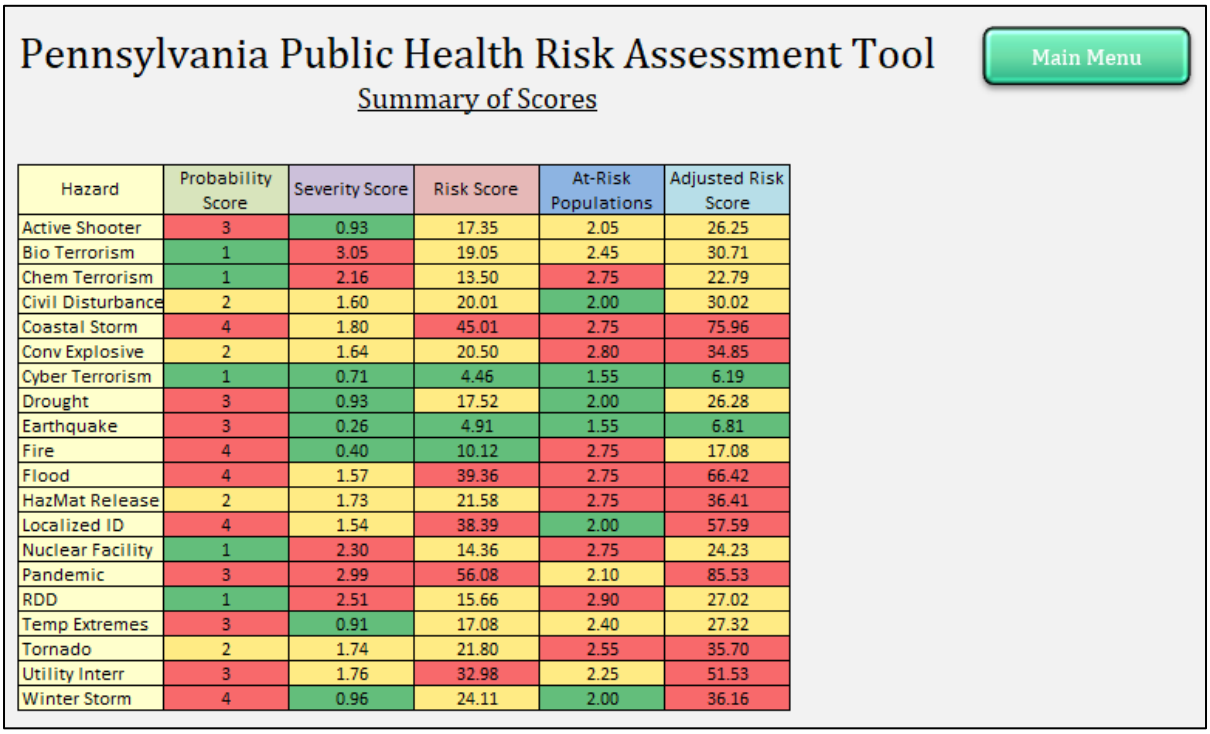
Hazard:	Planning Priority Score:
Pandemic	1
Coastal Storm	2
Flood	3
Localized ID	4
Utility Interr	5
HazMat Release	6
Winter Storm	7
Conv Explosive	8
Tornado	9
Bio Terrorism	10
Civil Disturbance	11
Temp Extremes	12
Drought	13
RDD	14
Active Shooter	15
Nuclear Facility	16
Chem Terrorism	17
Fire	18
Earthquake	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 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 the individual Hazard worksheets must have been completed for this sheet to display correctly. Figure 23 displays the Summary of Scores.

Figure 23. Summary of Scores



Pennsylvania Public Health Risk Assessment Tool

Main Menu

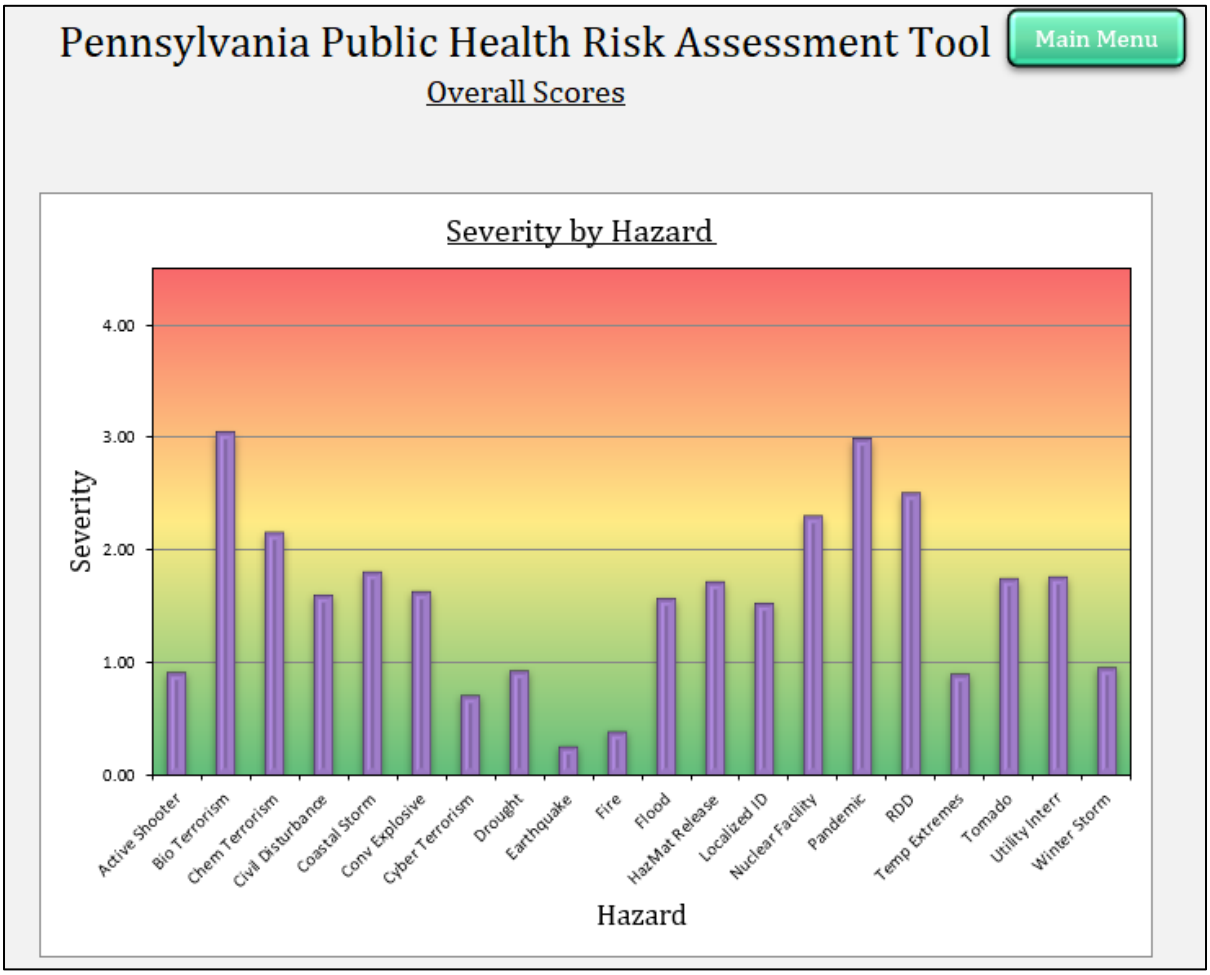
Summary of Scores

Hazard	Probability Score	Severity Score	Risk Score	At-Risk Populations	Adjusted Risk Score
Active Shooter	3	0.93	17.35	2.05	26.25
Bio Terrorism	1	3.05	19.05	2.45	30.71
Chem Terrorism	1	2.16	13.50	2.75	22.79
Civil Disturbance	2	1.60	20.01	2.00	30.02
Coastal Storm	4	1.80	45.01	2.75	75.96
Conv Explosive	2	1.64	20.50	2.80	34.85
Cyber Terrorism	1	0.71	4.46	1.55	6.19
Drought	3	0.93	17.52	2.00	26.28
Earthquake	3	0.26	4.91	1.55	6.81
Fire	4	0.40	10.12	2.75	17.08
Flood	4	1.57	39.36	2.75	66.42
HazMat Release	2	1.73	21.58	2.75	36.41
Localized ID	4	1.54	38.39	2.00	57.59
Nuclear Facility	1	2.30	14.36	2.75	24.23
Pandemic	3	2.99	56.08	2.10	85.53
RDD	1	2.51	15.66	2.90	27.02
Temp Extremes	3	0.91	17.08	2.40	27.32
Tornado	2	1.74	21.80	2.55	35.70
Utility Interr	3	1.76	32.98	2.25	51.53
Winter Storm	4	0.96	24.11	2.00	36.16

Overall Scores

Click on the button that reads “Overall Scores” to navigate to a summary of the overall scores. This worksheet allows you to identify hazards that would have a large impact, as shown in Figure 24.

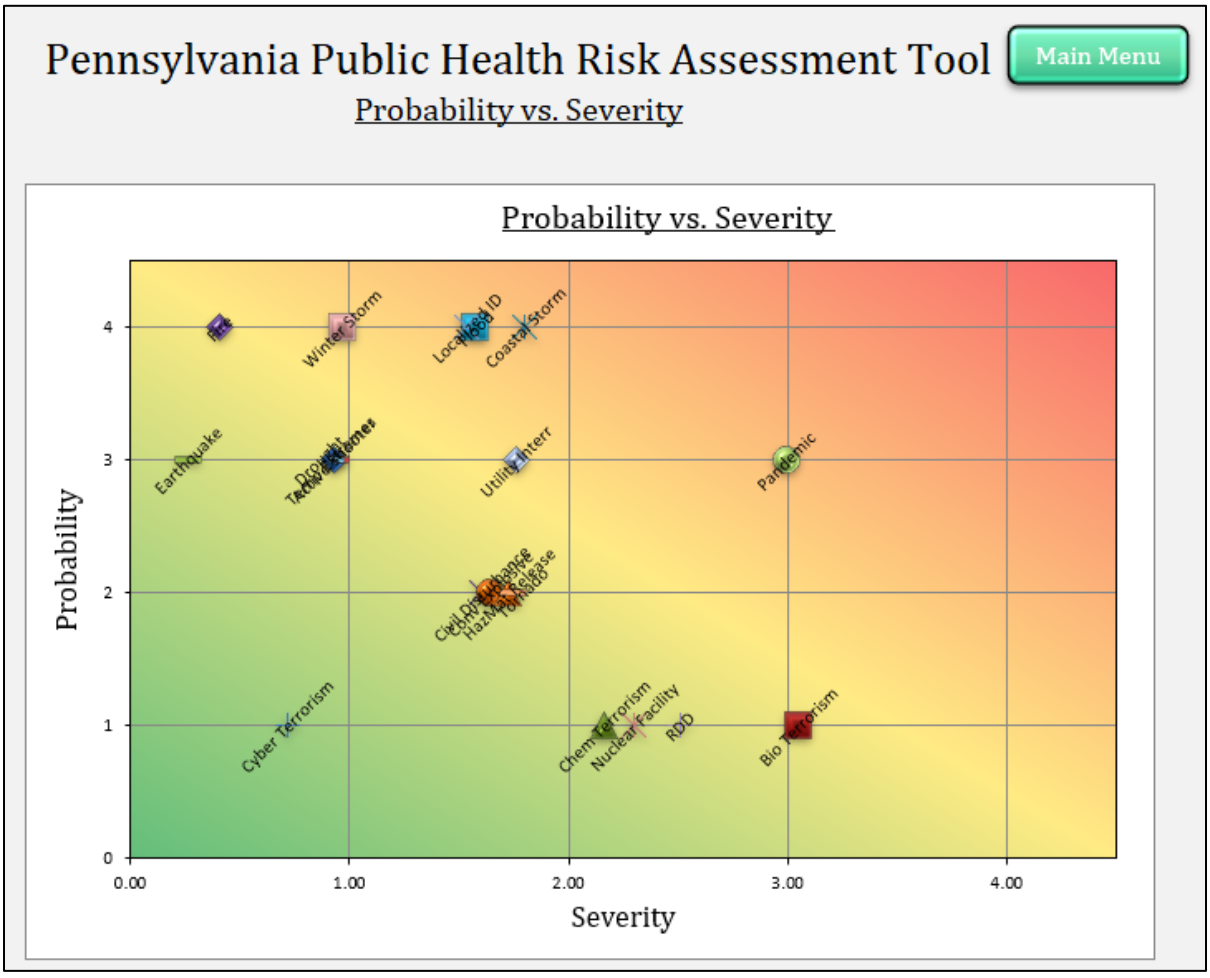
Figure 24. Overall Scores



Probability vs. Severity

The "Probability vs. Severity" worksheet displays these values for each hazard. All 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 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 25.

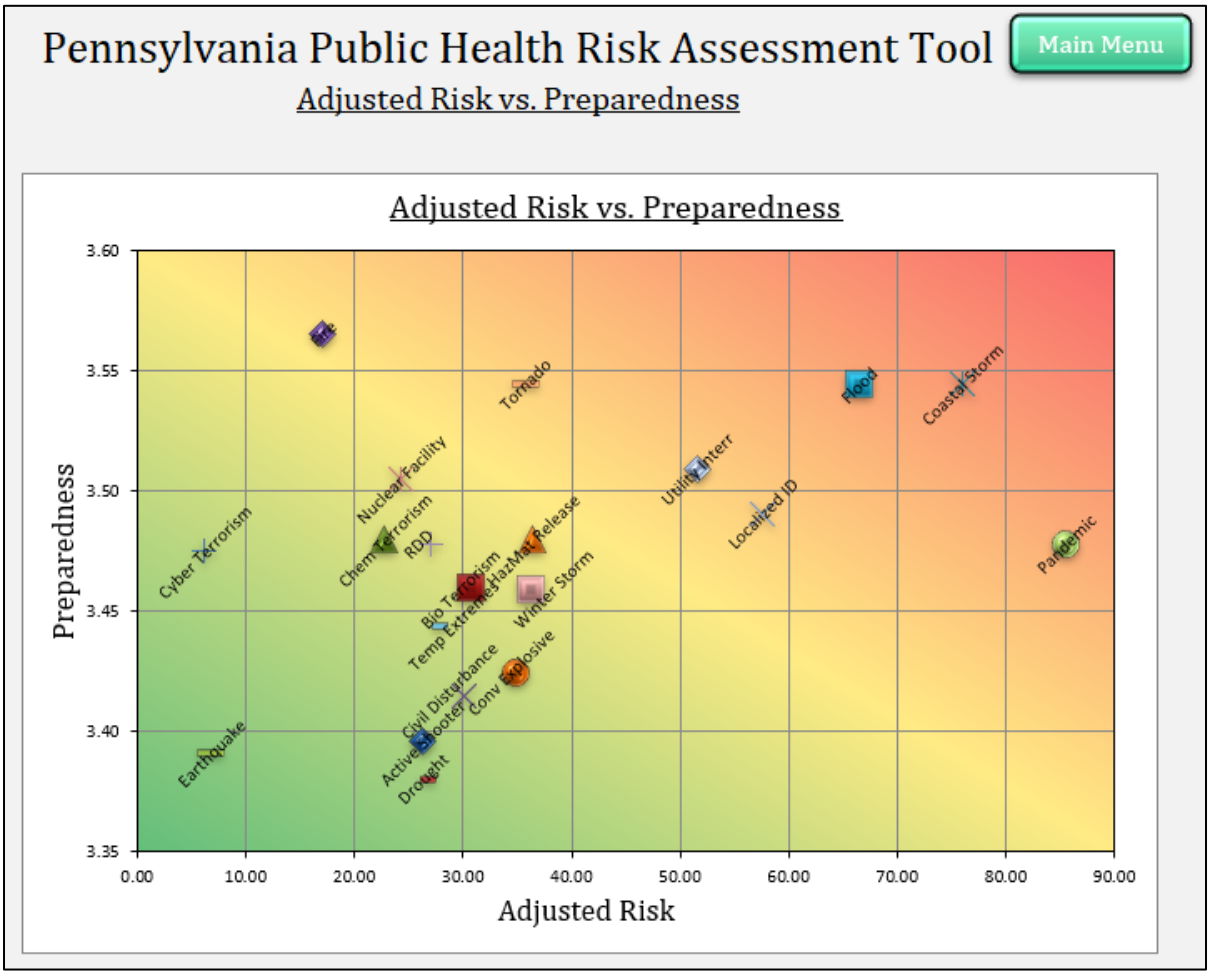
Figure 25. Probability vs. Severity



Adjusted Risk vs. Preparedness

The "Adjusted Risk vs. Preparedness" worksheet displays these scores for each hazard. All 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 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. The Adjusted Risk vs. Preparedness graph is shown in Figure 26.

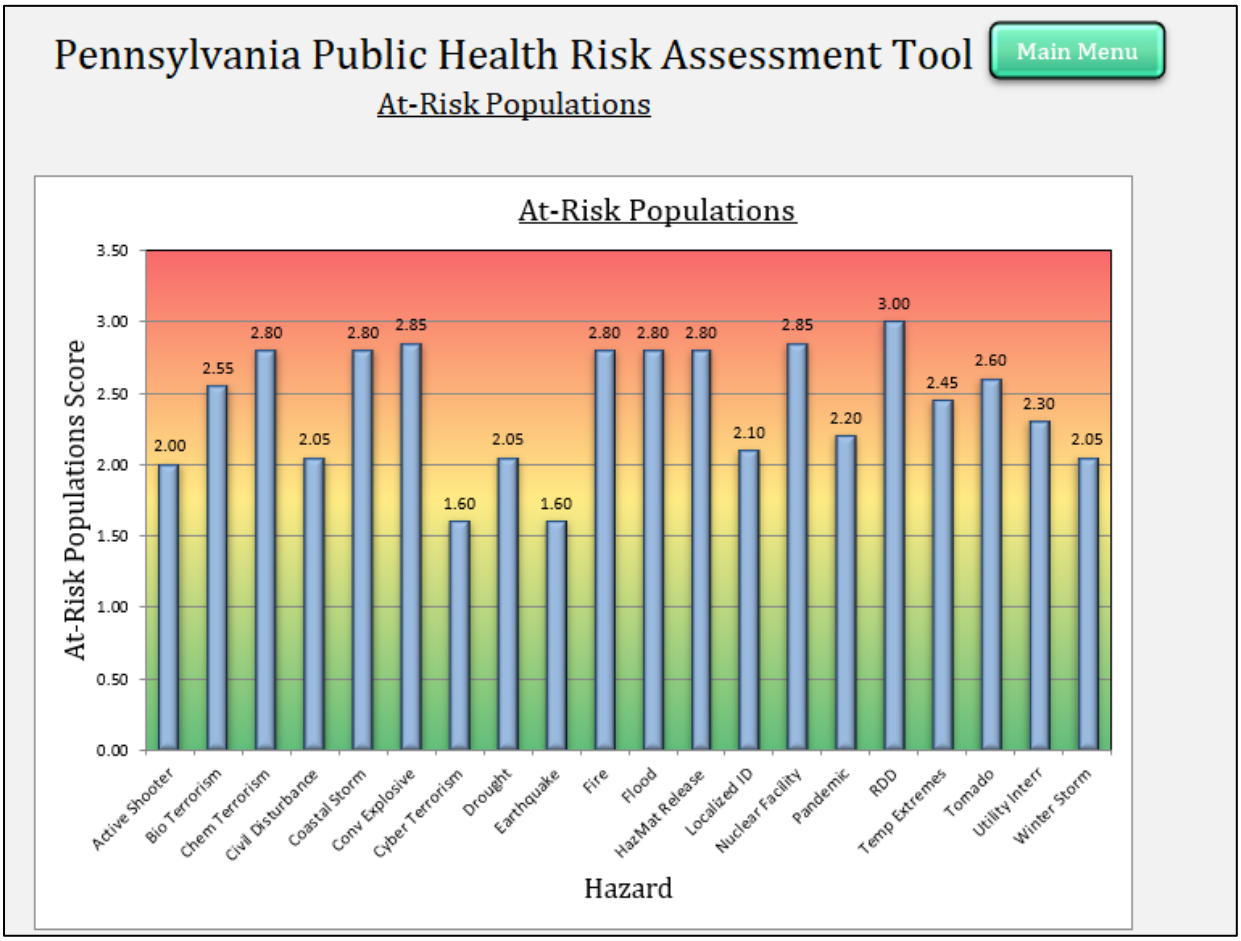
Figure 26. Adjusted Risk vs. Preparedness



At-Risk Populations

The "At-Risk Populations" worksheet displays a graph of the At-Risk Populations Scores of all hazards (Figure 27). All the individual Hazard worksheets must have been completed for this sheet to display correctly.

Figure 27. At-Risk Populations

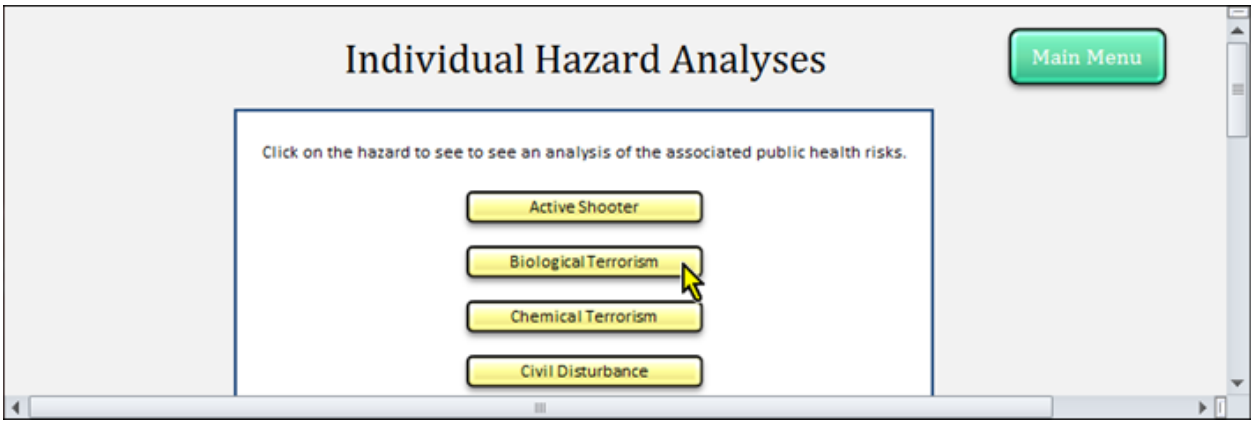


Individual Hazard Analyses

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 four severity domains, an assessment of the needs and the sizes of at-risk populations, and a graph of the status of each PHEP capability 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 28. More information about these worksheets can be found in the section "Hazard Analysis Worksheets" above.

Figure 28. Individual Hazard Analyses Menu



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