Regional Healthcare
Hazard Vulnerability Assessment

Prepared by:

The Northwest Healthcare Response Network

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PROJECT BACKGROUND

Background

The Northwest Healthcare Response Network (the Network), a healthcare emergency preparedness Coalition, coordinates regional preparedness, response and recovery activities with its healthcare, public health, emergency management, EMS and other partners. Hazards, be they natural or human-caused, can strike communities with little to no warning and cause an array of impacts ranging from minimal to catastrophic. Consequently, it is important to evaluate hazards that can potentially disrupt the healthcare delivery system. These evaluations often take the form of hazard vulnerability assessments, which can form the basis of healthcare emergency management programs and assist in prioritizing organizational activities and resources.

Purpose

In order to help assure preparedness and response activities align with identified healthcare and regional vulnerabilities, the Network collaborated with healthcare, public health, and emergency management partners to assess hazards in King, Kitsap and Pierce counties. Through this process, hazards were identified and prioritized based on expert input from healthcare emergency preparedness leaders. This Regional Healthcare Hazard Vulnerability Assessment (HVA) is developed as a tool to benchmark emergency management activities between and within the Coalition and its partners.

Goals

- Identify regional healthcare hazards based upon review of existing healthcare facility and regional HVAs.
- Seek participation from regional healthcare, public health and emergency management experts to validate identified hazards and assess regional healthcare impacts.
- Develop a Regional Healthcare Hazard Vulnerability Assessment inclusive of King, Kitsap and Pierce counties.
- Share finding with local, regional and state partners.

PROJECT METHODS OVERVIEW

This HVA report and its project components are based on a modified Delphi technique over a three-year project period: one in-person discussion and an initial survey for King and Pierce counties; and another survey with Kitsap County in 2018. The Delphi method is a consensus building survey technique. The technique was chosen following an extensive review of HVA and related models, tools and processes.

The project was divided into three phases:

- **Phase 1 (Winter-Spring 2016-17):** Identification of regional hazards and their likelihood.
- **Phase 2 (March & April 2017):** In person HVA discussion where experts ranked the impact of all identified regional hazards; NWHRN then distributed an online survey to King and Pierce county participants.
- **Phase 3 (February 2018):** Distributed an online survey to Kitsap County participants.

Consensus

Hazards were deemed to have reached consensus on their regional healthcare impact if they were rated consistently by 75% of the participants. Participants rated the regional healthcare impact for each hazard using a three-point Likert-type scale (Low, Moderate, or High).

The following hazard matrix illustrates the scheme used to map hazards which reached consensus on a Likelihood-Impact scale.

Figure 1: Hazard Risk Matrix

LIKELIHOOD			
HIGH	Medium	High	Extreme
MODERATE	Low	Medium	High
LOW	Insignificant	Low	Medium
	LOW	MODERATE	HIGH

IMPACT

DATA COLLECTION

To determine a list of potential hazards to inform Rounds 1-3, NWHRN staff reviewed hazards identified by the following jurisdictional and state HVAs:

- King County Regional Hazard Mitigation Plan Update: Volume 1: Planning-Area-Wide Elements
- Kitsap County Hazard Identification & Vulnerability Assessment
- Pierce County Hazard Identification & Risk Assessment
- Seattle Hazard Identification and Vulnerability Assessment
- Washington State Enhanced Hazard Mitigation Plan
- Public Health – Seattle & King County Hazard Identification and Vulnerability Analysis

Based on the data presented in these HVAs, Network staff designated the likelihood (Low, Moderate, High) for each identified hazard for presentation to Round 1-3 participants (see attachments), based on the following definitions of likelihood:

- Low
  - *Chance*: Could occur at some time.
  - *Frequency*: Has occurred 3 times or less in the past 10 years.
  - *Probability*: <35%
- Moderate
  - *Chance*: Might occur at some time.
  - *Frequency*: Has occurred more than 4-6 times in the past 10 years.
  - *Probability*: 35-65%
- High
  - *Chance*: Will likely occur in most circumstances.
  - *Frequency*: Has occurred at least 7 times in the past 10 years.
  - *Probability*: >65%

Likelihood & Impact Ranking Key
Green = Low
Yellow = Moderate
Red = High

Participants were then asked in each round to assess impact of each hazard to the regional healthcare system.

Twenty-one hazards were identified based on jurisdictional HVA analysis. Of those hazards, six had additional sub-hazards for full total of twenty-one hazards and fourteen sub-hazards (see Attachment A for further details). 27 of the 28 total hazards was analyzed by at least one of the above-mentioned HVAs, with a majority of hazards analyzed by at least two HVAs.

The one hazard assessed in this HVA that was not analyzed by jurisdictional HVAs is a Geomagnetic Storm. Hazard analysis for this threat was gleaned from Lloyd's of London, *Solar Storm Risk to the North American Electric Grid* (2013).

Impact

Following the Network's determination of hazard likelihood, participants were asked to evaluate the potential regional healthcare system impact of each hazard. Participants were asked to evaluate potential impacts in four general categories:

- Public Health and Safety
- Property, Facilities, Infrastructure
- Economy
- Other

Each hazard can result in impacts to one or more of these categories, and the severity of the impact may differ between each category.

An overview of potential impact information for each identified hazard can be found in Attachment B: Regional Healthcare Hazard Vulnerability Assessment Hazard Overview. The Network provided the following definitions to guide participants in ranking impact:

- Low – Causes minimal disruption and can be managed at the daily operational level.

- Moderate – Cannot be managed through normal operational means (e.g. activation of incident command structure and/or emergency operations plan), but does not threaten the ability of the regional healthcare system to continue providing essential services.

- High – Cause significant disruption and threatens the ability of the regional healthcare system to continue to provide essential services.

FINAL ANALYSIS

Overview

Based upon the two HVAs (2017 King-Pierce; 2018 Kitsap), it is clear there is agreement among the regional healthcare, public health, EMS and emergency management community that several of the 28 assessed hazards correspond to at least a "Moderate" likelihood and "Moderate" healthcare impact category. See Figure 2: Hazard Matrix Results on page 8. These nine hazards in alphabetical order are:

- Earthquake
- Geomagnetic Storm
- Health (epidemic, pandemic)
- Power Outage (Regional)
- Severe Weather (Storm)

- Technology Threats
- Terrorism (Small)
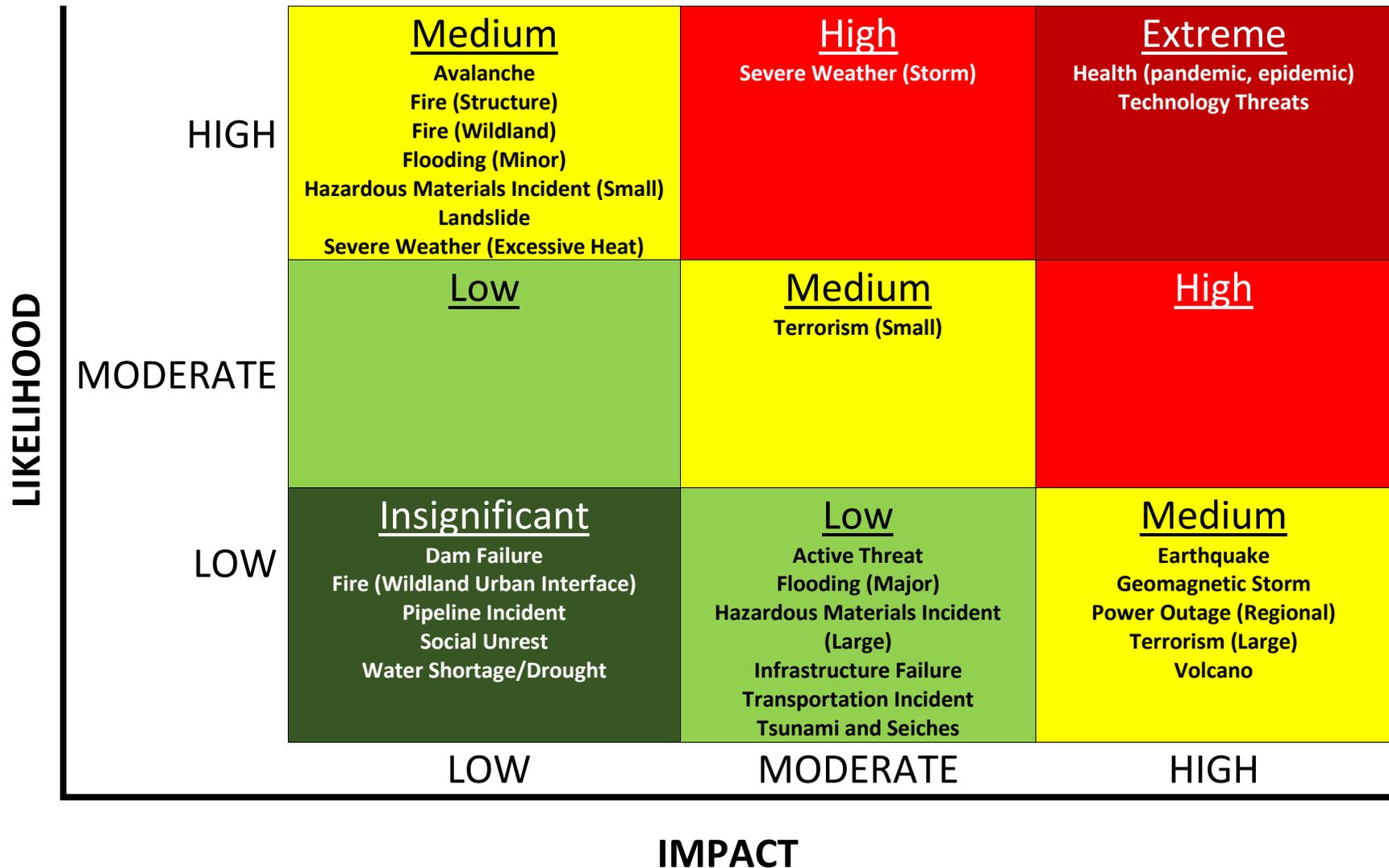- Terrorism (Large)
- Volcano

Health (epidemic, pandemic) and Technology Threats are the two hazards determined to be "Extreme" based on HVA participant impact ranking and Pre-Round likelihood definitions. Severe Weather (Storm) falls in a "High" hazard risk category, while the six remaining hazards noted above fall into two of the three "Medium" matrix categories. 18 other hazards fall into other "Medium", "Low" and "Insignificant" categories. One hazard, Power Outages (Isolated) did not reach consensus between the two HVAs. Final risk matrix stratification of all hazards can be found in Figure 3 on page 9.

These results present a question on how emergency managers and other preparedness officials should prioritize the remaining 19 hazards beyond the nine top. The results presented Figure 3: Final Hazard Risk Matrix are not meant to be in priority or ranked order. Information presented in this HVA should be compared to any existing jurisdictional and/or healthcare facility hazard assessments, and can be used to inform other HVAs.

Figure 2: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	• Health (epidemic, pandemic) • Technology Threats	'High' likelihood and 'High' impact
High	None	'Moderate' likelihood and 'High' impact
	• Severe Weather (Storm)	'High' likelihood and 'Moderate' impact
Medium	• Earthquake • Geomagnetic Storm • Power Outage (Regional) • Terror Attack (Large) • Volcano	'Low' likelihood and 'High' impact
	• Terror Attack (Small)	'Moderate' likelihood and 'Moderate' impact
	• Avalanche • Fire (Structure) • Fires (Wildland) • Flooding (Minor) • Hazardous Materials Incident (Small) • Landslide • Severe Weather (Excessive Heat)	'High' likelihood and 'Low' impact
Low	• Active Threat • Flooding (Major) • Hazardous Materials Incident (Large) • Infrastructure Failures • Transportation Incident • Tsunami and Seiches	'Low' likelihood and 'Moderate' impact
	None	'Moderate' likelihood and 'Low' impact
Insignificant	• Dam Failure • Fire (Wildland Urban Interface) • Pipeline Incident • Social Unrest • Water Shortage/Drought	'Low' likelihood and 'Low' impact
Uncategorized	• Power Outage (Isolated)	Not categorized in Matrix due to lack of consensus

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Figure 3: Final Hazard Risk Matrix*

		LOW	MODERATE	HIGH
LIKELIHOOD	**HIGH**	**Medium** Avalanche Fire (Structure) Fire (Wildland) Flooding (Minor) Hazardous Materials Incident (Small) Landslide Severe Weather (Excessive Heat)	**High** Severe Weather (Storm)	**Extreme** Health (pandemic, epidemic) Technology Threats
	MODERATE	**Low**	**Medium** Terrorism (Small)	**High**
	LOW	**Insignificant** Dam Failure Fire (Wildland Urban Interface) Pipeline Incident Social Unrest Water Shortage/Drought	**Low** Active Threat Flooding (Major) Hazardous Materials Incident (Large) Infrastructure Failure Transportation Incident Tsunami and Seiches	**Medium** Earthquake Geomagnetic Storm Power Outage (Regional) Terrorism (Large) Volcano

IMPACT

*Power Outage (Isolated) not categorized in Hazard Risk Matrix due to lack of consensus

FUTURE WORK

This Regional Healthcare Hazard Vulnerability Assessment is the second time the Northwest Healthcare Response Network has undertaken an analysis of potential hazards impacting our region. The Network plans on reviewing this HVA annually. Future regional healthcare HVA planning efforts the Network will consider including:

- Incorporating 12 additional counties (corresponding to the new geographic footprint of the Network) into the HVA: Whatcom, Skagit, Snohomish, San Juan, Island, Thurston, Lewis, Mason, Grays Harbor, Pacific, Clallam, and Jefferson.

- Reviewing existing and new HVA tools and processes.

- Completing a regional healthcare impact analysis by quantitatively assessing hazard impacts. For example, if an earthquake results in the loss of electrical power to a healthcare organization, is it possible to determine how individual consequences of an earthquake (loss of power, road damage, etc.) impact the regional healthcare delivery system?

- Connecting the outcomes of this regional HVA to coalition partner prioritization planning.