

Regional Healthcare Hazard Vulnerability Assessment

Prepared by:

The Northwest Healthcare Response Network

June 5, 2017



TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
PROJECT BACKGROUND.....	3
PROJECT METHODS OVERVIEW	3
PRE-ROUND DATA COLLECTION.....	4
ROUND ONE	6
ROUND TWO	8
FINAL ANALYSIS.....	10
FUTURE WORK	13

Attachments

Attachment A: Regional HVA Hazard Overview (summary)

Attachment B: Regional Healthcare Hazard Vulnerability Assessment Hazard Overview (full version)

Attachment C: Regional Healthcare HVA Survey (Phase 2)

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 and other partners. Many healthcare organizations are required to assess facility and community hazards from an emergency management perspective annually and following significant real-world events and exercises. These assessments form the basis of healthcare emergency management programs and assist in prioritizing program 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 and Pierce Counties. Through this process, hazards were identified and prioritized based on expert input from healthcare emergency preparedness leaders. The 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.
- 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 involving one in-person round and a second round email survey. The Delphi method is a consensus building survey technique that is traditionally done in three rounds of surveys. For this project, the Network used a modified Delphi method that included two defined phases (one in person and one via survey). The technique was chosen following an extensive review of HVA and related models, tools and processes.

The project was divided into three distinct phases to achieve the defined goals.

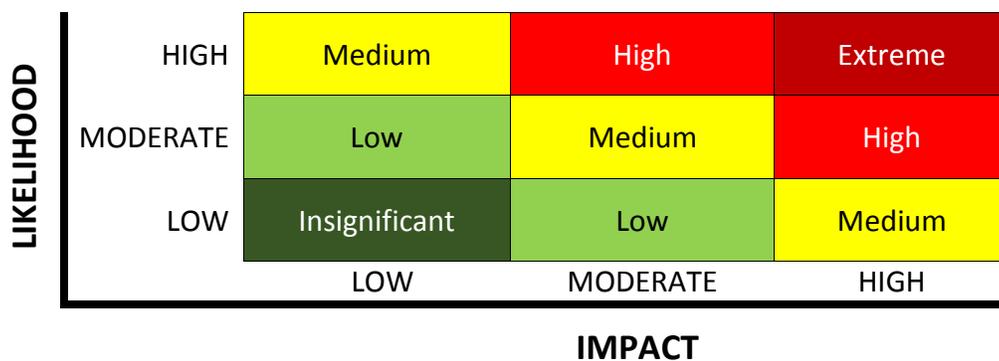
- **Pre-Round (Winter-Spring 2016-17):** Identification of regional hazards and their likelihood.
- **Round 1 (March 2017):** The NWHRN hosted an in person HVA discussion round where expert participants ranked the impact of all identified regional hazards.
- **Round 2 (April 2017):** Distributed an online survey to a larger group of participants to validate ranking of regional hazards.

Consensus

In both Round 1 and Round 2, 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



PRE-ROUND DATA COLLECTION

To determine a list of potential hazards to inform Rounds 1 and 2, 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
- 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 and 2 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). 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 Network 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.

ROUND ONE

Overview

On March 15, 2017, the Network convened a group of a dozen healthcare, public health and EMS experts and lasted approximately three hours. The session included a description of the project and its goals; an overview of established regional hazards as defined by existing local/regional and healthcare facility hazard assessments; an opportunity for participants to propose additional hazards; rank both established hazards and any additional hazards; and a discussion of the next round of the project.

Results

Participants reviewed 28 total hazards identified in the Pre-Round. Of these hazards, 24 (86%) reached consensus among participants. Participants were invited to add additional hazards to the 28 identified; following discussion however, no additional hazards were added to the list.

Two hazards—Health (epidemic, pandemic) and Technology Threats—were rated a ‘High’ impact by participants and noted as ‘High’ likelihood during the Pre-Round. Thus, this places them in the ‘Extreme’ hazard matrix category.

Severe Weather (Storm), which was noted as ‘Moderate’ likelihood during the Pre-Round, was also rated ‘High’ impact by participants, thereby placing it in a ‘High’ hazard matrix category.

Based on participant impact rating, the remaining 25 hazards are placed in a Medium (N=13), Low (N=6), or Insignificant (N=6) matrix category.

The four hazards that did not reach consensus, but a majority of participants did agree upon are (along with the majority Impact rating):

- Dam Failure – 67% Low
- Fires (Wildland Urban Interface) – 67% Low
- Flooding (Major) – 67% Moderate
- Social Unrest – 58% Low

Participant Demographics

Twelve experts participated in the first round. Participants represented seven healthcare organizations, one local health jurisdiction, and one fire department, and a majority (75%) have previously participated in an organizational or regional HVA process.

Participants represented the following organizations:





- Kaiser Permanente
- Valley Medical Center
- Tacoma Fire Department
- Seattle Children's Hospital
- Harborview Medical Center

- Virginia Mason Medical Center
- Public Health - Seattle & King County
- Eastside Psychological Associate
- The Polyclinic

Participants represented the following sectors:

- Behavioral Health (1)
- City/County Emergency Management (1)
- EMS (1)

- Hospital (7)
- Outpatient (6)
- Public Health (1)

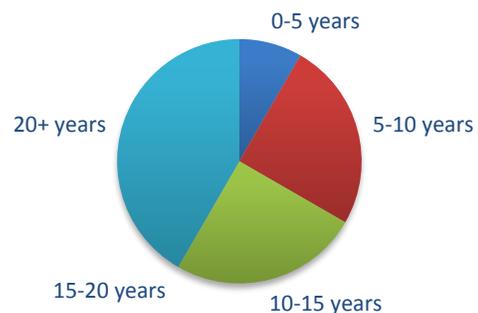
Participants represented the following healthcare fields:

- Administration (1)
- Behavioral Health (1)
- Emergency Management (7)
- EMS (1)
- Engineering/Facilities (2)

- Environment of Care Team (1)
- Public Health (1)
- Safety (5)
- Supply Chain (1)

Participants in the first round had significant professional experience in their respective fields. While one participant noted 0-5 years of professional experience, all other participants reported at least 5-10 years of professional experience. Almost half of participants (n=5) noted at least 20 years of experience (see chart).

Participant Years of Experience



ROUND TWO

Overview

On April 6, 2017, the Network disseminated a Regional Healthcare HVA Survey to over 200 colleagues seeking their input on regional hazards. Participants were provided an overview of each hazard, the ranking determined through Round 1, any comments from Round 1 participants, and all attached documentation. Participants were asked to assess the hazards and determine: “Based on the hazard definition, regional likelihood, and comments from the first HVA round discussion, how would you rank the regional healthcare impact of...” each hazard (See Attachment C: Regional Healthcare HVA Survey [Phase 2]). Round Two participants were asked to consider the ranking from the first round before ranking each hazard on a 3-point Likert Scale (Low, Moderate, or High) using the same definitions for impact as outlined for Round 1.

Slight changes were made to a few of the twenty-eight hazards presented in the first round. Those changes included:

- Moving bio-terrorism from the Health hazard to Terror Attack
- Changing the likelihood of the Health hazard from ‘Moderate’ to ‘High’

The survey was disseminated via SurveyMonkey and open between April 6-21, 2017.

Results

Forty-two individuals participated in the second round survey. Of the 28 hazards, 12 (43%) reached consensus. While this total is half the consensus total of Round One, *all hazards surveyed in Round Two reached at least 50% agreement on their regional healthcare impact, with several narrowly missing the 75% ‘consensus’ definition. Furthermore, the ranking of impact for all hazards in Round 2 (High, Moderate, Low) corresponded exactly to the same rank in Round 1.*

Thus, Health (epidemic, pandemic) and Technology Threats are placed in the ‘Extreme’ hazard matrix category, and Severe Weather (Storm), is placed a ‘High’ hazard matrix category.

Like Round 1, the remaining 25 hazards are placed in a Medium (N=13), Low (N=6), or Insignificant (N=6) matrix category.

The 14 hazards that did not reach consensus, but a majority of participants did agree upon are (along with the majority Impact rating) in alphabetical order:

- Active Threat – 74% Moderate
- Dam Failure – 60% Low
- Fire (Structure) – 71% Low
- Fire (Wildland) – 74% Low
- Fires (Wildland Urban Interface) – 67% Low
- Flooding (Minor) – 64% Low
- Flooding (Major) – 55% Moderate
- Geomagnetic Storm – 52% High
- Hazardous Materials Incident (Small) – 74% Low
- Power Outages (Isolated) – 62% Low
- Power Outage (Regional) – 69% High
- Severe Weather (Excessive Heat) – 67% Low
- Social Unrest – 52% Low
- Terror Attack (Small) – 71% Moderate
- Tsunami and Seiches – 71% Moderate

- Volcano – 71% High

Participant Demographics

Forty-two individuals participated in the second round. Participants represented a variety of healthcare organizations, local health jurisdictions, EMS agencies, and local emergency management departments. A majority (71%) have previously participated in an organizational or regional HVA process.

Participants represented the following sectors:

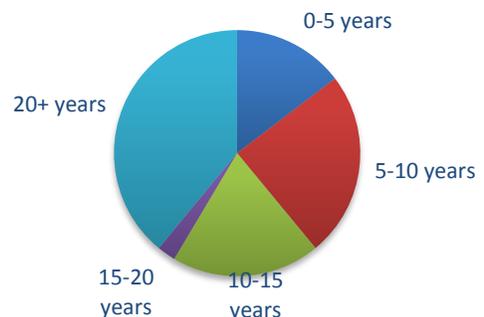
- Behavioral Health (1)
- Blood Centers (1)
- Cancer Care (1)
- City/County Emergency Management (4)
- Dialysis Provider (2)
- EMS (3)
- Federal Health Care Agency (1)
- Hospital (14)
- Long-Term Care Facility (13)
- Long-Term Acute Care Facility (1)
- Medical Community Center (1)
- Outpatient (6)
- Public Health (3)

Participants represented the following healthcare fields:

- Administration (9)
- Behavioral Health (1)
- Clinical (4)
- Emergency Management (18)
- EMS (3)
- Engineering/Facilities (7)
- Nursing Home / Short & Long-Term Stay (1)
- Public Health (3)
- Safety (12)
- Security (2)
- Supply Chain (2)

Participants in the second round had significant professional experience in their respective fields. While six of the forty-two participant noted 0-5 years of professional experience, the vast majority of participants reported at least 5-10 years of professional experience (see chart). 79% of participants noted their organization(s) is located in King County, and 29% noted Pierce County. Participants noted that their organizations additionally served in the following other counties: Clallam, Clark, Cowlitz, Franklin, Grays Harbor, Island, Jefferson, Kitsap, Lewis, Mason, Snohomish, Skagit, Thurston, and Whatcom.

Participant Years of Experience



FINAL ANALYSIS

Based upon the two survey rounds of the HVA project, 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. 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 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. The 19 other hazards fall into other “Medium”, “Low” and “Insignificant” categories. Final risk matrix stratification of all 28 hazards can be found in Figure 3 on page 12. The “Medium” designation is the only matrix tier with three distinct levels.

These results present a question on how emergency managers and other preparedness officials should prioritize the remaining 19 hazards: should all hazards falling into any of the three “Medium” matrix categories be prioritized over any categories, such as that of the “Low” (‘Low’ likelihood and ‘Moderate’ impact) category with six hazards?

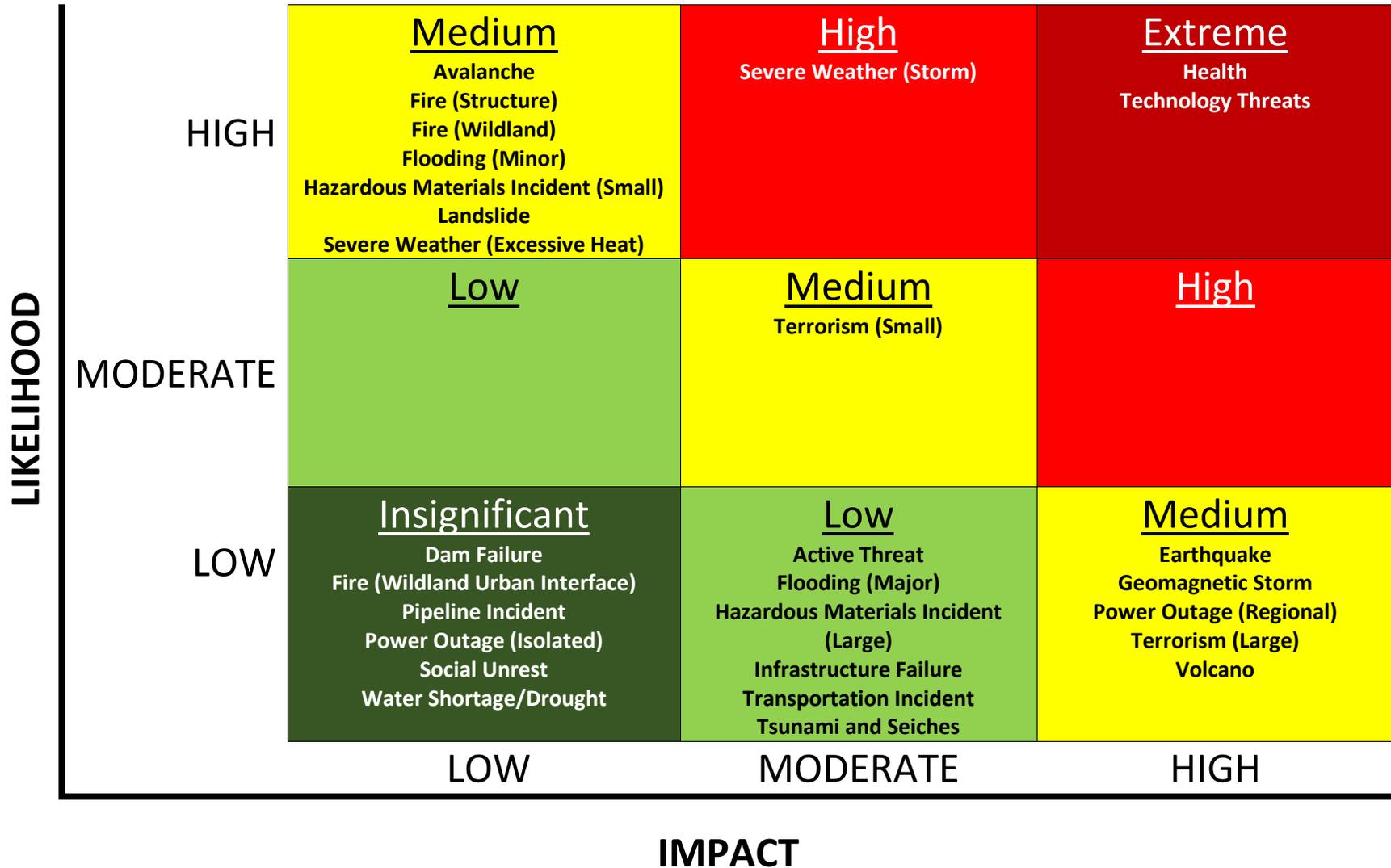
At an individual facility or similar level, the seven ‘High’ likelihood and ‘Low’ impact hazards (see Figure 2 below) may indeed rise above, in terms of prioritization, the six ‘Low’ likelihood and ‘Moderate’ impact hazards (Active Threat, Flooding [Major], Hazardous Materials Incident [Large], Infrastructure Failure, Transportation Incident, and Tsunami & Seiches), as these “Medium” hazards may have a significant impact on patient care or daily operations. In this scenario, both axes of the matrix—likelihood and regional healthcare system impact—are weighted equally, thereby prioritizing the seven ‘High’ likelihood and ‘Low’ impact hazards above the six ‘Low’ likelihood and ‘Moderate’ impact hazards.

At a regional level, however, it may be more appropriate to place greater emphasis on the regional healthcare impact axis in relation to likelihood, as more regional preparedness and response resources may be dedicated to the six ‘Low’ likelihood and ‘Moderate’ impact hazards than seven ‘High’ likelihood and ‘Low’ impact hazards (Avalanche, Fire [Structure], Fires [Wildland], Flooding [Minor], Hazardous Materials Incident [Small], Landslide, Severe Weather [Excessive Heat]). This interpretation would thus result in greater emphasis on these ‘Low’ likelihood and ‘Moderate’ impact hazards, as major flooding, large hazardous materials incidents, infrastructure failures, etc. may have a greater impact on the healthcare delivery system across the region when compared to even these seven ‘High’ likelihood and ‘Low’ impact hazards.

Figure 2: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	<ul style="list-style-type: none"> • Health (epidemic, pandemic) • Technology Threats 	'High' likelihood and 'High' impact
High	None	'Moderate' likelihood and 'High' impact
	<ul style="list-style-type: none"> • Severe Weather (Storm) 	'High' likelihood and 'Moderate' impact
Medium	<ul style="list-style-type: none"> • Earthquake • Geomagnetic Storm • Power Outage (Regional) • Terror Attack (Large) • Volcano 	'Low' likelihood and 'High' impact
	<ul style="list-style-type: none"> • Terror Attack (Small) 	'Moderate' likelihood and 'Moderate' impact
	<ul style="list-style-type: none"> • Avalanche • Fire (Structure) • Fires (Wildland) • Flooding (Minor) • Hazardous Materials Incident (Small) • Landslide • Severe Weather (Excessive Heat) 	'High' likelihood and 'Low' impact
Low	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Dam Failure • Fire (Wildland Urban Interface) • Pipeline Incident • Power Outages (Isolated) • Social Unrest • Water Shortage/Drought 	'Low' likelihood and 'Low' impact

Figure 3: Final Hazard Risk Matrix



FUTURE WORK

This Regional Healthcare Hazard Vulnerability Assessment is the first 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 Kitsap County into the HVA.
- 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.