NWHRN Healthcare System
Hazard Vulnerability Assessment

District Level Review

Prepared by:

The Northwest Healthcare Response Network

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Contents

PROJECT OVERVIEW

Introduction

The Northwest Healthcare Response Network (NWHRN) is a healthcare coalition responsible for coordinating healthcare-related preparedness, response, and recovery activities within its service area of 25 sovereign tribal nations and 15 counties in Western Washington. In order to help assure preparedness and response activities align with identified healthcare and regional vulnerabilities, the NWHRN collaborated with tribal, healthcare, public health, emergency medical services, fire, and emergency management partners to assess hazards in its coalition service area in order to build a Healthcare System focused Hazard Vulnerability Assessment (HVA).

Purpose

HVAs form the basis of emergency management programs and assist in prioritizing organizational activities and resources. The original HVA served as a compliment to individual facility and healthcare organization HVAs by developing a hazard analysis for the healthcare community at both a coalition-wide as well as individual district-based levels. The purpose of the HVA review was to provide a mid-cycle assessment of the Healthcare Coalition HVA to ensure the analysis continues to provide an accurate representation of the hazards that will have the greatest impact to healthcare. Specific objectives to achieve this goal include:

- Review the ranking of identified hazards from the previous Coalition HVA and update as appropriate.
- Discussing with local partners in each of the Network's four districts the level of impact of each hazard to the healthcare system within their district.
- Using the collected data to produce a total of five updated HVAs: a full coalition HVA discussing hazards and their healthcare impacts, as well as four district HVAs providing a risk analysis for each district.
- Sharing the findings of the project with local, regional, tribal and/or state partners.

The project was divided into three major phases:

- **Phase 1:** Internal review of current Coalition HVA and county, city, state, and tribal HVA's.
- **Phase 2:** Focus group-based discussions with district partners and district HVA review.
- **Phase 3: Compile and update data based on group discussions.**

MID-CYCLE REVIEW AND VALIDATION

During the internal review process, NWHRN staff assessed the list of hazards that were previously rated to determine if there were any additional hazards that would be relevant to add. It was determined that one additional hazard should be added to the list of hazards and put forward to the groups for discussion. Supply Chain was the one new hazard that was added to the list due to the challenges experienced during 2020 and

onwards. In each of the district group discussions, participants first voted on whether supply chain was a standalone hazard or if they thought it should be an amplifier of other hazards. If they determined that it was a standalone hazard, then they voted on its likelihood and level of impact.

No hazards were removed during the internal or external mid-cycle review. To see the original list of hazards follow the link here : 2020 List of Hazards.

The same definitions of likelihood and impact were utilized during the mid-cycle review process. Consistent with the original HVA under review, the NWHRN used the following definitions for the likelihood of a hazard occurring:

- 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

HAZARDS

A total of 20 hazards were chosen for inclusion in the HVA. During the previous HVA process, one of the hazards, climate change, was acknowledged as a hazard amplifier instead of a distinct hazard. Additionally, another hazard, fire, was separated into structural and wildfire types both of those changes remained the same during this HVA review. During the HVA review process, Supply Chain was submitted as a new hazard for each of the district focus groups to discuss and determine if it should be considered a standalone hazard or an amplifier. The following definitions were derived from literature review as well as discussions within each district focus group, additional definition feedback discussed during the HVA review and will be considered for future HVAs.

Avalanche – An avalanche is a mass of loosened snow or ice that suddenly, and usually swiftly, slides down a mountain, growing by collecting additional material as it descends. While both controlled and uncontrolled avalanches often occur every winter, avalanches considered for this HVA are those that are large enough to be considered a potential threat to healthcare delivery.

Climate Change – Projected regional warming and sea level rise is expected to bring new challenges to the Northwest as well as exacerbate existing hazard impacts. While this hazard was originally chosen for inclusion due to its appearance in many other HVAs, NWHRN has chosen following consultations with coalition partners to acknowledge it as an amplifier of existing threats and consider it as we analyze the risk of other hazards. During the HVA review all Districts reconfirmed that Climate Change would remain an amplifier.

Cyber Threat – Cyber threats are disruptions to information technology and/or communications systems. They can be caused accidentally from faults in software programming code, for example, or deliberately by malicious agents. This hazard considers actual disruptions or successful attacks on our healthcare systems.

Dam Failure – A dam is an artificial barrier built across a watercourse to impound or divert water. Dam failure is the sudden, rapid, and uncontrolled release of impounded water resulting in downstream flooding. Dam failures can result in flooding of areas that do not typically experience flooding and in a faster time than weather-related flooding.

Drought – Drought is a prolonged period of low precipitation severe enough to reduce soil moisture, water and snow levels below the minimum necessary for sustaining ecological, civic, and economic systems without disruption.

Earthquake – An earthquake is shaking of the ground caused by a sudden slip on a fault. Earthquakes can result in variety of primary and secondary hazards occurring as well. For the purposes of this HVA, earthquakes of 6.5 magnitude or higher (equivalent to the 2001 Nisqually earthquake) are the focus.

Energy Emergency – Energy emergencies include any disruption to the energy infrastructure of the healthcare system in Western WA. This includes direct impacts such as power outages and indirect impacts such as disruption of gas due to a pipeline incident.

Erosion (Coastal) – Coastal erosion is a hazard unique to coastal areas of Washington and along some rivers and canals. This hazard creates specific risks for healthcare facilities along the coasts and in island communities.

Fire – Western Washington experiences three types of fire threats: structure fires, wildfires, and wildland urban interface (WUI) fires where development is adjacent to densely vegetated areas. While virtually every HVA reviewed examined fire, NWHRN staff and partners have chosen to classify fire into two main categories relevant to healthcare; the first category is structural fires, and the second category includes both wildfires and WUI fires.

Flooding – Western Washington is very prone to flooding. Flooding typically occurs after the region experiences large, wet and warm weather systems.

Hazardous Materials – Hazardous materials include the unwanted, unplanned, or deliberate release or escape of substances that may cause or create a risk to public health, safety, or the environment. This hazard does not include biological agents.

Health – Health as a hazard includes disease outbreaks, pandemics, and bioterrorism incidents. An outbreak can be characterized by the extent of spread of the disease and is typically defined as above normal incidence of the disease than would be expected among the population. Examples of this include above epidemics/pandemics, respiratory seasons as well as rare diseases such as Ebola.

Landslide – Landslides occur when gravity overcomes the strength of the soil and rock in a slope, often with the help of contributing factors such as heavy rainfall, erosion of the toe of a slope, ground shaking, or human action. This hazard also includes debris flows, mudslides, and mudflows due to their similar types of impact to healthcare.

Severe Weather – Severe weather includes storms and excessive heat events. Storms are an atmospheric disturbance featuring sustained strong winds (40+ mph) and/or significant precipitation (rain or snow). Excessive heat events are defined as a weather pattern that is substantially hotter and/or more humid than average for a location at that time of year.

Social Unrest – Social unrest includes a wide range of activities from violent to peaceful, legal to illegal, criminal to principled and highly planned to completely spontaneous which disrupt a community or organization. Many of these events can be broadly categorized as civil disturbances.

Supply Chain – An interruption to the network of suppliers, storage facilities, transporters, and distributors involved in the production, delivery, and sale of critical products.

Terrorism – Terrorism is defined as "the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof". This hazard includes actions meant to inflict mass casualties on the population such as active shooters.

Transportation – Transportation as a hazard deals with both the disruption of the infrastructure as well as incidents involving the modes of transportation themselves and is inclusive of all types of transportation: aviation, road, rail, and marine.

Tsunami and Seiches – A tsunami is a series of waves typically generated during an earthquake by sudden displacement of the sea floor or lakebed. Seiches are standing waves in an enclosed or partially enclosed body of water primarily generated by changes in atmospheric pressure.

Volcano and Lahars – Washington State has five active volcanoes (defined as a vent in the earth's crust through which magma, rock fragments, gases, and ash are ejected from the earth's interior): Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, and Mount Adams.

METHODS

A modified version of the Delphi technique was used for the HVA review process of assessing the district level hazard impact and risks. The Delphi technique is a method of consensus building involving collating the judgment of a small group of subject matter experts. This technique was chosen based upon its success in previous HVA projects. The main modification to the technique is the limitation of the information review to a single round of virtual focus groups for each district, rather than including a second-round distribution of an online survey to a wider audience.

For each district focus group, participants were provided background information on the project, an overview of established hazards and asked to assess two components of each hazard: the likelihood of the hazard occurring, and the impact of the hazard to the district's healthcare infrastructure if the hazard were to happen. For the hazard likelihood, focus group participants were asked for their assessment and vote on the current rating of the likelihood derived from the 2020 Coalition HVA. Participants had an opportunity to vote to either keep the current rating or to change it. Following the discussion on likelihood, participants were asked to evaluate and vote on the potential district level healthcare infrastructure impact of each hazard and once again vote to either keep the current impact rating or change it. Participants were asked to evaluate potential impacts in four general categories:

- Public Health and Patients – Impact of hazard to people/patients
- Facility – Impact of hazard to healthcare facility/facilities
- Infrastructure – Impact of hazard to healthcare related resources i.e., medical supplies/equipment, PPE, etc.
- Other – Other potential healthcare impacts i.e., staffing shortages, etc.

Each hazard can result in impacts to one or more of these four categories, and the severity of the impact may differ between each category. After reviewing the impact of each hazard and holding an open discussion, participants were asked to provide a rating of the hazard using a three-point Likert-type scale (Low, Moderate, or High). The NWHRN provided the following definitions to guide participants in ranking impact:
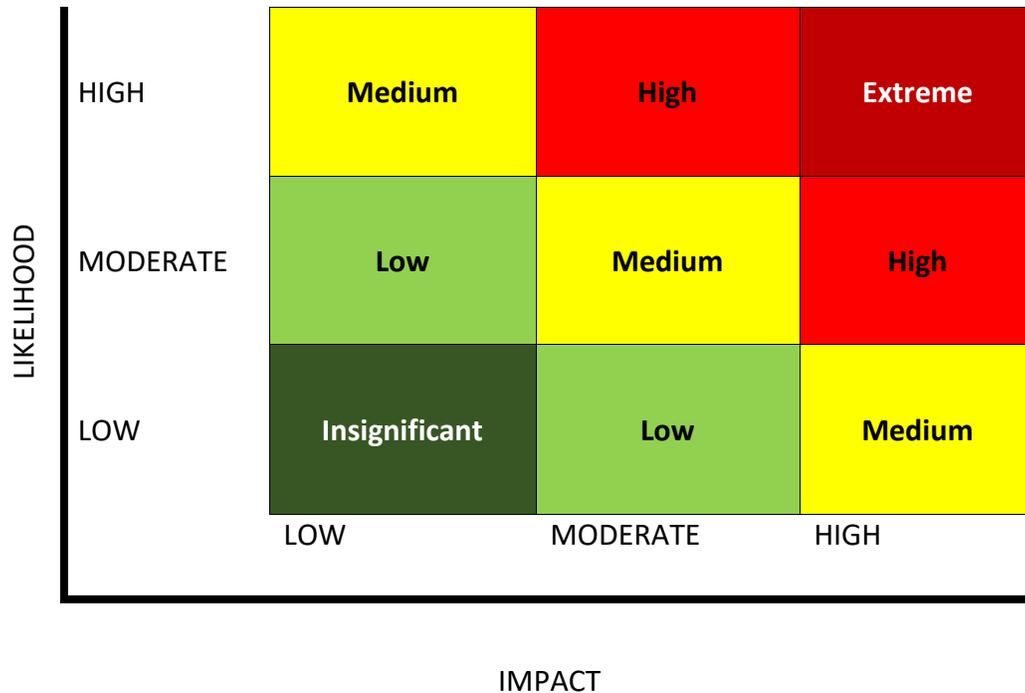
- <u>Low</u> – Causes minimal disruption and can be managed at the daily operational level.
- <u>Moderate</u> – Cannot be managed through normal operational means (e.g., activation of incident command structure and/or emergency operations plan) but does not threaten the ability of the regional healthcare system to continue providing essential services.
- <u>High</u> – Cause significant disruption and threatens the ability of the regional healthcare system to continue to provide essential services.

Once participants voted on hazards impact, utilizing a polling feature, results were displayed to the group. Hazards were deemed to have reached consensus of at least 60% of the focus group participants.

Risk Matrix

Hazards reaching consensus for both likelihood and impact ratings were then plotted on a hazard risk matrix to create a final risk profile. This risk matrix provides a high-level summary of the stratified hazard risk levels for each district with those hazards considered high in likelihood and impact are rated as 'extreme,' and those with low likelihood and impact are rated as 'insignificant'.

Figure 1: Hazard Risk Matrix Template

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

IMPACT

RESULTS

The aim of the HVA review process is to ensure that the results of the Coalition HVA remain accurate, up to date, and a current representation of the most impactful hazards and vulnerabilities to healthcare. Across all four Districts, health hazard and cyber threat are the two hazards that consistently were ranked in the extreme category. The chart below depicts the hazard rankings for each of the Districts.

Matrix Designation	Central District	North District	Northwest District	West District
Extreme	Cyber Threat Energy Emergency Hazardous Material Health Incident	Cyber Threat Health Incident	Cyber Threat Energy Emergency Health Incident Severe Weather Transportation Incident	Cyber Threat Energy Emergency Flooding Health Incident Severe Weather
High	Earthquake Severe Weather Social Unrest Terrorism Transportation Incident	Energy Emergency Flooding Severe Weather Terrorism	Fire-WUI/Wildland Flooding Landslide Supply Chain Terrorism	
Medium	Fire WUI/Wildland Flooding Landslide Supply Chain Volcano	Earthquake Fire-Structure Social Unrest Transportation Incident Volcano	Drought Earthquake Erosion Coastal Fire-Structure	Dam Failure Earthquake Fire-WUI/Wildland Hazardous Material Landslide Social Unrest Supply Chain Terrorism Transportation Incident Tsunami & Seiches Volcano
Low	Avalanche Dam Failure Drought Erosion Coastal Tsunami & Seiches	Dam Failure Hazardous Material Landslide	Hazardous Material Tsunami & Seiches Volcano	Erosion Coastal
Insignificant	Fire Structure	Avalanche Drought Erosion Coastal Fire-WUI/Wildland Tsunami & Seiches	Avalanche Dam Failure Social Unrest	Avalanche Drought Fire-Structure

CENTRAL DISTRICT

Summary and Demographics

Central District (King and Pierce counties) held its focus group on Monday, May 26th, 2021, with a total of 20 individuals participating. Professional backgrounds among individuals included members from Hospitals, Public Health, Outpatient Clinics, Home Health, LTC, Healthcare Alliances, and one state-wide response NGO.

Figure 2: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	• Cyber Threat • Energy Emergency • Hazardous Material • Health Hazard	'High' likelihood and 'High' impact
High	• Earthquake • Severe Weather • Social Unrest • Terrorism	'Moderate' likelihood and 'High' impact
	• Transportation Incident	'High' likelihood and 'Moderate' impact
Medium	• Volcano	'Low' likelihood and 'High' impact
	• Fire-WUI/Wildland • Flooding • Landslide • Supply Chain	'Moderate' likelihood and 'Moderate' impact
Low	• Drought • Tsunami & Seiches	'Low' likelihood and 'Moderate' impact
	• Avalanche • Dam Failure • Erosion-Coastal	'Moderate' likelihood and 'Low' impact
Insignificant	• Fire-Structural	'Low' likelihood and 'Low' impact

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Figure 3: Hazard Risk Matrix

		LOW	**MODERATE**	**HIGH**
LIKELIHOOD	**HIGH**	**Medium**	**High** Transportation	**Extreme** Cyber Threat Energy Emergency Hazardous Materials Health Incident
	MODERATE	**Low** Drought Erosion-Coastal	**Medium** Fire-WUI/Wildland Flooding Landslide Supply Chain	**High** Earthquake Severe Weather Social Unrest Terrorism
	LOW	**Insignificant** Fire-Structural	**Low** Avalanche Dam Failure Tsunami and Seiches	**Medium** Volcano

IMPACT

Results and Analysis

Based upon the Hazard Matrix, the most extreme risks to Central District's healthcare system are Cyber Threats, Energy Emergencies, Hazardous Materials Incidents and Health Incidents based upon their high likelihood and high impact as rated by the focus group. The matrix also identifies Earthquakes, Severe Weather, Terrorism, and Transportation as high priority risks.

As noted in the Hazards section, Climate Change remained as modifier of the other existing hazards as majority voted by participants of the focus group. Supply Chain was voted in as a standalone hazard and ranked at a medium level hazard. Through the HVA review process, several hazards were re-ranked based upon discussion and review. Health Incidents moved from high to an extreme ranking. Additionally, Social Unrest went from a medium ranking to a high ranking and Avalanche moved from a medium ranking to a low ranking.
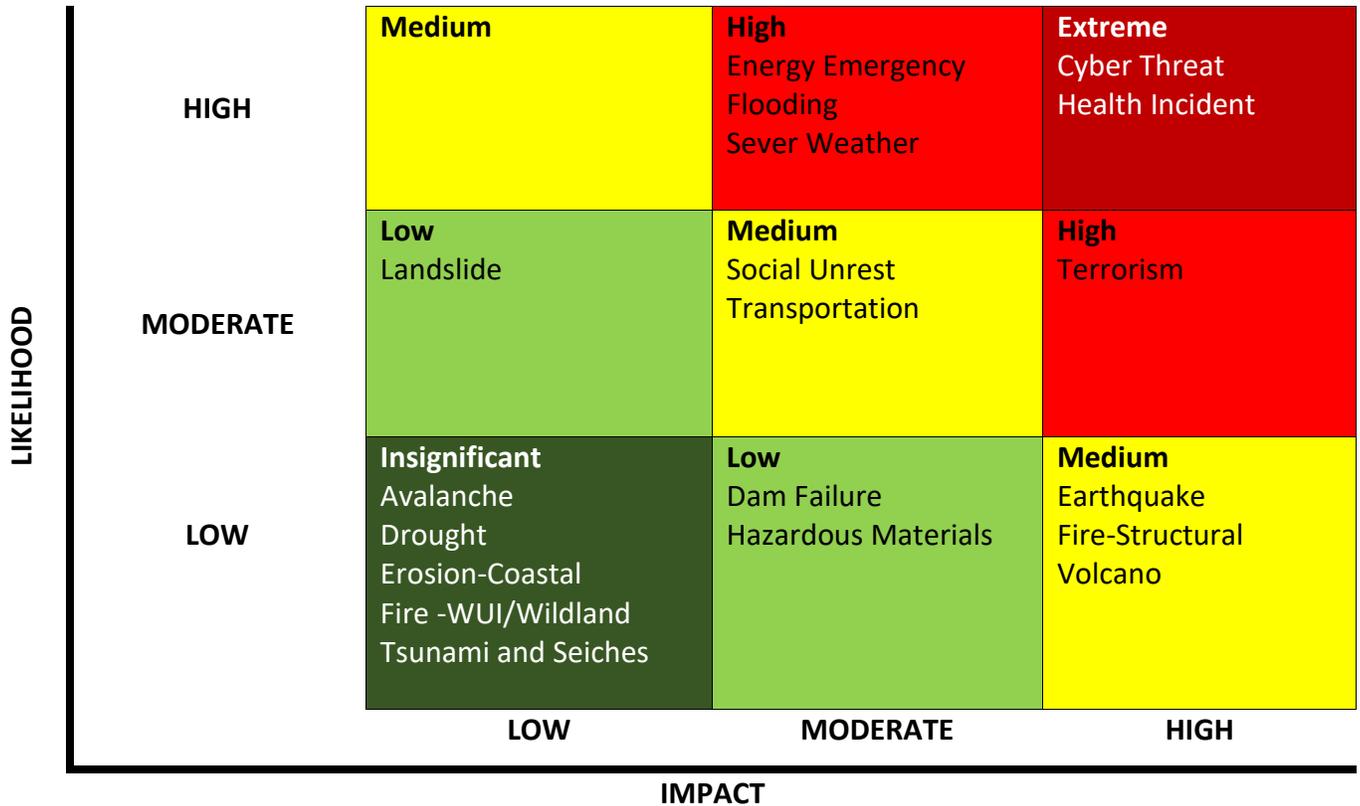
NORTH DISTRICT

Summary and Demographics

The North District (Island, San Juan, Skagit, Snohomish, and Whatcom counties) hosted its focus group on Friday, April 2nd, 2021. A total of 14 individuals participated. This group was primarily composed of highly experienced individuals, with a diverse professional background. The sectors that represented through the participants were Hospital, LTC, Outpatient Clinics, Fire, EMS, County Emergency Management, Surgery Centers, Home Health, DOH, and Hospice.

Figure 4: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	• Cyber Threat • Health Incident	'High' likelihood and 'High' impact
High	• Terrorism	'Moderate' likelihood and 'High' impact
	• Energy Emergency • Flooding • Severe Weather	'High' likelihood and 'Moderate' impact
Medium	• Earthquake • Fire – Structural • Volcano	'Low' likelihood and 'High' impact
	• Social Unrest • Transportation	'Moderate' likelihood and 'Moderate' impact
		'High' likelihood and 'Low' impact
Low	• Dam Failure • Hazardous Materials	'Low' likelihood and 'Moderate' impact
	• Landslide	'Moderate' likelihood and 'Low' impact
Insignificant	• Avalanche • Drought • Erosion-Coastal • Fire – WUI/Wildland • Tsunami and Seiches	'Low' likelihood and 'Low' impact

Figure 5: Hazard Risk Matrix

LIKELIHOOD		IMPACT		
HIGH		**Medium**	**High** Energy Emergency Flooding Sever Weather	**Extreme** Cyber Threat Health Incident
MODERATE		**Low** Landslide	**Medium** Social Unrest Transportation	**High** Terrorism
LOW		**Insignificant** Avalanche Drought Erosion-Coastal Fire -WUI/Wildland Tsunami and Seiches	**Low** Dam Failure Hazardous Materials	**Medium** Earthquake Fire-Structural Volcano
		LOW	**MODERATE**	**HIGH**

Results and Analysis

Based upon the Hazard Matrix, The North district reconfirmed the most extreme risks as Cyber Threats and Health Incidents based upon their high likelihood and high impact as rated by the focus group. The matrix also identifies Energy Emergency, Flooding, Severe Weather and Terrorism as high priority risks.

As noted in the Hazards section, Climate Change remained as modifier of the other existing hazards as majority voted by participants of the focus group. The North District participants had the opportunity to vote on whether Supply Chain should be a standalone hazard or an amplifier of other hazards. The North District was the only district to vote that it would not be a standalone hazard. The results of the vote were very close, however, since the majority vote was not in favor of it as a standalone hazard, there is no hazard ranking for Supply Chain. There will be an opportunity to revisit this during the next Hazard Vulnerability Assessment.

NORTHWEST DISTRICT

Summary and Demographics

The Northwest district (Clallam, Jefferson, and Kitsap counties) held its focus group on Wednesday April 14th, 2021. In total 23 individuals participated. The participants came from a variety of professional backgrounds including county Emergency Management, Outpatient Clinics, LTC, Fire, EMS, Public Health, Hospital, Community Health Center, and Private Ambulance.

Figure 6: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	• Cyber Threat • Energy Emergency • Health Incident • Severe Weather • Transportation	'High' likelihood and 'High' impact
High	• Fire-WUI/Wildland • Supply Chain • Terrorism	'Moderate' likelihood and 'High' impact
	• Landslide • Flooding	'High' likelihood and 'Moderate' impact
Medium	• Earthquake	'Low' likelihood and 'High' impact
	• Drought • Fire-Structural	'Moderate' likelihood and 'Moderate' impact
	• Erosion-Coastal	'High' likelihood and 'Low' impact
Low	• Hazardous Material • Tsunami and Seiches • Volcano	'Low' likelihood and 'Moderate' impact
		'Moderate' likelihood and 'Low' impact
Insignificant	• Avalanche • Dam Failure • Social Unrest	'Low' likelihood and 'Low' impact

Figure 7: Hazard Risk Matrix

		LOW	MODERATE	HIGH
LIKELIHOOD	**HIGH**	**Medium** Earthquake	**High** Landslide Flooding	**Extreme** Cyber Threat Energy Emergency Health Incident Severe Weather Transportation
	MODERATE	**Low**	**Medium** Drought Fire-Structural	**High** Fire -WUI/Wildland Supply Chain Terrorism
	LOW	**Insignificant** Avalanche Dam Failure Social Unrest	**Low** Hazardous Materials Tsunami and Seiches Volcano	**Medium** Erosion-Coastal

IMPACT

Did not reach consensus

Results and Analysis

Based upon the Hazard Matrix, the most extreme risks to Northwest District's healthcare system, based upon their high likelihood and high impact as rated by the focus group, are Cyber Threats, Energy Emergencies, Health Incidents, Severe Weather, and Transportation Incidents. The matrix also identifies Landslide, Flooding, Supply Chain and Terrorism as high priority risks.

As noted in the Hazards section, Climate Change was previously ranked as a medium hazard for the Northwest District. During the review process, Climate Change was shifted to a modifier of the other existing hazards as majority voted by participants of the focus group. Supply Chain was voted in as a standalone hazard and ranked at a high-level hazard. Through the HVA review process, several hazards were re-ranked based upon discussion and review. Hazardous material went from a medium level hazard to a low hazard and additionally Erosion-Coastal went from a low hazard to a medium hazard.
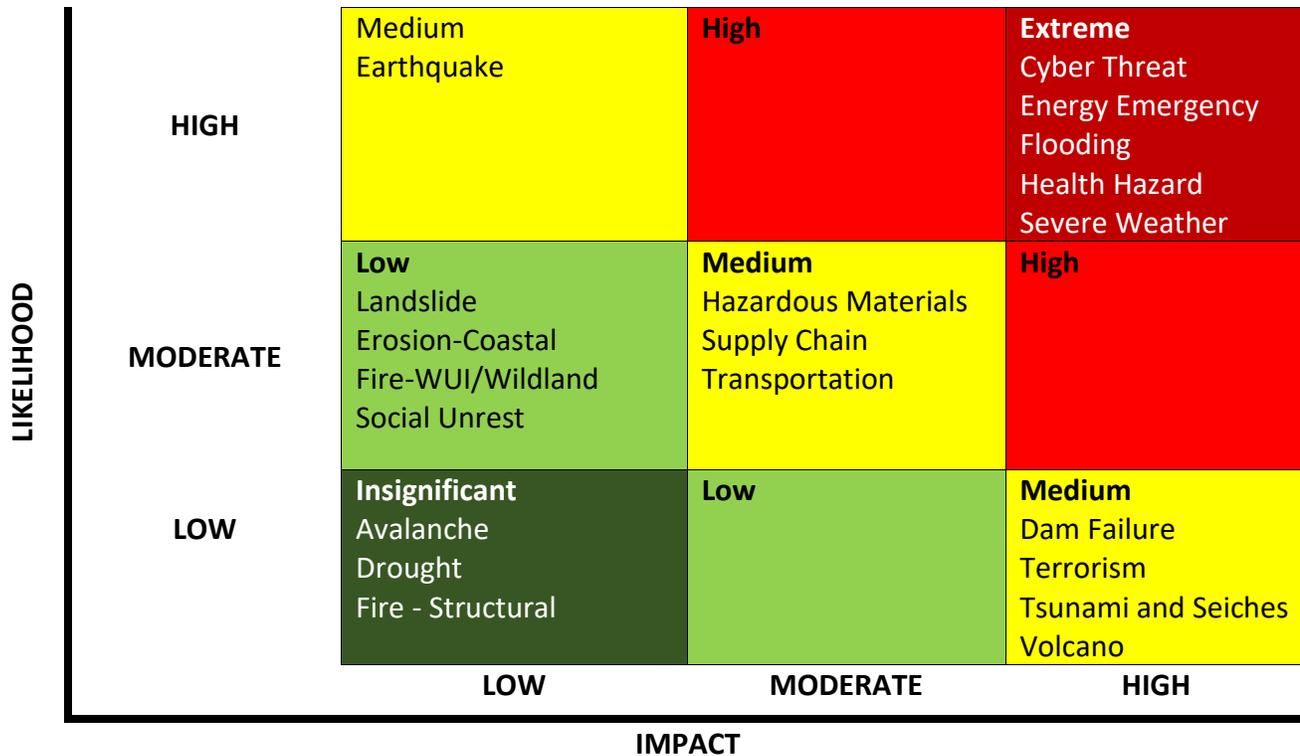
WEST DISTRICT

Summary and Demographics

The West district (Grays Harbor, Lewis, Mason, Pacific, and Thurston counties) hosted its focus group on Tuesday May 13th, 2021, with a total of 15 individuals in attendance. The participants came from a variety of different professional backgrounds including Private Ambulance, county Emergency Management, Home Hospice, Behavior Health Hospital, Outpatient Clinics, Public Health, DOH, and Dialysis.

Figure 8: Hazard Matrix Results

MATRIX DESIGNATION	HAZARD	MATRIX DEFINITION
Extreme	• Cyber Threat • Energy Emergency • Flooding • Health Hazard • Severe Weather	'High' likelihood and 'High' impact
High		'Moderate' likelihood and 'High' impact
		'High' likelihood and 'Moderate' impact
Medium	• Dam Failure • Terrorism • Tsunami and Seiches • Volcano	'Low' likelihood and 'High' impact
	• Hazardous Materials • Supply Chain • Transportation	'Moderate' likelihood and 'Moderate' impact
	• Earthquake	'High' likelihood and 'Low' impact
Low		'Low' likelihood and 'Moderate' impact
	• Landslide • Erosion-Coastal • Fire-WUI/Wildland • Social Unrest	'Moderate' likelihood and 'Low' impact
Insignificant	• Avalanche • Drought • Fire - Structural	'Low' likelihood and 'Low' impact

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Figure 9: Hazard Risk Matrix

HIGH	Medium Earthquake	**High**	**Extreme** Cyber Threat Energy Emergency Flooding Health Hazard Severe Weather
MODERATE	**Low** Landslide Erosion-Coastal Fire-WUI/Wildland Social Unrest	**Medium** Hazardous Materials Supply Chain Transportation	**High**
LOW	**Insignificant** Avalanche Drought Fire - Structural	**Low**	**Medium** Dam Failure Terrorism Tsunami and Seiches Volcano
LIKELIHOOD	**LOW**	**MODERATE**	**HIGH**

IMPACT

Results and Analysis

Based upon the Hazard Matrix, the most extreme risks to West District's healthcare system, based upon their high likelihood and high impact as rated by the focus group, are Cyber Threats, Energy Emergency, Flooding, Health Hazard and Severe Weather.

As noted in the Hazards section, Climate Change remained as modifier of the other existing hazards as majority voted by participants of the focus group. Supply Chain was voted in as a standalone hazard and ranked at a medium level hazard. Through the HVA review process, several hazards were re-ranked based upon discussion and review. Earthquake went from a ranking of extreme to a medium ranking. Health Incident and Energy Emergency went from a high ranking up to an extreme ranking. Dam Failure and Landslide went from a low to a medium ranking. Social Unrest went from an insignificant ranking to a medium ranking.

Conclusion and Future Work

This fourth NWHRN Healthcare Hazard Vulnerability Assessment Review represents an update of the 2020–2021-year HVA assessment which included findings from all four district HVAs. While this work is part of a larger HVA project representing a full coalition level HVA, these results can also be interpreted on their own and will help guide and prioritize the NWHRN's planning and response efforts within each district, as well as more broadly across the whole coalition.

Throughout this HVA project, significant feedback was received on several components including the definitions of hazards and data gathered for likelihood and impact. The NWHRN plans on reviewing this feedback, identifying actions to take, and incorporating those changes into future HVA documents. The NWHRN plans to review our Coalition HVA biannually. We will continue to review our city, county, and state partner HVAs, updated hazard information, and experience with real world events as part of the ongoing process in order to keep our healthcare focused HVA as current and relevant as possible.