

Public Health Risk Assessment Tool

This document is a sample Hazard Risk Assessment tool for Public Health Units (PHU). Its purpose is to assist PHUs in identifying hazards or vulnerabilities they must plan for. It is intended as a guide to assist in priority setting within the construct of a comprehensive emergency management program, and is consistent with the requirements under the Emergency Preparedness and Response Public Health Program Standard to undertake hazard identification-risk assessment (HIRA) activities.

Risk = Probability x Impact

Risk is defined as the product of **probability** of the hazard and its potential **impact**.

Probability

Probability may be expressed as the likelihood of an event occurring within a given time period; for example, the probability of event x occurring at a given location in the next year is y. Table 1 quantifies probability for a given event to assist in calculating risk.

Issues to consider for probability include, but are not limited to:

1. known factors
2. historical data
3. statistics from industry, other geographical areas, etc.

Table 1

Probability Rating	Description	Detail
A	Highly Likely	nearly 100% probability in next year
B	Likely	between 10 and 100% probability in next year, or at least one chance in 10 years
C	Possible	between 1 and 10% probability in next year, or at least one chance in next 100 years
D	Unlikely	less than 1% probability in next 100 years

Impact

For the purpose of this hazard assessment, **impacts** address the degree to which the hazard being considered will affect the community and its ability to provide and safeguard key public and private sector services and assure the security of its residents, property and the environment. It should be assessed according to three dimensions of impacts: **human impacts, physical infrastructure impacts and business impacts**.

The **Overall Impact Rating** then provides a summary assessment of the effect of the hazard on the community, its infrastructures, programs and services, especially considering the PHU in the context of its roles and functions. For example, the hazard may directly impact the staff, clients or the infrastructure that is critical for public health service delivery. In addition the hazard may result in illness or injury in the community and increased patient loads on the acute care hospital system; if healthcare facilities need to be evacuated, the entire healthcare system will be impacted. An event such as a labour disruption or a power failure may directly limit a public health provider's ability to deliver services while not directly impacting the rest of the region. Most events will impact both the PHU and the community or region to varying degrees.

The rating given for **human impacts** should consider whether the hazard has/is:

1. unlikely to cause injury, illness or death in community members and providers¹ (e.g. large public gatherings or civil disturbances)
2. low probability of injury, illness or death in community members and providers (e.g. transportation-related hazardous chemical spill)
3. high probability of injury or illness in community members/providers; low probability of death (e.g. water system contamination event)
4. high probability of death in community members/providers (e.g. radiation event, bioterrorism, nuclear event)

The rating given for **physical infrastructure impacts** should consider whether the hazard is/will cause:

1. unlikely to cause physical infrastructure damage within the community impacting, disrupting or prohibiting needed services, with additional issues being magnitude of replacement costs and extent of recovery time (e.g. pandemic influenza);
2. minor physical infrastructure damage (e.g. severe weather event such as tornado, fires, building collapse)
3. moderate physical infrastructure damage (e.g. severe weather events such as hurricane, explosions)
4. extensive physical infrastructure damage with marked impacts on/disruptions of a wide variety of services, high replacement costs and prolonged recovery time (e.g. earthquakes, floods, forest fires, nuclear event)

The rating given for **business impact** should consider whether the hazard is/will cause:

1. unlikely to cause service interruptions² within the community
2. minor or limited service interruptions
3. significant/widespread service interruptions
4. numerous public and private entities unable to provide services

¹ Providers refers to the full range of public and private services, programs or functions, e.g. policing, food retailing and other commercial networks, etc.

² Service interruption may include: employees unable to work, interruption of supplies/commercial services, transportation disruptions, public services curtailed or disrupted, e.g. school closures, disruption/failures of utilities

Table 2

The **Overall Impact Rating** is the sum of the three impact factors for each hazard:

4	Marginal	Normal level of functioning or increased level of public/private services required within the community
5-7	Serious	Community can assure a normal level of services with assistance from within region or reduced levels of service with resources existing within the community
8-10	Critical	Community can only assure a normal level of services with assistance from outside the region or the community is reduced to providing a minimal level of service with normal resources existing within the community
11-12	Catastrophic	Community cannot assure core public/private services without extensive assistance from provincial or federal resources

Combining the **Impact Rating** with the **Probability Rating** determines the **Risk**, as outlined in Table 3.

Table 3: Risk Rating³

Impact Rating \ Probability Rating	A Highly Likely	B Likely	C Possible	D Unlikely
11-12: Catastrophic	A11-A12	B11-B12	C11-C12	D11-D12
8 -10: Critical	A8-A10	B8-B10	C8-C10	D8-D10
5 – 7: Serious	A5-A7	B5-B7	C5-C7	D5-D7
4: Marginal	A4	B4	C4	D4

 High  Moderate  Low  Very Low

Using Table 3, planning may proceed with those events prioritized at the highest risk.

³ Adapted from: All-Hazard Assessment Model Version 3, Manitoba Health Disaster Management Services, June 2004.

**Public Health Hazard Risk Analysis Tool
Naturally Occurring Events**

Event	Probability	Human Impact	Property Impact	Business Impact	Overall Impact Rating	Risk Rating
	A, B, C, or D (Table 1)	1, 2, 3, or 4	1, 2, 3, or 4	1, 2, 3, or 4	4-12 (Table 2)	(Table 3)
Hurricane						
Severe thunderstorm						
Tornado						
Air Quality Episode, e.g. severe prolonged smog episode						
Blizzard						
Extreme Heat						
Extreme Cold						
Ice Storm						
Earthquake						
Drought						
Forest Fire						
Flood						
Landslide						
Epidemic						
Pandemic						
Volcanos						
Tidal waves						

**Public Health Hazard Risk Analysis Tool
Technological / Infrastructure Events**

Event	Probability	Human Impact	Property Impact	Business Impact	Overall Impact Rating	Risk Rating
	A, B, C, or D (Table 1)	1, 2, 3, or 4	1, 2, 3, or 4	1, 2, 3, or 4	4-12 (Table 2)	(Table 3)
Electricity System Failures						
Transportation Emergency (e.g. plane, train, multi-vehicle crashes)						
Fuel System Disruption/Shortages						
Water System Emergency						
Wastewater System Failures						
Communication System Failure						
Structural Collapse						
Fires						
HAZMAT Events						
Nuclear Power Station Event						
Radiological Exposure						
Public Services Event (e.g. hospital fire)						

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Human Related Events						
Event	Probability	Human Impact	Property Impact	Business Impact	Overall Impact Rating	Risk Rating
	A, B, C, or D (Table 1)	1, 2, 3, or 4	1, 2, 3, or 4	1, 2, 3, or 4	4-12 (Table 2)	(Table 3)
Terrorism – Biological						
Terrorism – Chemical						
Terrorism – Radiological						
Terrorism – Nuclear						
Civil Disturbance						
Labour Action						
Large public gatherings						
Armed conflict						

Source documents:

1. Kaiser Permanente Medical Center Hazard and Vulnerability Analysis
2. All-Hazard Assessment Model – Manitoba Health Disaster Management
3. Integrated Hospital Emergency Management System – OCIPEP, 2001
4. CBRNE Plan checklist – A Template for Healthcare Facilities - 2002