PROMOTOR **TRANSFERABLE TRAINING MODULES ON**

Risk Assessment in the Environment

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Promotor Transferable Training Module on Risk Assessment in the Environment

Instructor's Guide

Statement by the Authors

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Risk Assessment in the Environment Module

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Risk Assessment – *The Value of Risk in Relation to Your Surroundings*

Module Summary

Risk assessment is the process that tells us the likelihood and severity of a harmful event. Then, based on our personal judgment (informal risk assessment we apply in our everyday lives) or an objective process (formal process applied by scientists) we can determine how the hazards that surround us can affect our safety in workplaces, public areas, and own homes. In assessing the risks in our environment in which we live, we are continuously evaluating everything that surrounds us and everything as a whole that can affect us. All of us evaluate the risk of our activities in our daily lives. Similarly, government agencies estimate the risk of different health and environmental threats, such as toxic substances, to determine what is a safe level of exposure so as not to cause adverse effects to our health. In this module you will learn to identify and differentiate between the interrelated concepts of what is a hazard and what is a risk. You will also learn how government agencies develop the suggestions that help safeguard our health.

Learning Objectives

- Differentiate and identify what is a hazard and what is a risk
- Describe the concepts of uncertainty, probability, and variability
- Define what is risk assessment
- Identify the four principal steps of risk assessment
- Learn basic information regarding the risks of lead and other hazards that surround us

Risk Assessment Background

Risk assessment is an important concept that is applicable to our lives. We do it every day when we are exposed to a hazard such as a wet floor, chemical spill, or spoiled food. Because hazards affect us every day, it is important to consider how we assess risks in our lives and how government agencies evaluate risks. Government agencies similarly evaluate risks but applying a more formal process. Our own process of assess risks can help us understand how government agencies establish health, safety, and environmental standards (legal limit) as well as the recommendations when there is insufficient information to establish a standard that is enforceable.

Hazard, Risk, and Safety: To begin to understand risk assessment it is important to understand what is a hazard, what is risk, and what is meant by safety? A **hazard** is anything that has the ability to cause harm and therefore may pose a threat that can negatively affect a person or the environment (e.g., a wet floor is a hazard). Within the context of this module, environmental hazards can include both **physical hazards** (factors around us that can cause harm, such as a spill on a floor or a constant loud noise) and **chemical hazards** (harmful chemical in any form, such as cleaning products or asbestos). **Risk** is the probability that a harmful event will occur and the amount or severity of harm from that event (the probability and consequences of slipping on the wet floor define the risk). Another way of thinking about risk is the probability that a hazard can affect a person or the environment and the consequence of that hazardous event occurring. If the probability is low and/or the potential effects are mild, then the risk is low; if the probability is high and/or the potential effects are serious, then the risk is high. Without a hazard there is no risk and with every hazard there will

always be some degree of risk (Table 1). **Safety** involves making a judgment about whether the risk is low enough to be considered safe or is too high to be considered dangerous. The judgment about safety can be personal, or made by a governmental agency, and can vary from one person (or agency) to another.

Table 1 Examples of hazards and risks in our daily lives.

Question	Hazard	Risk
What is the probability that my son or daughter will get sick with the flu if he/she is in contact with other children that are sick with the flu in school?	Flu from other children sick at school	The likelihood that my son or daughter will get sick and the severity of that sickness
What is the probability that I will fall down stairs that do not have a banister?	Stairs without a banister	The likelihood and amount of injury from falling down stairs

Table 1. Examples of hazards and risks in our daily lives.

How can we know if something around us that represent a risk? The first step is to find out whether it is harmful and can affect our health (hazard can impact us). There are five key questions that can help us find out if the hazard represents a risk. The questions that we should ask ourselves are:

- Is there a hazard (is there the potential for something harmful to happen)?
- Are we exposed to the hazard?
- What is the risk associated with that exposure?
- What is the likelihood of that hazardous event happening?
- What are the consequences and how much harm may occur if that hazardous event happens?

These questions address the possibility of harm. This is where we must ask what are the consequences to health or well-being, or if it could even cause death. Understanding the consequences of that risk should inform the risk management process.

There are different ways to identify a hazard and its potential effect. A simple example would be the identification of mold (e.g., black mold) in a home. This mold can be found under the sink, in the kitchen, or in the bathroom tub. At the same time, you can identify the cause of the mold such as the presence of a leak or lack of ventilation. The mold is a hazard because exposure to mold can affect one's health. The risk is determined by how much exposure occurs (is there a lot of mold and is it in a location where family comes in contact?) and how severe are the health effects (does the mold cause mild irritation or fever and shortness of breath or how sensitive are family members?).

Similarly, contaminants can be detected in the drinking water of a community through water quality testing (monitoring of water quality). These contaminants can be found in groundwater that is used to supply homes with drinking water. The source of the contaminants can be identified as a factory or landfill that is leaching the contaminants. The contaminants are a hazard because drinking contaminated water can affect one's health. The risk is determined by which contaminants are

present, at what concentrations, how much are people drinking, and are the health effects mild or serious.

In both examples, the hazards (mold and contaminant) may affect the health of people and the environment, therefore it is important to identify the potential risks in order to take precautions and to protect the exposed population. We can discover what are the risks associated with hazards in several ways. For chemicals, scientists study animal models (***in vivo*** or **animal testing**). Unfortunately, we also learn from situations where people have been exposed to high levels of contaminants (**case studies** or **epidemiological studies**).

Remember, risk is the probability that a person or a group of people will be harmed by a hazard. **Risk assessment** is a process by which we understand and identify hazards and calculate or determine the likelihood (probability) and severity of that hazardous event occurring. We assess risks every day, often without realizing it. Our everyday risk assessment is used to inform our personal judgment to determine if and how we can be affected by hazards that are around us, in workplaces, public areas and even in our own homes. We assess our risks and then decide on the actions we will take. This all depends on the degree of harm that the hazard represents. The degree of risk may be based on how you were exposed (e.g., skin, ingested, or inhaled), the amount and concentration, and the length of time of the exposure.

Government Risk Assessment: We are not the only ones concerned about risks from the hazards that surround us. Several government agencies carry out risk assessments within various contexts to protect the general population (Table 2).

Table 2 Governmental agencies that are in charge of measuring risk.

Agency Name and Acronym	This agency is in charge of…
US Food and Drug Administration (FDA)	providing safe food to consumers, in addition to determining what medical drugs can be sold in the United States market
Occupational Safety and Health Administration (OSHA)	protecting the health of workers
Agency for Toxic Substances and Disease Registry (ATSDR)	prevent harmful exposures and diseases related to toxic substances
US Environmental Protection Agency (US EPA)	safeguarding the environment and people's health

Table 2. Governmental agencies that are in charge of measuring risk.

The risk assessment that these agencies implement is a formalized process that is based on **toxicology** (the study of the effects of chemicals on health), **epidemiology** (the study of disease occurrence in humans), **economics**, and **social factors**. In general, the process focuses on estimating the probability that a harmful event will occur and the likely magnitude of the adverse effects. During this formalized risk assessment, all of the available information on the effects and associated risks of a chemical substance is collected. Government agencies use information from epidemiological and toxicological investigations. Also, these agencies conduct their own internal investigations to add to the body of knowledge.

Government agencies use risk assessment to identify which risks need to be controlled by preventive measures, **remediation** efforts, allocate resources, procedure changes, and control measures. Using the information gathered through a risk assessment process, government agencies can set **permissible exposure limits** (sufficient scientific evidence of significant harm to the population is concluded, therefore the government can issue a standard which is enforceable by law) for chemical

substances as well as give **human health guidelines** (issued by governmental or non-governmental organizations, but not generally enforceable by law). The decisions made by government agencies that use the risk assessment process not only happen once, but this process is continually updated to incorporate new information once it is available (this can be a slow updating process at times). Generally, the formal risk assessment process includes four main steps, which are the following (Table 3):

Table 3 Summary of the steps carried out in the risk assessment process.

Step	Definition
Hazard Identification	Involves the collection of data to determine which contaminants are present, where they are present, at what concentrations, and what types of health effects they are capable of causing
Dose-Response Evaluation	The purpose of this step is to calculate the dose (amount of human exposure) at which an adverse effects can be observed
Exposure Assessment	The potentially affected or vulnerable populations and routes of exposure are identified in order to calculate the amount of exposure, based on the frequency, duration, and the amount of contact with the contaminant
Risk Characterization	All the information that is obtained from the above steps is combined to determine the actual risk of exposure to the hazardous substance

Table 3. Summary of the steps carried out in the risk assessment process.

The dose-response evaluation step of the risk assessment process is very important because it documents the relationship between the amount of a hazard that people are exposed to and the effect at different exposure levels. In other words, **dose-response** measures the amount (dose) that causes a certain adverse effect (response). Typically, this comparison is used in the development of a formal risk assessment on a chemical substance. The more you are exposed to the hazard, the more your health is at risk.

To better understand dose-response we will graph it for the consumption of chili peppers (Figure 1). If a person eats one jalapeño pepper they will have a slight reaction to it, if this person then eats three jalapeño peppers they are going to feel the spiciness, and if they have six jalapeño peppers their mouth will be burning. Similarly, this happens with a chemical substance. If you consume a small amount of the chemical maybe nothing happens but if you triple the dose the reaction will be more severe. It is also important to note that some chemicals substances might cause severe health effects in small quantities or different responses will occur depending on the person exposed. Using the example of the chili peppers, you might only need a small amount of a certain type of chili (habanero) to have a major effect or some people do not have a tolerance to chili peppers while other do have a tolerance and can eat many chili peppers without any having negative effects.

When it comes to pollutants or chemical substances that may have an effect on human health, knowledge of these effects are important for individuals or communities that are impacted by them. The US EPA, ATSDR, OSHA, and most state health and environmental agencies divide the effects into two types: 1) **carcinogen** is a chemical that causes cancer or 2) **noncarcinogen** is a chemical that causes other types of health effects (e.g., effects on internal organs, reproduction system, or the developing fetus). This is an important distinction because a carcinogen is regulated more strictly (exposures are controlled to much lower acceptable levels), which is significantly more costly.

A carcinogen is treated as something that could lead to the development of cancer, even at low exposures. Typically, the chemical has no zero-risk level, but at some low exposure level the risk is so low as to be considered safe. To label a chemical as carcinogenic is complicated because it can take many years/decades to find the evidence needed to establish with certainty that it does cause cancer. Once a chemical is identified as a carcinogen, it is assumed that there is always a possibility of risk and it increases with the dose and the exposure time. In contrast, for many noncarcinogens there is a low level of exposure that effects the health of a person in other ways (e.g., skin rashes, heart problems, and development of diabetes). Actually, not all substances can cause cancer, regardless of how high the dose and how long the exposure time, it also depends on the chemical and other personal characteristics (e.g., genetics, gender, and age).

Probability, Uncertainty and Variability: When we go through the risk assessment process it is useful to consider other concepts such as probability, uncertainty, and variability. These concepts are important in determining how strong the risk assessment process can determine what happens in reality. Risks are not always the same for everybody and every situation. Our knowledge of hazards and how they affect people can also be incomplete. Probability, uncertainty, and variability can be found in every step of risk assessment.

Probability is the likelihood that a certain result will occur. Risk is essentially probability. In terms of risk assessment, it is a measure of how likely an adverse effect will occur from an exposure. Probability can be defined in terms of time, an event, a population, an activity, etc. For example, what is the probability of winning the state lottery (1 in 175,223,510) or dying from a stroke (1 in 29)? Table 4 contains other examples of the probability of different risks.

Uncertainty in the process of risk assessment involves the lack of precise knowledge. In risk assessment much of our knowledge about the adverse effects of chemicals on the human body come from animal studies and there is some uncertainty about whether humans will be affected the same as the animals. There is often also uncertainty about the exact level of exposure for all individuals in an affected population. A risk assessment often makes assumptions about how humans respond to chemicals and how much human exposure occurs in the population; these assumptions may not be accurate for all people who are exposed. For example, when assessing the risks of lead exposure, there may be uncertainty about blood lead concentrations in an exposed population or the total amount of daily lead exposure in that

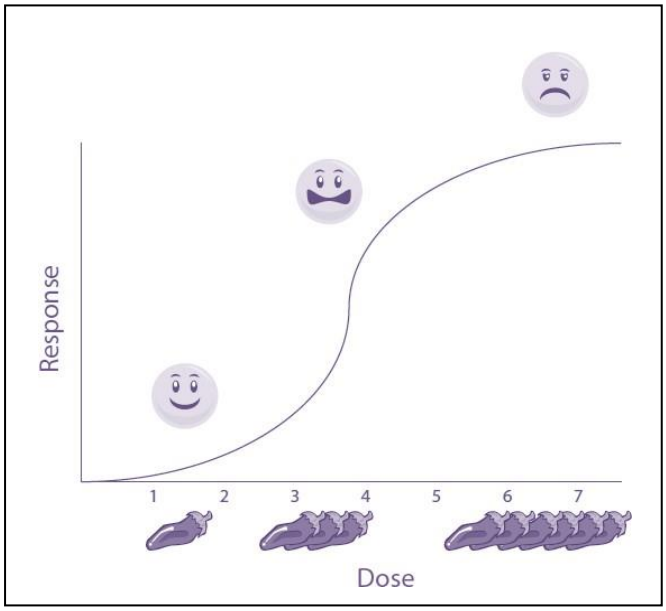


Figure 1. Dose-response graph for the consumption of chili peppers.

population. When a risk assessment is carried out an amount of lead in blood will have to be used which is representative of the entire population exposed to calculate the risk (to calculate the risk for each individual in a population exposed would take a lot of time and money). As the amount of lead that is calculated does not exactly match all the individuals of a population, here is were uncertainty is introduced into the risk assessment process. In other words, since you have to make an assumption regarding the amount of blood lead, there will be individuals in the population who have more blood lead and/or daily exposure and others who will have less blood lead/exposure than the value that was chosen for the risk assessment calculation. The following table presents more practical examples (Table 4).

*Table 4 Examples of risks and their respective probability and uncertainty (adapted from Environmental Health (3rd Edition) by Dade W. Moeller). *Data availability, how the study was conducted, and etc. may contribute to the uncertainty.*

Risk	Probability of this risk	Uncertainty*
Death before age 85 (all causes)	70%	Low
Death due to cancer (lifetime)	25%	Low
Death by cigarette smoking (1 pack per day through 40 years)	13%	Medium
Death by car accident (lifetime)	2%	Low

Table 4. Examples of risks and their respective probability and uncertainty (adapted from *Environmental Health* (3rd Edition) by Dade W. Moeller). *Data availability, how the study was conducted, and etc. may contribute to the uncertainty.

Variability is very much different from the concept of uncertainty although they are often confused. Variability within the framework of risk assessment refers to the differences between individuals in a population in how a contaminant affects their health and how much exposure they have to that chemical. Variability produces differences in exposure over time and health effects among the various affected people. To clarify the idea of variability the following table provides some practical examples (Table 5).

Table 5 Practical examples of variability.

	Examples
1	Not all people who smoke cigarettes develop cancer
2	Women are more likely to develop breast cancer than men
3	You drank three cups of coffee today, but only a single cup yesterday
4	An adult will have a different reaction to a chemical compared to a six year old boy

Table 5. Practical examples of variability.

We are not all the same therefore the dose of a substance affects us in different ways. Often exposure to other hazards (e.g., cigarettes) may increase the risk as well as the development of certain health problems. Sometimes, it is difficult to distinguish between variability and uncertainty, so to give you a better idea the following are more detailed examples in the context of risk assessment:

Example: Lead

Lead is a metal that affects the long-term health of humans because it causes problems that do not necessarily develop overnight. It has a greater effect on vulnerable populations such as children and the elderly. It is important to know that no amount of lead is safe and because of this we have to be aware of its different sources. Some of these sources include paint in a house that was built before 1978, certain types of pottery and glass used for cooking/storage (the glaze may contain lead or the

glass was made with lead), certain candies produced in other countries (e.g., Mexico), and solder typically found in old plumbing such as cast iron (when lead-based solder wears, lead particles are

transported in the drinking water). The health effects that may develop include slow mental and physical development, anemia, and stomach problems. Determining the risk of lead exposure may include an assessment of the home taking into account certain characteristics as well as probable sources. Measuring lead in a person's blood is one way of determining the level of exposure of a person. In assessing the risk, there will be variability in exposure to lead a population given that there are various characteristics of the household as well as the personal characteristics and behaviors of this population. At the same time, there will be uncertainty in quantifying the effects of lead exposure because they cannot accurately account for factors such as genetics, lifestyle, and exposure to other chemicals.

What can we do?

To reduce exposure to lead the possible sources need to be reduced. It is important to wash hands frequently and clean toys that are in contact with soil. Stay informed about recalls regarding toys or candy containing lead. If you live in a house built before 1978, keep the paint in good condition. Keeping it in good condition helps contain any lead-based paint. If you remodel your home, you should take a sample of the wall and paint that will be part of the remodeling effort. If samples indicate that the wall or paint containing lead it is a good idea to hire an expert contractor that is certified in lead abatement who can take precautions to reduce exposure. Consider using cold tap water for drinking and cooking. If you have not used the tap water for more than six hours, you should let the water run for a minute or two before using it. Also, if someone in your household works in a place where he/she comes into contact with lead it is recommended that they change clothes and shoes before entering the home. It is likewise recommended to wash their work clothes separately.

Children under age six should have their blood analyzed for lead. If the level of lead in the child's blood is higher than that recommended by the Centers for Disease Control and Prevention (5 micrograms per deciliter of lead in blood), the Department of Health Services Arizona or local health services should work with the family to identify the source of lead and how they can reduce their exposure to the lead.

Example: Falls

The act of falling is an involuntary loss of balance that allows the human body to make contact with the ground or other surfaces. Falls are a hazard that is present in our daily lives. Vulnerable populations such as children and the elderly tend to be at higher risk for falling and being harmed as a result. Many times, we do not think anything is going to happen to children because they are small, but because their bodies are still developing, they are at risk of having more serious consequences, similar to the elderly. Falls may cause serious injuries, minor shock, or even death. It is important to prevent falls because the effects are often internal and cannot be seen readily. When assessing the risk of a fall, we should note the area of interest and identify places where people can trip, slip, and fall. There will be variability in the number of times those individuals in a population passing through the area of interest, which might have a history of falls. Also, there is uncertainty in that each person can have different effects of the fall that are related to genetics, lifestyle, or health condition.

What can we do?

Remove all toys or other objects that can be considered a hazard from a pathway. Install handrails in places that have stairs or balconies. Also, use non-slip mats in bathtubs or slippery areas such as entrance areas and/or stairs. Also, wear shoes that fit well and have non-slip soles to prevent falls. It is always important to illuminate areas where people frequent at nighttime. It is recommended

that if a liquid spills onto the floor, it should be cleaned immediately to prevent slips or fall. Avoid drinking too much alcohol or taking medication that may affect your balance. Muscle strengthening and balance exercises can help prevent falls. It is also recommend having yearly checkups regarding your general health as well as your musculoskeletal function.

If a person falls, do not pick them up quickly. First, you should check if they are conscious or dizzy/sick. If the person cannot get up by himself or herself, you should ask for help from someone else to help you get them up. Similarly, if you witness a severe fall do not move the person and immediately call 911 for medical assistance.

Additional Resources

Web Resources – More Information on Risk Assessment

The "background" section in this module was developed to provide basic knowledge on the theme. In other words, important components and ideas are only highlighted and summarized. The purpose of this section is threefold: 1) provide additional sources of information in order to deliver an alternative way of looking at a theme, 2) expand the general information provided in the "background" to facilitate better training preparation, 3) offer potential training handouts or supplemental material that can also assist training participants. The brevity of the "background" section encourages the trainer to learn more outside of what is presented. The "background" section is a good jumping off point. Here are some suggested on-line resources that contain relevant information, but please feel free to research others:

Table 6 Web Resources – More Information on Risk Assessment

Riesgos Ambientales y la Salud (Spanish)	Sylvia Vega Gleason	http://biblio.juridicas.unam.mx/libros/1/357/13.pdf
Risk Assessment (English)	US Environmental Protection Agency	www.epa.gov/riskassessment/
¿Qué es el Riesgo? (Spanish)	United Nations Office for Disaster Risk Reduction	www.unisdr.org/2004/campaign/booklet-spa/page9-spa.pdf
Análisis de Riesgos: Gestión de Riesgos (Spanish)	La Suma de Todos	www.madrid.org/cs/StaticFiles/Emprendedores/Analisis_Riesgos/pages/pdf/metodologia/2GestiondeRiesgos%28AR%29_es.pdf
Environmental Hazards (English)	Commonwealth of Massachusetts	www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/hazards/
Hazard and Risk (English)	Health and Safety Authority	www.hsa.ie/eng/Topics/Hazards/
Centro de Estudios e Investigación del Medio Ambiente (Spanish)	Método de Evaluación de Riesgos	www.slideshare.net/ceima/mtodo-de-evaluacin-de-Riesgos

Riesgos Ambientales (Spanish)	Universidad Pedagógica Nacional	www.pedagogica.edu.co/observatoriobienestar/docs/GUIA_RIESGOS_AMBIENTALES_UPN.pdf
Health Hazard Evaluations: Program Information (English)	Center for Disease Control and Prevention	www.cdc.gov/niosh/hhe/HHEprogram.html
Public Health Assessments and Health Consultations (English)	Agency for Toxic Substances and Disease Registry	www.atsdr.cdc.gov/hac/pha/pha_foreword.asp
Workplace Safety and Health (English)	Center for Disease Control and Prevention	www.cdc.gov/Workplace/
Los Buenos Recuerdos (Spanish)	National Fire Prevention Association	www.losbuenosrecuerdos.org/home.html
Overview of the Healthy Home Rating System (English)	US Department of Housing and Urban Development	http://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhrs
Hunting Home Hazards (English)	Federal Emergency Management Agency	http://emilms.fema.gov/IS909/assets/07_HuntingHomeHazards.pdf
Hazards (English)	Occupational Safety and Health Administration	www.osha.gov/youngworkers/hazards.html
NIOSH Workplace Safety and Health Topics: Hazards to Outdoors Workers (English)	Center for Disease Control and Prevention	www.cdc.gov/niosh/topics/outdoor/
Accidentes en la Oficina, Riesgos Específicos (Spanish)	El Portal de la Seguridad, la Prevención y la Salud de Chile	www.paritarios.cl/consejos_riesgos_en_la_oficina.htm
Workplace Safety and Health: Office Environment and Worker Safety and Health (English)	Center for Disease Control and Prevention	www.cdc.gov/niosh/topics/officeenvironment
Riesgos y Prevención en la Industria Minera (Spanish)	Ing. Ricardo Haddad	www.bvsde.paho.org/bvsacd/scan2/012922/012922.pdf
Hazard Identification at the Mining Site (English)	Mining Safety	www.miningsafety.co.za/dynamiccontent/102/Hazard-Identification-at-the-Mining-Site
Salud Laboral de las trabajadoras de las Maquilas (Spanish)	Instituto Sindical para América Central y el Caribe	www.isacc-instituto.org/en/magazines/articles/47/salud-laboral-de-las-trabajadoras-de-las-maquilas/
Proteja su Salud: Asma (Spanish)	US Environmental Protection Agency	www.epa.gov/espanol/saludhispana/asma.html

Childhood Lead Prevention Program (English/Spanish)	Arizona Department of Health Services	www.azdhs.gov/phs/oeh/children/lead/families.htm http://translate.google.com/translate?hl=en&sl=en&tl=es&u=http://www.azdhs.gov/phs/oeh/children/lead/families.htm
Recalls (English)	Consumer Product Safety Commission	www.cpsc.gov/recalls/

Training Tools

Video Resources – More Information on Risk Assessment

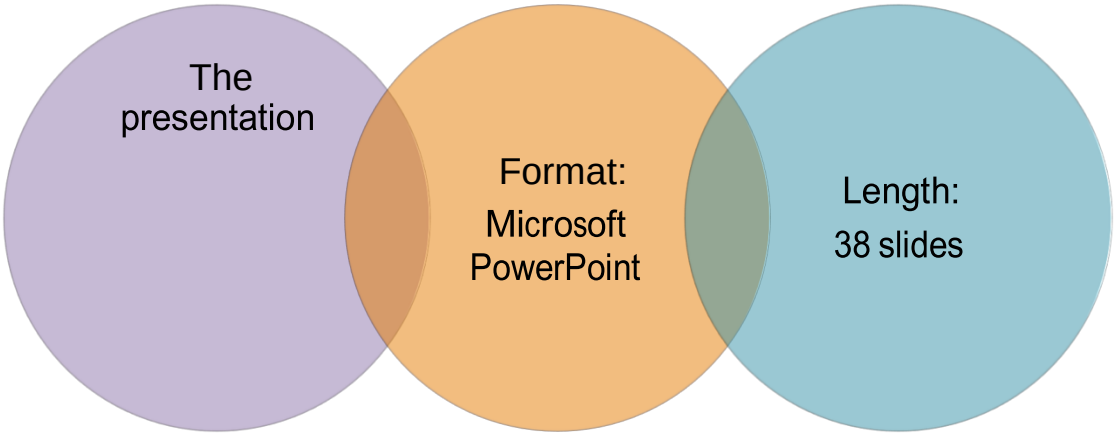
This section provides video suggestions that may help in the preparation of a training or can be utilized as a training tool to help trainees understand theme concepts. Some of the videos can also be used as a visual demonstration when you are nor able to set-up real-life activities. Here are some suggested video resources that contain relative information, but please feel free to research others:

México Frente a los Riesgos Ambientales (Spanish)	Seguridad Total T.V.	www.youtube.com/watch?v=ejoMJrGg4Pc
Contaminación Ambiental para Niños (Spanish)	Televisión del Programa Ambiental de la Naciones Unidas	www.youtube.com/watch?v=1-Ap9s
¡Cuídate! Prevención de Riesgos Laborales en el Trabajo (Spanish)	Junta de Andalucía: Consejería de Trabajo Dirección General de Trabajo y Seguridad Social	www.youtube.com/watch?v=fj7e-uE_5NY
Accidentes en Casa (Spanish)	Club 700 Hoy	www.youtube.com/watch?hl=en&gl=US&client=mv-google&v=KQxdxEDHObE&feature=related&nomobile=1
Hazard vs Risk --- Same Difference? (English)	Risk Bites	www.youtube.com/watch?v=VF-8QksiU7c&hd=1
Captain Safety Episode 4 --- Avoid Workplace Hazards (English)	Volusia County Safety Committee	www.youtube.com/watch?v=oJHy2239CcU
Hidden Hazards in Your Home (English)	Insurance Information Institute	www.youtube.com/watch?v=uIUv3hFleLc
Kitchen for Trouble (English)	National Fire Protection Association	www.youtube.com/watch?v=BMXOZw3QpQI&feature=endscreen&NR=1&hd=1

NFPA's New Electrical Safety PSA (English)	National Fire Protection Association	www.youtube.com/watch?v=l-wXyw0tvSA

Visual Aids – PowerPoint Presentation

The PowerPoint presentation provided is a prepackaged visual aid that can be utilized to train *promotores* on the respective theme of the module. It is meant to be adaptable and should be modified according to the audience needs and knowledge base. The information in the presentation is similar to that in the "background" section of this module. Certain terms and/or ideas may not be in the "background" section, thus a separate glossary is provided in this section to assist in defining.



Presentation Concept Glossary

- Animal models --- Refers to scientific studies and tests conducted on animals to observe how they react to a substance. Usually, these animal models help predict reactions in humans.
- Chemical Toxicity – Type of toxicity that is characterized to be a result of a particular chemical. In the example provided in the presentation it would be the difference levels of capsaicin that gives the chili its spiciness.
- Dose --- Quantity of something. In this case, the quantity of a substance that you or a population if being exposed to.
- Exposure --- The act of encountering a hazard. When there is an exposure to a chemical it is the act of the chemical entering the body (inhalation, ingestion, or dermal) through liquid, soil/dust, air, or contaminated food. Exposure depends on how much of a hazard a person contacts and the length of time they are in contact with the hazard.
- Flammable – The potential for something to burn easily.
- Food and Drug Administration (FDA) --- The government agency responsible for protecting the food supply and identifying what medications can be sold in the US market.
- Mold – a fungus that can grow food and other surfaces.

- Occupational Safety and Health Administration (OSHA) --- The government agency that is in charge of protecting the health of workers.
- Precaution --- A security measure that prevents damage.
- US Environmental Protection Agency (US EPA) --- The government agency that implements environmental regulations.

Training Assessments and Extensions

- Have the *promotores* write a list of some of the hazards that are found in their homes. Then have them write the risks that these hazards represent. Afterwards, have them discuss how variability can affect the risk (e.g., lifestyle, number of times exposed, etc.). Have them present their ideas or answers on a board or flipchart to the other *promotores*.
- Ask the *promotores* to comment or demonstrate how they would explain risk assessment to children in the 5th grade. They can organize themselves into groups to plan the explanation and present how they would proceed. *Promoters* in the audience listening to the explanation can fill the role of the 5th grade children.
- Ask the *promoters* to make a list of the jobs their family members do for a living and have them identify what agency/organization would use risk assessment to develop permissible exposure limits or human health guidelines.
- Have the *promotores* identify chemical substances in cleaning products or beauty products that you have provided. After they have compiled a reasonable list, have them research on-line about the potential health effects of these substances. Next, have them write down these potential effects and list them next to each chemical substance. They can have a group discussion on their individual top three chemical substances that they have researched.

Concept Activities

These complimentary activities were designed to provide a hands-on component to the module trainings. They may be used to demonstrate a concept to visual learners or reinforce ideas presented to ensure comprehension. The activities have been divided into three sections (warm up, activity, and wrap up) in order to guide *promotores* through the concepts(s). Also, some activities have "cheat sheets" for the trainer or handout materials that can be copied and handed out tot the promoter at the training. Similar to other components in these modules, they may be adapted as needed considering the training time, knowledge base, or available materials.

Activity 1. Caution with Chemical Substances in Your Home

Materials

- See-through storage containers with lids (the containers should be identical)
- Liquids and solids (each group of liquid/solid are placed in identical containers and labeled with a code at the bottom that allows you to identify the liquid/solid that is contained)

Liquids:

- Strawberry soda --- red color (e.g., Crush Strawberry Soda)
- Laxative --- red color (e.g., Aaron Health Magnesium Citrate Cherry)

- Sports drink --- red and blue color (e.g., Gatorade Fruit Punch or Frost Glacier Freeze, PowerAde Berry Ice or Mountain Blast)
- Anti-diarrhea medicine - pink color (e.g., Pepto-Bismol®)
- Liquid soap --- pink color (e.g., Ultra Palmolive® Soft Touch Vitamin E Dishwashing Liquid)
- Water --- clear
- Rubbing alcohol --- clear
- Liquid soap --- blue color (e.g., Gain® Ultra Bleach Alternative Honeyberry Hula Liquid Dish Soap)
- Glass cleaner --- blue color (e.g., Windex® Original Glass Cleaner)

Solids:

- Candy --- pink color (e.g., Willy Wonka Strawberry Nerds®)
- Fabric softener --- pink color (e.g., Gain® Scent Booster Fireworks Sweet Sizzle)
- Candy --- assorted colors (e.g., Smarties®)
- Antacid tablets --- assorted colors (e.g., Tums® Assorted Fruit)
- Moisture control --- white color (e.g., DampRid Moisture Absorber)
- Mints --- white color (e.g., Tic Tac® Peppermint)

Warm Up

Inform the *promotores* that every 13 seconds the Poison Control Center receives a call that is related to the exposure to a toxic substances. In fact, 40% of these cases involve children less than three years old. Ask the *promotores* if they have any experiences related to accidental poisonings in the home. Listen to what their experiences are regarding accidental poisonings in the home.

Mention to them that in this activity they will be observing different liquids and solids in order to distinguish what they are. The goal is to emphasize the importance of keeping toxic materials in their original containers in order to avoid confusion as well as the accidental poisoning, injury, or even death of a person.

Activity

1. Group the liquid and solid colored substances on a table so that the *promotores* can observe. The following is the grouping scheme:

Liquids

- Red Group: strawberry soda, laxative, and red sports drink
- Pink Group: anti-diarrhea medicine, and pink liquid soap
- Clear Group: water and alcohol
- Blue Group: blue liquid soap, window cleaner, and blue sports drink

Solids:

- Pink Group: pink candy and fabric softener
- Multicolor Group: assorted color candies and antacid tablets
- White Group: moisture control and mints

2. After they observe from a distance the liquid and solid substances, let them know that in this activity they will have to identify the contents of the containers.

3. Split into the *promotores* into groups (group number depends on how many *promotores* are participating in the training).
4. Provide each group of *promotores* with a set of solid or liquid group schemes provided in step 1. Put the group of solid or liquid that they will be assigned in the middle of the table where the group is located.
5. Before the *promotores* begin, let them know that the *only rule of the activity is not to open the containers*. They can only observe them.
6. Give them 10 minutes to work in groups and identify the contents of the containers that they were assigned.
7. After the 10 minutes is over, each group will comment on their speculations about the contents of the containers.
8. At the end of the activity, give them the name of the substances that are contained in each container so that they are aware of what is really in them.

Wrap Up

After the activity, discuss with them the importance of keeping toxic substances in their original packaging and avoiding placing these products in containers that are typically used for food. Ask them, what changes can be made in their home to reduce risk? Also, discuss with them the risks of not properly storing medicine or chemical substances (Table 7).

Table 7 Risks of not properly storing medicine and chemical substances and their associated prevention strategies.

Substance	Risks	Prevention Strategy
Medicine	Intoxication Death	Do not store them in bedside tables or drawers where children may have access to them
Chemical Substances	Intoxication Death	Keep them in their original packaging. Never place a chemical or a medicine in a bottle used for juice or soda. Do not put chemical substances near food. Make sure that the labels are in good condition, if not put a label with the product name.

Table 7. Risks of not properly storing medicine and chemical substances and their associated prevention strategies.

Activity 2: Hazard vs. Risk Comparison

Materials:

- Copies of the worksheet “Hazard vs. Risk”
- Pen or pencil to complete the worksheet

Warm Up:

Ask the *promotores* if they were clear with the explanation about the difference between risk and hazard. Depending on their answers, discuss with them their perceptions about risk and hazard. Remind them that risk is basically the probability that a hazard can affect humans and/or the environment and the hazard is anything that may pose a threat. Tell the *promotores* that in the following exercise will be identifying the risk for each hazard.

Activity:

1. Give each *promotor* a worksheet and a pencil or pen.
2. Have them work individually on the worksheet. Have them match the hazard with the appropriate risk.
3. Tell them they will have five to ten minutes to complete the worksheet.
4. When each *promotor* completes the worksheet have them share their answers aloud.

Wrap Up:

After the activity, discuss with them the importance of the hazards and risks that are presented in the worksheet. Asked them to discuss the affects of variability and if they know someone who has been affected by one of these risks. Also, you can discuss with them the government agency that would carry out a risk assessment process to establish permissible exposure limits or human health guidelines for hazards presented.

Activity 3. Lead: The Silent Epidemic

Materials

- Items that contain lead*, such as:
    - Ceramic pots that contain leaded paint
    - Fishing weights
    - Sweets or candy made with chili or packaged in ceramic pots imported from Mexico
    - Glasses or containers with glass-based glaze
    - Imported crayons

*Test the items previously to make sure that they result in a positive/negative spot test.

- Items that do not contain lead*
- Spot test kit for lead (e.g., 3M™ LeadCheck™ Swabs)
- Gloves
- Re-sealable zip storage bag (collect used spot test materials)

Warm Up:

Ask the *promotores* if they can name some of the potential items that may contain lead in their home. Listen carefully to what they say. Mention to them that a case of lead exposure will typically follow by an assessment of the home, taking into account certain characteristics. Some of these characteristics include the construction year of the house (before 1978 may contain lead-based paint), certain ceramics and glass utensils used in the kitchen, candies or sweets consumed, old plumbing, and even everyday items. Tell the *promotores* that in this activity they will me performing a test that determines the risk of lead contained in items that may be found in the home.

Activity:

1. The *promotores* will be divided into small groups or they can also work individually according to the preference of the trainer.
2. Provide each *promotor* a pair of gloves, two items that they will sample (one contaminated with lead and the other lead-free) and the spot test kit for lead.
3. Once the materials are distributed, demonstrate to them how the spot lead test is conducted. Let them see what a positive test looks like and what a negative test looks like (follow the instructions provided in the spot test kit).
4. After the demonstration, tell them to perform the test on the items that they have in front of them.

Wrap Up:

When the *promotores* are finished testing for lead, begin a discussion with them about their thought on the items that contained lead. What are their reactions? Which groups/individuals were surprised about the items that have a positive test for lead?

Supplemental Material

Hazard vs. Risk Worksheet

Hazard		Risk
		Visits by children to emergency rooms because of medication intoxication are twice more common than intoxication by other products found in the home (Centers for Disease Control and Prevention)
		Children exposed to secondhand smoke from cigarettes are more likely to visit intensive care units when they become sick with the flu compared to children who are not exposed to secondhand smoke (American Cancer Society)
		Each year more than 76 million people get sick from food poisoning (Medical Center, University of Maryland)
		Approximately 30% of burglaries the thief entered through a window or door that was not locked. (US Department of Justice)
		Approximately 450 people in the U. die each year from accidental carbon monoxide exposure from fuel-burning appliances, electrical appliance and fuel (charcoal, wood) burned in unventilated areas (Centers for Disease Control and Prevention)
		At an international level there are 3 million people poisoned by pesticides reported each year (World Health Organization)

Glossary

Animal testing – refers to studies that are tested on animals.

Carcinogen – something that is directly associated with causing cancer.

Case studies – research studies based on a real-life situation where data can be obtained.

Chemical Hazard – chemical (liquid, solid, or gas) substances that may cause harm.

Dose-Response – describes the changes caused by different levels of exposure (doses) to something (usually a chemical) after a certain time period.

Economics – social science field that studies economic activities and the impact on diverse areas of our society.

Epidemiological studies – area of science that studies the patterns of disease or health effects in a specific population.

Epidemiology – science area that studies the incidences and controls of diseases or health effects on a defined population.

Hazard – substance, situation, or object that is considered a source of danger.

Human Health Guidelines – recommendations that are not enforceable but are suggested in order to guide government agencies and the public.

In vivo – refers to studies that are tested on living organisms.

Noncarcinogen – something that is not associated with causing cancer, but may cause other effects.

Permissible Exposure Limits – legal limits in the United States that are set to protect from chemical and physical hazards.

Physical Hazards – factors in the environment that can physically harm (can also harm within out touching).

Probability – helps us to understand what might happen.

Remediation – the action of cleaning-up or stopping an environmental impact.

Risk – the possibility that something bad will happen.

Risk Assessment – process that determines the value of risk related to a situation, substance, or recognized threat.

Safety – the state of being “safe” from harm.

Social Factors – characteristics that influences a person's experience, personality, attitude, and lifestyle.

Toxicology – scientific area that studies the adverse effects of chemical substances on organisms.

Variability – the state of being different or changing.

Uncertainty – a lack of certainty due to limited knowledge or exact knowledge.