**AFRICAN INSTITUTE FOR PROJECT MANAGEMENT STUDIES**

**(AIPMS)**

**COURSE NAME: DIPLOMA IN PUBLIC HEALTH (2019/2020)**

**STUDENT NAME: FRANCIS MORI MOGA.**

**FINAL EXAMINATION PAPER:**

**Question 1:**

**List the types of people who are most vulnerable to waterborne diseases. Explain your answers why and how to overcome the diseases:**

Introduction:

Waterborne diseases are caused by pathogenic microorganisms that most commonly are transmitted in contaminated fresh water. Infection commonly results during bathing, washing, drinking, in the preparation of food, or the consumption of food thus infected. Various forms of waterborne diarrheal disease probably are the most prominent examples and affect mainly children in developing countries; according to the World Health Organization, such diseases account for an estimated 4.1% of the total DALY global burden of disease, and cause about 1.8 million human deaths annual.

Water-borne diseases spread by contaminating drinking water systems with faeces and urine of infected animals or people. The spread of contaminated water is likely to happen where private and public drinking systems get their water such as surface waters - creeks, rivers, lakes, and rain. These sources of water may be contaminated by infected animals or people. Runoff from: Landfills, Sewer pipes, Septic fields, and industrial or residential developments May also spread contamination, which has been the cause of a number of dramatic outbreaks of faecal-oral diseases such as typhoid or cholera. There are a number of additional ways in which faecal material may reach a person's mouth such as in food that is contaminated, or the person's hands. Generally, food that is contaminated is the one most common way people become infected. The germs in faeces may cause the diseases by even slight contact and transfer. The contamination might happen because of floodwaters, septic fields, water runoff from landfills, and sewer pipes. One way to break continued transmission of water-borne diseases is to improve the hygienic behavior of people and provide them with basic needs such as:

* Sanitation services
* Clean and safe Drinking water
* Bathing facilities
* Washing facilities

**Waterborne illnesses usually is acquired through:**

* **Pollution –** dangerous levels of chemicals, nitrates or heavy metals in the water supply due to industrial pollution or the over-use of agricultural chemicals.
* **Dirt & Contamination** – Bacteria, viruses and parasitic organisms invisibly contaminate the water and cause disease. Much of this contamination is through water coming into contact with an animal and human waste then the infectious agent enters the body. Waterborne diseases include most of the **enteric**(related to the intestine) and diarrhoeal diseases caused by parasites, bacteria and viruses.

*In all these cases, the origin of the contamination is faeces of people who are already infected by the disease. Some diseases may be transmitted via the faeces of infected animals. In places without adequate sanitation and where people defecate in the open, waterborne disease is far more likely to occur. By sanitation, we mean the prevention**of**human contact with wastes. If faeces are effectively separated from people then the transmission routes of waterborne diseases are cut off.*

**Vulnerable groups to water borne diseases:**

**Children**:

Children are a vulnerable population compared to adult because of their susceptibility to injury and their dependence on others for livelihood, decision making, and emotional support. Caring for children in an emergency involves psychological and social challenges stemming from their level of cognitive ability, emotional vulnerability, and dependence upon the support of family members . Children specially (0-5) years of age are more venerable to water borne diseases because of their law immunity and the detoxification mechanisms has not yet developed, hence this gives them high chances of contracting most of the waterborne or water related diseases such as Diarrheal diseases due various microorganisms ( bacterial, viral and parasitic), Cholera, Typhoid, Amoebic dysentery, viral hepatitis (A,& E), and poliomyelitis. They may also suffer greater harm from exposure to chemical agents because of their size, metabolisms, respiratory rates, and other factors. Children are also likely to develop dehydration, malnutrition, anemia and exhaustion more quickly than adults, and they are more susceptible to infectious diseases.

To reduce the effect of such senarios, the environmentalist and the emergency health team should mobilize resources and put in place some policies that to followed to reduce such risks, and this will include:

* Provision of emergency safe water and sanitation services.
* Promote hand washing with soap
* Safe disposal of excreta, faeces.
* Provide adequate drainage of stagnant water
* Provide safe disposal of waste water
* Promote vector control mechanisms
* Proper food handling
* Advocate for breast feeding
* Carry out health education and conduct immunization especially to children below the age 5.
* Provide nutrition’s ratios for the anaemic and malnourished children.
* Provision of Vitamins (A) support supplement.

**Pregnant and lactating women:**

Pregnant women also suffer most due to the spread of water-borne diseases and will also have special needs and face increased risks during disasters. Women are more vulnerable to the water borne- diseases due to the fact that women are engage in home related services that uses water, e.g. general cleanliness, washing, water collection at the collection points, and the whole responsibility in caring for all the children and any sick family member. So they may be at risk of contracting any health problem either through direct contact or through the services that they offer. During any crisis or event caused by flooding, landslide or heavy rainfall that causes environmental disaster, women always become victims of such situations because of their vulnerability to infectious diseases related to waterborne, water related, water washed and water -based diseases eg. Typhoid, diarrheal disease, , viral hepatitis, Malaria, Malnutrition anemia,, chemical exposure with fluorides, Arsenics, or lead poisoning. The Vulnerability of women to water borne-diseases may result to:

* Infections to various water borne, water related, water washed or water base diseases.
* Premature deliveries, underweight infants, and infant mortality due to exposure to some chemical agents.
* Some women may have to deliver babies without the benefit of hospital care.
* Pregnant Malnourished women of reproductive age may be more vulnerable to adverse health effects of chemical exposures
* women also run the risk of being evacuated without access to medical records containing information critical to their welfare or that of their fetuses.
* They may lose access to prenatal vitamins or other essential medication.
* Pandemic outbreaks may be particularly life threatening for pregnant women or their unborn children, and exposure to other illnesses, such as viruses, in crowded shelters could constitute a further hazard.
* Furthermore, if relief workers are unaware of women’s pregnancies, they might include them in mass vaccination or other prophylactic programs contraindicated for pregnant individuals.

To mitigate the occurrence of these waterborne diseases, the following policies and services should be put in place.

* Provision of clean and safe drinking water be made available and accessible.
* Provision of sanitary services to promote women health.
* Develop Health promotion and health education programs on sanitation
* Establishing health care services that can respond to any health issues.
* Carry out mass Immunization programs to women specially the productive group.
* Provide nutritional support to the women who Are malnourished and anemic to boost their health specially the lactating mothers
* Provide any socio-economic support to the most vulnerable group.

**The elderly and the disable persons:**

In an emergency situation with water related hazards, older adults may be less likely to heed disaster warnings, can be reluctant to leave their homes, may require more functional assistance, and are more likely to have new infections diseases and chronic medical and/or psychiatric conditions. They are also prone to suffer health related conditions which are water borne, water related, or water washed such as diarrheal diseases, cholera, Typhoid, helminth worms, and other conditions such as malnutrition, anemia. pneumonia etc. Additionally, during emergencies and in their aftermaths, the health of older adults can deteriorate because of poor nutrition, extreme temperatures, exposure to infection, interruptions in medical treatment, and emotional distress including arthritis, hypertension, heart disease, diabetes, and respiratory ailments. Elder persons demonstrate a variety of unique challenges that may impact their response to a disaster. These include, but are not limited to: diminished sensory capacity, decreased mobility and physical frailty, income shrinkage and financial limitations, loss of friends and social status, isolation and loss of life-long partners, changes in housing, multiple medications, complex medical problems, ill health, cognitive impairment They are also at increased risk of abuse or exploitation. Frail older persons and other vulnerable adults have physical and cognitive characteristics that reinforce the need for a specialized disaster response strategy.

* + Focus first on post disaster priorities such as water food shelter safety and emotional support.
  + Ensure that older persons are reunited with their families or caregivers as soon as possible.
  + Return to the daily routine as soon as possible.
  + Provide attention to functional needs (including selfcare and mobility).
  + Teach family members and caregivers about expected responses of older adults to trauma and provide coaching on how to give care.
  + Ensure that older persons have fair and equal access to resources and protection against abuse and exploitation.
  + Ensure an adequate supply of medicines to minimize interruption of any ongoing treatments. Older persons may require additional attention in terms of receiving clear consistent and repeated assurances explanations of what is happening and directions on what to do.

It has to be noted that Lack of access to regular income, work and health care, declining physical and mental capacities and dependency within the households with no income or work, older people tend to depend on others for their survival and this leads to vulnerability to various chronic communicable and non-communicable diseases

**Measures to be taken for the prevention of waterborne disease may include and not limited to:**

* Make sure that the water is visibly clean and free from any sand and silt. You can filter the water to get rid of any visible dirt.
* Only drink clean and safe water. Use either clean portable water or water that has been treated with water purifiers. Do not consume untreated water.
* Make sure that the stored water is free of germs and clean for later use.
* In bathing water, if it is not clear, put some antiseptic liquid to get rid of harmful bacteria.
* Practice exceptional hand hygiene by washing hands meticulously with soap after using the toilet, before and after preparing food, before eating or drinking anything.
* Children should always wash hands when they enter a home after playing games, and also everyone should wash hands while entering the home.
* Make sure that the food is washed and thoroughly cooked to get rid of harmful bacteria and other hazardous germs.
* Immunize yourself to safeguard yourself from vaccine-preventable diseases like Typhoid, Hepatitis A, Polio, etc.
* As far as possible use disposable glass and plates while eating or drinking from outside.
* Avoid previously prepared food reused after long hours exposed food,
* Regularly get your water treatment device like filters, RO unit, etc., serviced and maintained.
* Get rid of all stagnant water and clear the nearby bushes from the surrounding areas
* Ensure that the environment is kept clean from any dumping of waste.
* Waste generated should be kept in a designated location for a proper disposal.
* Vaccinate all children below the age of 5 and all women of the productive age.

**Note:**

Clean water is a prerequisite for reducing the spread of water-borne diseases. It is well recognized that the prevalence of water-borne diseases may be greatly reduced by providing people with safe, sanitary disposal of feces and provision of clean drinking water. Water has to be disinfected to kill any pathogens that might be present in the water supply and to prevent them from growing again in distribution systems. Without disinfection, the risk of infection with water-borne disease increases cannot be underestimated.

**Question two:**

**Suppose that inhabitants of a village obtain water from a spring. What advice would you give to the users about the prevention of contaminants entering the spring?**

Source water protection is a major component of an integrated management approach towards ensuring the safety of drinking-water, as recommended in the WHO Guidelines for Drinking-water Quality and as reflected in the Water Safety Plan concept. Regulatory frameworks and supporting policies and programmes are essential for effective source water protection. Source water protection safeguards public health by ensuring the quality and quantity of water used for drinking-water. Protecting water sources can reduce health risks associated with hazardous agents, particularly for those agents that cannot be effectively removed by conventional water treatment. Preventing source water contamination is often easier and less costly than treating contaminated water. For example, ensuring that wells are properly sealed from surface water runoff is less costly than removing persistent pesticide from source water.

Practical approaches to source water protection commonly fall under two categories: controlling point source pollution and attaining standards for the management of diffuse pollution. All efforts should be made to identify possible pollution sources in the watershed to ensure that the appropriate strategies and plans for source water protection are implemented.

Developing and implementing source water protection plans requires effective institutions responsible for source water protection planning, implementation and management. For example, drinking-water supply agencies or water suppliers are often not responsible for managing source water catchment areas and may not necessarily have the appropriate expertise to develop and implement source water protection plans. As such, regulations should facilitate engagement of a wide variety and comprehensive representation of all watershed users, community and stakeholders. Best practices for community involvement and public hearings should be followed.

Special measures that the users and the community members should consider and put in practice to avoid the contamination of the spring water may include and not limited to:

* An inspection of the ground upstream (catchment) of the spring is essential to ascertain that there is no danger of pollution or, if there is, what measures can be taken to prevent it.
* A concrete waterproof protection box, also known as a spring box, should be constructed over the spring to prevent all actual and potential sources of contamination.
* Springs should be protected from flooding and surface water pollution by constructing a deep *diversion ditch* above and around the spring. The ditch should be constructed so it collects surface water running towards the spring and carries, or diverts, it away. It needs to be deep enough to carry all surface water away, even in a heavy rainstorm. The surrounding area should be fenced to protect it from animals.
* The area around the spring should be fenced to prevent access by animals, but overflow water should be directed to an area outside the protection zone where the animals can take water, particularly in pastoral areas.
* Conduct an awareness or sensitization to the community on measures to take to avoid contamination of the spring water. Such measures may include:
* No latrines should be located or built within 30m upstream or downstream of a spring.
* Open defecation in around the spring area should be avoided.
* Do not dispose off waste in a near-by dry wells or in abandon wells.
* Avoid the use of pesticides, fertilizers, herbicides, degreasers, fuels or other pollutants near the well.
* Fence the area around the spring tank to prevent pollution by children or livestock.
* To put up a sign post along the border of your water source protection area to notify people that any pollution in the area can affect the quality of the water as well as the health of the community.
* To avoid dumping of hazardous waste on the ground near the spring. This can contaminate the soil which could also contaminate the ground water or near-by surface water.

**Question 3:**

The following are pollution sources. Give two specific pollutants for each source.

1. A residential area:
2. A metal plating plant:
3. Agricultural activities:
4. An uncontrolled landfill site:
5. Urban surface water run-off

**A residential area:**

Residential pollution is the presence of hazardous materials or noises within a home or nearby that may negatively affect people. Such residential pollutants may affect your health especially if exposure continues over longer periods of time even at low levels. The most common exposure is to air pollution, but also to food contamination and other types of pollution. The exposure to hazardous materials can occur in several ways through breathing in polluted air– if the air indoors at home gets contaminated or by direct contact with toxic and/or corrosive materials and through accidental ingestion of toxic chemicals or polluted water/liquids, and such residential pollutants may include:

* Mining sites near the residential area,
* Chemical factory within the residential area.

**A metal plating plant:**

There are numerous sources of industrial chemical contaminants, the result of controlled or uncontrolled waste disposal and releases into the environment. Industrial wastes may contain contaminants classified by the Federal government as hazardous and nonhazardous. However, this classification primarily separates wastes containing high concentrations of pollutants versus wastes that contain low concentrations. For example, metal-plating industrial wastes contain high concentrations of toxic metals such as Cr, Ni, and Cd and are usually classified as hazardous. However, municipal wastes, classified as nonhazardous, also contain these metals and many others, but at much lower concentrations.

Most industrial contaminants originate from a few general categories of industrial wastes and this include:

Cadmium:

Cadmium compounds occur naturally in the environment, particularly in areas of mineralization. The major emission source is the processing of metal ores for lead, zinc and copper, where cadmium is a valuable by-product. Its major use is in metal plating and battery making. Cadmium is classified as a cancer-forming agent. Inhaling cadmium over a long period may lead to lung cancer. It may also cause kidney disease.

**Zinc:**

Zinc occurs widely in nature and is another metal essential in trace quantities for good health. Exposure to elevated levels is more likely through occupational exposure in industry, including: mining smelting and processing of metal ores metal plating (galvanizing). Zinc and its compounds are widely used in consumer products. Insufficient zinc intake has a detrimental effect on growth, and immune and reproductive system development. Adverse health effects generally only occur where the exposure is high.

**Agricultural activities:**

"Agriculture is the single largest producer of wastewater, by volume, and livestock generates far more excreta than do humans. As land use has intensified, countries have greatly increased the use of synthetic pesticides, fertilizers and other inputs," write Eduardo Mansur, Director of FAO's Land and Water Division. "While these inputs have helped boost food production, they have also given rise to environmental threats, as well as to potential human health concern. The pollutants of greatest concern from agricultural activities for human health include:

* Pathogens from livestock,
* Pesticides and fertilizers.

**An uncontrolled landfill site:**

Leachate:

Leachate is the liquid formed when waste breaks down in the landfill and water filters through that waste. This liquid is highly toxic and can pollute the land, ground water and water ways.

**Greenhouse gases:**

When organic material such as food scraps and green waste is put in landfill, it is generally compacted down and covered. This removes the oxygen and causes it to break down in an anaerobic process. Eventually this releases methane, a greenhouse gas that is 25 times more potent than carbon dioxide. The implications for global warming and climate change are enormous. Methane is also a flammable gas that can become dangerous if allowed to build up in concentration

**Urban surface water runoff:**

Waterways and receiving waters near urban and suburban areas are often adversely affected by urban storm water runoff. Urban storm water runoff affects water quality, water quantity, habitat and biological resources, public health, and the aesthetic appearance of urban waterways. As reported in the National Water Quality Inventory 1996 Report to Congress (US EPA, 1998d), urban runoff was the leading source of pollutants causing water quality impairment related to human activities in ocean shoreline waters and the second leading cause in estuaries across the nation. Urban runoff was also a significant source of impairment in rivers and lakes. Pollutants associated with urban runoff potentially harmful include:

* Pesticides and fertilizers from surrounding areas.
* Eroded sediments from construction sites

**Question: 4**

Explain 5 reasons why emergencies can put people at greater risk of waterborne disease:

An emergency is a situation or state characterized by a clear and marked reduction in the abilities of people to sustain their normal living conditions, with resulting damage or risks to health, life and livelihoods. Disasters commonly cause emergency situations, both directly and indirectly. Evacuation or other necessary steps taken to avoid or ﬂee from a disaster, for example, can cause disruption of normal life on a scale calling for emergency action. Sudden, large-scale movements of people within and between countries often produce emergency conditions. Dramatic loss of livelihoods and increased spending needs due to drought or ﬂooding may place people in a very vulnerable situation. A cholera epidemic may overwhelm the capacity of a city’s under-resourced health service, creating an urgent need for support. In such emergency situations, local coping mechanisms are overwhelmed and so collective, specialized and often external action is required.

During an emergency, it is common to see primary effects of the disaster followed by secondary effects. For instance, the primary effect of a mudslide might be that many people are injured and need urgent medical attention. A secondary effect might be that blocked sewers and broken water mains lead to an outbreak of water- and sanitation related disease some weeks later.

Disasters or emergency situations causes damage to the environmental as well as to health facilities and services in the community leading to the spread of water borne and water diseases. This is especially due Flooding, power failures, broken pipes and blocked sewage lines, roads, and can disrupt water, waste and food-handling services.

*(Pan American Health Organization, 1982, 1995; Hanna, 1995).*

During emergency, Water borne diseases are always caused through the following ways:

1. Flooding. This causes contamination of water which will result in:

* Spread of Water borne diseases such as Cholera, typhoid, diarrheal diseases, dysentery etc.
* Availability of Stagnant water that leads to Proliferation of vector breading sites hence leads to the spread of vector borne diseases such as malaria, Schistosomiasis, Druncunculus etc.
* Increase chances in human/vector contacts

1. Damage or break down to water supply lines and facilities.

* Leads to water contamination and the possible spread of Cholera, typhoid etc.
* Shortage or lack of water that will lead to diseases such as Trachoma, Conjunctivitis, scabies, skin diseases and typhus or Louse borne relapsing fever.

1. Environmental contamination due to poor excreta disposal.

During emergency sanitation system may be broken down, that may lead to environmental contamination due to lack of facilities, consequently leads to open defecation which may results to:

* Spread of parasitic diseases (Helminth) such as Round worms hook worms, whip worms etc.
* Spread of diseases such as Cholera and typhoid, Amoebic dysentery and Giardiasis

1. Poor solid waste management:

Improper solid waste disposal in the community during emergency may result to:

* Blockage of drains and sewers hence creating flooding, stagnant water, water contamination and un hygienic conditions hence this leads to the spread of various water borne diseases.
* The dumping sites provides breeding sites for rodents, flies, mosquitoes etc. which become vectors for different water borne diseases.

1. Poor drainage system.

During crisis, the drainage system may be partially affected or damage which may be a results of a blocked sewage pipe, overflowing toilets or damage/overflowing safety tank. This will lead to the release of the sewage water to the environment resulting in contamination of the environment, hence the spread of various water borne diseases (Diarrheal diseases, Typhoid Cholera, Parasitic disease, Viral etc.)

References:

*WIT Transactions on Ecology and the Environment, Vol 142, © 2010 WIT Press*

www.witpress.com, ISSN 1743-3541 (on-line).

**Question 5:**

In your own words, what is your understanding of public health and what are its key elements.

By definition, Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organization, public and private, communities and individuals. (WHO). It incorporates the interdisciplinary approaches of epidemiology, biostatistics and health services, environmental health, community health, health economics, policy, occupational health and other important subfields. In general, public health is concerned with protecting the health of the entire population. The population can be as small as a local neighbourhood or as big as a country, region or the world. Public health professionals opt to prevent health problems from happening or recurring through surveillance of cases, implementing health education programs for the promotion of healthy behaviour, promotion of hand washing, fluoridation of drinking water, breastfeeding, delivery of vaccinations and distribution of condoms etc, recommending policies such as the use of seatbelt, implementing non-smoking laws, and administering services and conducting research which is in contrast to the clinical professionals like doctors and nurses who focuses primarily on treating individuals after they become sick or injured. Public health also works to limit health disparities among individuals and communities by promoting health care equity, quality and accessibility.

Public health has two distinct aspects namely:

1. It deals with the prevention of any health-related condition rather than curative aspects of health.
2. It deals with the population level rather than individual level health issues.

The public health fields confront global health issues such as improving access to health care, controlling infectious diseases, reducing environmental hazards, violence, substance abuse and injury. This is achieved through the implementation of the right policies and regulations that could be laid down by professional health experts so that the government, private health sectors, stakeholders and the community should undertake to achieve the desired public health objectives and goals through the implementation of the following elements of public health:

1. Monitor health status to identify and solve community health problems

This is where the health problems within the community is assessed, to identify what problems the community may have, determining what tools the community has and what may be hurting the community most in terms of health.

1. Diagnose and investigate health problems and health hazards in the community.

* This activity is carried out in the community to explore the potential health problems within a community, and trying to solve a serious health problem in a particular community. This provides the community with programs that increase their knowledge on certain diseases and conditions. It can put some measures to contain an outbreak of the disease that happens within a community. At the community level health officials go to investigate what could be a potential health hazard It looks for neighbour hoods that could post a treat in a near-by community.

1. Inform, educate, and empower people about health issues.

It promotes a community to get involved in the health issues of their area. This portion wants the citizens of a local area to know exactly what is going on in their community, providing them with essential information allowing them to make informed decisions. The health implementing agencies provide them with programs within their community to obtain this knowledge. Also, to make health information within a community accessible to the public. This seeks to explore the social and structural determinants of health and make them feel included and allow them to be able to make informed decisions and have access to the same information. Making it a point to give everyone the same access and help them find the care they need. This makes every one of the community knowledgeable about their own health as well as getting them involved in it.

1. Mobilize community partnerships and action to identify and solve health problems.

This is where the health programs engage the community to work together as a group to help them identify their health-related problems, get the community aware of their health conditions. Develop programs and projects that improve the health of the overall community. Agencies tend to engage with police departments, schools and even community elders to allows everyone know the common health issue going on. Allowing them to work together to come up with a solution that would benefit the community and reduce or even eliminate the health issue altogether.

1. Develop policies and plans that support individual and community health efforts.

This is a policy development specific for health-related issues. The policy to be developed on a particular problem that is troubling the community. The formation of such policies allows agencies to start getting ready the programs that they are instructed to implement based on the policy. These programs would include affordable and safe home care that would improve or even prevent conditions that trouble other specific group (e.g. children) or vulnerable group. Developing policies that are directly or indirectly related to health can help certain populations to regain health which will help the whole community.

1. Enforce laws and regulations that protect health and ensure safety.

This is where laws and regulations are put in place for and by health agencies to make sure that the community is safe and well protected from any health-related hazards, and that the community is following safety guidelines in order to protect the public from potentially being affected in a way that will negatively affect their health. Agencies or health departments are to execute the laws regarding proper sanitation and environmental safety. By making sure these laws are being executed it can prevent an outbreak that will negatively affect the health of a community. Such laws and regulations may include prevention of violence against women and children and maintaining healthy environment around the community for preventing the negative implications of possible lead poisoning specially to children.

1. Link people to needed personal health services and assure the provision of health care when otherwise unavailable

This is where health agencies to help people find the proper health services they may require and getting them set up with a primary physician that they need on a regular basis. Agencies here implement educational programs based on the need of the community, and to informing people of the possible benefits that they are entitled to. Benefits such as provision of medical services and food stamps can make their lives easier and be healthier. Another possible benefit is housing by giving them a place to live it can too prevent some negative health outcomes. health.

1. Assure competent public and personal health care workforce.

Health agencies providing health services must hire and train staff that they think are capable to provide the best care to the population they serve. They would determine the requirements and level of education an individual must have to be employed. After determining if someone meets the criteria, they would come up with an intensive training program to ensure all employees are properly educated and ready to work. It would be helpful for the people that the agency is hiring be able to reflect the cultures, traditions and language of the population they will serve.

1. Evaluate effectiveness, accessibility, and quality of personal and population- based health services.

The health providing agency assesses and gather information on all the health services they have been providing and determine if they are useful and accessible to all individuals that need that health service. This allows agencies to move services and resources around in a strategic way that would benefit the community in an impactful way. Also, this would give agencies time to re-examine themselves in case the service delivery system is inadequate and come up with a new program that would better work within the community which will include all the social determinants of health in the research that will be conducted. This allows for people to take the necessary steps to find the source of the problem and develop measures to address the problem and re-shape programs to fix the issue to benefit the community by improving the health delivery system.

1. Research for new insights and innovative solutions to health problems:

This is where the government, the health implementing partners comes to gather to research on some of the key health risk factors that affect the community. The research project(s) is based on establishing a pilot project for innovative health approaches or to established funds for a specific health project and the use of innovative technologies that might be needed and put in use to identify the health problems affecting the community, and what additional mechanisms might be needed to address such challenges. Some examples of such pilot research project may focus on areas such as:

* Research carried out the causes of air contamination, air pollution, their causes, effects prevention control and way forward.
* Solid waste management
* Diseases related to the causes of maternal and perinatal death.etc.

References:

[www.cdc.gov/info](http://www.cdc.gov/info).

**Question 6:**

**Discuss how environmental health and sanitation affect the nutritional status of the vulnerable groups**

There is strong evidence suggests that the connections among nutritional status, nutrients, and environmental toxicants are not trivial, but the extent of these interactions has not been fully investigated. There are several ways in which nutrition and environmental chemicals are interconnected. It is also worth noting that most individuals are not exposed to a single toxicant, and the impact of multiple exposures on human health is largely unknown. Because of the number of toxicants and the range of manifestations of malnutrition, the relation between environmental exposures and nutritional status/nutrients is multifaceted and complex. Furthermore, it is very important to encourage the involvement of nutritionists in the design of high-quality, rigorous studies of nutritional assessment and interventions in populations exposed to environmental chemicals.

First, it has to be noted that food may be the vehicle for delivering toxicants and may increase an individual's exposure and toxicant body burden. Second, as a toxicant is absorbed by the human body, it may interact with an individual's nutritional status to affect the amount of toxicant that is retained and bioavailable to do harm. It is also possible that toxicants may affect nutrient absorption and stores. Third, once inside the body, nutrients and nutrient metabolism may also interact with the toxicant in affecting a specific health outcome. Other factors, such as gender and age, need to be considered because they affect both nutritional status (child-feeding practices) and toxicant exposure (hand-to-mouth behavior is common in young children).

Malnourished individuals, especially women of reproductive age and young children, may be more vulnerable to adverse health effects of chemical exposures. The very nature of children's growth and development creates windows of vulnerability to both nutritional deficiencies and toxicant exposures. A recent article suggests that neurodevelopmental disorders caused by chemical exposures constitute a modern “silent pandemic”. With a double burden of nutrient deficiencies and environmental exposures, a substantial portion of the world's children may never realize their right to optimal health and development. (WHO).

Children:

Health implications in children due to environmental contamination, chemical exposure can be found in water, food, body care and consumer products.

Polluted indoor and outdoor air, contaminated water, lack of adequate sanitation, toxic hazards, disease vectors, ultraviolet radiation, and degraded ecosystems are all important environmental risk factors for children. Particularly in developing countries, environmental hazards and pollution are a major contributor to childhood deaths, illnesses and disability from acute respiratory disease, diarrhoeal diseases, physical injuries, poisonings, insect-borne diseases and perinatal infections. Childhood death and illness from causes such as poverty and malnutrition are also associated with unsustainable patterns of development and degraded urban or rural environments. Exposure to chemical toxins from the environment due to poor sanitation plays a major role in child health during pregnancy, infancy and childhood. During these sensitive stages of life, exposure to neurotoxins such as lead, Arsenic, Mercury, pesticides fertilizers and solvents can cause functional deficits and life-long adverse health effects of exposure that would have little or no adverse effects in adult. An other source of exposure to neonates and infants are hospital settings and nurseries where they can be exposed to chemicals which have been shown to impact fertility in later life, as well as causing neurological defects, obesity and cancer.

**Women /Pregnant mothers:**

Women of reproductive age are also vulnerable to environmental pollution and nutritional deficiencies. This is especially true during pregnancy, when maternal and fetal growth create high nutrient demands. Environmental exposures in women of reproductive age to Polluted indoor and outdoor air, contaminated water, lack of adequate sanitation, toxic hazards, disease vectors, ultraviolet radiation, and degraded ecosystems are especially precarious because women may become sources of exposure to their fetuses and infants through placental exchange and breast milk. The connection between toxicants and chronic diseases, environmental contamination and exposures may contribute to the development and course of diseases in adulthood, particularly neurodegenerative diseases beyond the effects of suboptimal nutritional status.

Environmental chemicals not only harm people’s ability to reproduce but can also negatively affect pregnancy. Many chemicals absorbed or ingested by pregnant women can cross the placenta to the fetus and can cause an array of adverse health effects, because women are vulnerable during pregnancy as physiological changes such as weight gain and increases in blood and plasma volume occur, which can alter concentrations of chemicals and result in a greater absorption of toxic substances. Studies have shown that BPA and high levels of flame-retarding chemicals (polybrominated diphenyl ethers) can alter pregnant women’s thyroid hormones, which are essential for normal fetal growth and brain development.

**Elderly:**

It has been reported that as ageing progresses, people experience a gradual deterioration in body function and their capacity to respond to infectious diseases, chronic disease, chemical exposure, including the metabolism and elimination of chemical substances. This leads to high prevalence of various age related diseases, that make that elderly susceptible to the harmful effects of environmental contamination and exposure chemicals. Research shows that chemicals, such as solvents and lead, can contribute to cognitive impairment and have adverse effects on immune and respiratory function. They can also increase blood pressure and insulin levels, possibly resulting in cardiovascular effects or the onset of metabolic syndromes, including diabetes mellitus. Another area of concern is the potential for drug-toxicant interactions, as the elderly, in general, use more medication than the rest of the population. Pharmaceuticals in drinking water present an additional environmental challenge as they may, even at very low concentrations, impact the health of elderly adults whose metabolic capability is already compromised and who are taking a variety of pharmaceutical medications. Finally, the elderly, like young children, typically spend a significant portion of each day indoors at home or in care facilities, which makes them more susceptible to indoor air pollution.

**Workers:**

Workers vulnerability to the nature of their work causes a threat of ill health. Exposure to chemical exposure can arise from living and working environments or overall socioeconomic situation. Types of work that carry a higher risk include agriculture, construction and painting, cleaning and maintenance services, and hairdressers and beauty salons. The emission of volatile organic compounds (VOCs) and particulates which can be easily inhaled have been associated with asthma. Hairsprays, permanent waves, acrylic nail application and numerous other salon products have been linked to higher incidences of cancers, neurological diseases such as dementia and depression, immune diseases, birth defects, reproductive disorders, skin diseases, asthma and other breathing problems. The waste management and recycling industry is another particular sector of concern; large numbers of substances are emitted during work activities that could give rise to a significant burden of ill health. Few studies have examined the potential impacts on the health of people working in this sector, but the most significant issues appear to be presence of dust, bioaerosol and hazardous metals. Evidence exists that people from lower socioeconomic groups are at higher risk of adverse health outcomes after chemical exposure compared to wealthier social groups. Factors such as living environment, level of education, ethnicity, type of employment and lifestyle can have a significant effect on the burden of environmental toxicants, their accumulation in the body and the prevalence of diseases and health problems. Recent studies have shown that food habits and lifestyle can have a profound impact on the types and level of intake of harmful chemicals by disadvantaged communities.

**Question 7.**

Paul, a resident in the outskirts of your town, consults you about building a latrine in the compound of his house. He is an open-minded man who is keen to improve life for his family. He has a wife and three young children, and his elderly mother also lives with them. He doesn’t have a tap in his house and gets water from a nearby well. The area has heavy soil and the rock below is impermeable.

1. Which types of latrine are possible choices for him?
2. Which types of latrine would you recommend, and why?
3. What other advice would you give him about the location, design and construction of the latrine

Pit latrines still remain widely used and are the commonest basic form of improved sanitation and as their primary means of excreta disposal with Low-cost, simplicity of construction, little or no water usage, ease in operation and maintenance, the ability to cope with bulky cleansing materials and the ease for regular improvement of the facility makes it convenient and easily taken up. The pit latrine technology currently offers a number of options ranging from simple designs like the traditional (without concrete slabs) to the simple improved, and further to more advanced Ventilated Improved (VIP). However, the use of pit latrines in urban areas has been marred by poor performance in terms of fast filling, bad smells and insect nuisances, which are associated with user dissatisfaction and a risk to disease transmission. Yet, well-constructed, operated and maintained pit latrines isolate, store and partially treat human excreta thereby minimizing contact and their inherent public health hazards.

There are various types of latrines with varying degrees of suitability for different circumstances. When constructing a sanitary latrine, an important criterion is to opt for dry or water-sealed**.** The major criterion regarding the choice of technology is the availability of water for flushing. For flush latrines to function, water must be available (at least 2.5 litres per flush) all year round.

1. Paul should be advice to construct either pit latrine, a pit latrine with a slab, a VIP latrine, a double pit latrine or the ecosan types of toilet (Arborloo and Fossa Alterna). The construction and use of the ecosan types of toilet may require a consent from the family members or even from the community so that it is in line with the cultures, traditions and norms of the community.
2. I would recommend to Mr. Paul to construct or use the Ecosan types of latrines. But if the norms and cultures of the community does not support use of these latrines or not acceptable then I recommended Paul to opt for the VIP types, because the VIP latrines types are fitted with vent pipes which used to exhaust the foul odor from the pit latrine and control flies.
3. Advice given to Paul:

* Location**:** The location of the toilet shouldbe at the back of the house if possible, with about 30 metres away from the house. If there is water well, then the distance between the toilet and the water well should be at least more than 30 metres apart.
* Design: Before design the toilet, Paul should study the type of soil so that a good decision is made the toilet depth should not be less than three (3) metres deep if the area is not rocky. If the soil is rocky which cannot extend for two metres, then Paul has to raised it upwards with some concretes and cement to at least 3 metres level while making sure that a nice slab is mandatory for easy use by every family member.
* Construction: Paul has to use what ever materials available that he can afford for the construction of the toilet (being Cement, bricks, timbers, poles, mudding etc.), taking into consideration the privacy of each and every individual in the family.

**Question 8:**

Explain five ways in which urbanization creates challenges for effective sanitation and solid waste management.

Urbanisation occurs mainly because people move from rural areas to urban areas and it results in growth in the size of the urban population and the extent of urban areas. These changes in population lead to other changes in land use, economic activity and culture. Historically, urbanisation has been associated with significant economic and social transformations. For example, urban living is linked with higher levels of literacy and education, better health, lower fertility and a longer life expectancy, greater access to social services and enhanced opportunities for cultural and political participation (UNDESA, 2014). However, urbanisation also has disadvantages caused by rapid and unplanned urban growth resulting in poor infrastructures such as inadequate housing, water and sanitation, poor solid waste management, poor transport system and in adequate health care services.

Some challenges caused by the rapid urbanization are:

1. **Poor Housing:**

In developing countries, about a third of urban inhabitants live in impoverished slums and squatter settlements (UN-Habitat, 2012). **Slums** are urban areas that are heavily populated and have sub-standard housing with very poor living conditions, creating several problems such as:

* Overcrowding, due to houses being built very close together using inadequate materials leading to poor living environment in terms of sanitation and hygiene, hence prone to water borne and water related diseases
* Restricted access to water supplies
* Such Housing facilities may have un hygienic or no sanitation/latrine facilities and no solid waste disposal, which leads to a polluted and degraded local environment
* Inadequate health care facilities which, coupled with the poor living conditions, increases sickness and death rates due to communicable diseases.

1. **Poor sanitation and solid waste management:**

.

Urban always leads to poor sanitation and waste management system. The waste generated always and often ends up in illegal dumps on streets, open spaces, wastelands, drains or rivers. This is frequently a problem in peri-urban areas, which are convenient for dumping wastes because of the availability of open space and ease of access from central urban areas. This can lead to the pollution of groundwater and surface waters which may be used as a source for drinking water. Sometimes the wastes are collected and taken to legalized waste disposal sites, but these are not always properly managed to protect water bodies and groundwater. Some people may want to get rid of their wastes by burning them in their backyards if there is no collection system, this leads to exposure to un pleasant hazardous and toxic substances.

1. **Poor Sewer system design and water pollution**

Few developing countries can afford to build modern waste treatment system for their rapidly growing populations. The World Bank estimates that only 35 percent of urban residents in developing countries have satisfactory sanitation services. Poor sewage design with the rapidly expanding population and the absence proper sewage disposal system cause pollution of surface and ground water systems rendering them unfit for human consumption and contributing to fresh water and degeneration of sanitary conditions in urban areas, consequently leading to emergence of various ill health ranging from communicable to chronic non communicable diseases.

1. **Bad city planning and refuse disposal scheme**:

Bad planning and indiscriminate erection of walls and housing structures block water flow channels to form big floods. Bad refuse disposal schemes marked by indiscriminate dumping of solid waste and thrash in drainages and stream channels results in clogging of flow path of rainwater and pollution of surface water system.

1. **Traffic and congestion**

Traffic congestion is becoming a big challenge particularly in a less developed country due to the rapidly expanding cities is often overwhelmed by the immense crush of pedestrians and vehicles of all sorts that clog the streets. This congestion sometimes makes the delivery solid waste to their designated sites more difficult. In times due to the jump, the delivery is delayed, or little quantities of the waste materials are delivered, and this results to more accumulation of waste materials at the residential sites as well as in the designated areas which soon developed to landfills in the residential areas.

**Question 9:**

How do good sanitation and waste management practices bring a positive effect to urban inhabitants? Give examples for effects on:

1. health
2. education
3. economic conditions
4. the environment.

Adequate sanitation, together with good hygiene and safe water, are fundamental to good health and to social and economic development. Improvements in one or more of these three components of good health can substantially reduce the rates of morbidity and the severity of various diseases and improve the quality of life of huge numbers of people, particularly children, in developing countries. Although linked, and often mutually supporting, these three components have different public health characteristics. Lack of sanitation leads to disease. The diseases associated with poor sanitation are particularly correlated with poverty and infancy and alone account for about 10% of the global burden of disease. At any given time, close to half of the urban populations of Africa, Asia, and Latin America have a disease associated with poor sanitation, hygiene, and water. (WHO). The development and implementation of good hygienic and sanitation policies such as promoting good health policies, advocating for good environmental management will change and safe life significantly. Some of these achievements may include:

**Good health:**

* The inhabitants are able to get clean and safe drinking water
* The chances for spread of infectious water borne diseases are reduced
* Transmission of diarrheal diseases are minimized.
* Reduction in cases of neglected tropical diseases such as schistosomiasis, soil helminth worms, and trachoma.
* Infections due to air pollution to environmental pollution is minimized.
* Acute respiratory infections are reduced specially in children who are malnourished and anemic.

**Education:**

* Good health provides good environment for education to all sorts of life.
* Healthy environment means healthy mind and body hence increases the enrollment of children to school.
* Health programs promote health in schools by carrying out deworming for intestinal parasites for the children in school hence improve school performance.
* School children dropout or absenteeism due to ill health is reduced.
* Health programs carry out health education on safe hygiene and sanitation to school children with messages such as handwashing with water and soap. These messages help them get rid of some infectious diseases, and they also act as health ambassadors in their communities.

**Environment:**

With clean and safe environment, the following is viable

* With clean environment, diseases such as amoebiasis, typhoid, Cholera , diarrheal diseases etc. which are caused by polluted drinking water are reduced.
* Diseases caused by Water polluted by chemicals such as heavy metals, lead, pesticides and hydrocarbon that leads to hormonal and reproductive problems, damage to the nervous system, liver and kidney damage and cancer are also reduced. Being exposed to mercury causes Parkinson’s disease, Alzheimer’s, heart disease and death.
* The chances of polluted beach causing rashes, hepatitis, gastroenteritis, diarrhea, encephalitis, stomach aches and vomiting are minimized.
* Water pollution affects marine life which is one of our food sources. Maintaining the environment clean reduces the chances of water contamination and pollution which means our marine food will always be healthy.
* The environment will be safe for any human life and activity.\

**Economic condition:**

Better health promotes better economy in any society.

* Better health status of an individual lower the cost of health expenses.
* There is a powerful, positive effect of better health on wealth at the individual, household, community and national levels.
* Improved health boosts personal and community income through its positive effects on: – education, productivity, investment, and making resources available.
* Health improvement leads to less days lost at work or for school going children due to illness.
* Less expenditure from the national government on providing and developing environmental health and safety policies.

**Question 10:**

**List and briefly describe the measures by which the success or otherwise of a public–private partnership providing water supply services can be assessed:**

In order to improve your sanitation and water system with the aim to make it more sustainable, it is of prime importance to conduct a water resources assessment. Especially when a comprehensive and large-scale change in the water and sanitation system is envisaged, it is crucial to know the various parameters related to water quality and quantity in your area. If you want to save water and therefore use water more efficiently in your project area, it is important to know the various water consumers and their actual water amount they use. Only by with a sound understanding of the present situation of water consumption in your project area, you can decide where and how to save water.

Some of the crucial components to be assesses include:

* 1. **Water resource assessment:**

To ensure the sustainable and effective management of our vital water resources, we must be able to adequately assess their sources, extent, dependability and quality.  This allows the assessment of land-use changes within the basin over time, and of the impacts on water availability under a wide variety of scenarios, including climate change. This is intended to help users, particularly policy specialists and water resource managers, identify current and future water management challenges and compare those with current and past water resources availability. The assessment enables better understanding on the impacts of past and present water management practices on water resources, as well as the interactions between climate, water and landscape. Its use can contribute to water reform by providing nationally and regionally consistent water resources information and data, such as surface water, groundwater, urban and agricultural water supply and use. Moreover, it can aid in the formulation of government policy and the development of broad-scale strategic plans and decision making.

* 1. **Risk assessment:**

Risk assessment provides a tool to identify specific hazards, analyze the risk associated with them and determine appropriate ways to eliminate or control those hazards. Risk assessments can be conducted on three levels: in relation to natural and human induced hazards; in relation to the risk faced by water utilities and regulatory agencies in their work; and finally, to the potentially harmful effects of water management decisions. Some risk are the results of human actions whilst others arise from natural causes.

* 1. **Vulnerability assessement**.

Vulnerability assessement is concern with both human and natural systems. Vulnerability assessement build on evaluations of exposures and sensitivity which will combine to yield potential impacts. Assessing the potential impacts together with adaptive capacity will result in an evaluation of the vulnerability. Alleviation or adaptation strategies therefore involve the identification of sectors/systems/ areas vulnerable to change and an examination of the scope to increase the coping capacity of these systems, their resilience, which will reduce the level of vulnerability once implemented. Coping capacity can rationally be expanded by applying these approaches. Prioritization will take into account the consequences of system failure or reduction, and the potential for improvement through planned adaptation.

* 1. **Social Assessement**:

Social assessement is being used for the systematic analysis of the social impacts that a proposed development water project or policy will have. It is particular relevant if these policies are adverse and extensive, and/ or a proposal is expected to attract extensive opposition, as big water infrastructure projects or changes in water pricing often do. Social impacts include all social and cultural consequences to human populations of any actions that affect the ways in which people live, work, play, relate to each other, organize to meet their needs, and generally cope as members of a society.

* 1. **Ecosystem assessement:**

Ecosystem assessement analyses the effects of climate change, for example, on ecosystems and on their ability to provide people with goods that they are used to. There by ,it gives decision makers the information they need to improve the conservation and sustainable use of ecosystems and to minimize negative impacts of water use. Riverine ecosystems include components like the source area, river channel, riparian zone, floodplain, ground water, wet lands and estuary, as well as any other important features such as rate and endangered species. A thorough ecosystem assessement need not only to consider the effects of change on the ecosystem, but also on the people who depend on the services offered by the ecosystem and for whom a changed ecosystem can have a number of more or less dire consequences.

* 1. **Environmental assessement:**

The environmental assessement is to study the environment in which the water project is planned for. It describes the activities that will take place during each face of the project.(i.e. the construction, operation and decommissioning), describe the likely environmental; impacts and where significant adverse impacts are predicted, and develop an environmental management plan to mitigate them. The assessement aims to assess the following points:

* Projected quantitative changes in availability of water for beneficial uses, such as fisheries, recreation and tourism, portable water supply, irrigation, industrial use and aesthetics.
* The extent to which receiving water quality standards and/or other beneficial use objectives will be achieved.
* The size of the water body that will be positively or negatively affected by any discharges, and the magnitude of the changes in water quality parameters.
* The public health impacts from chemical and/ or bacteriological pollution.
* Socio-economic impacts.
  1. **Economic Assessement:**

Economic assessement takes into account all costs and benefits on a year -by- year basis over the life of the project or programme. This sort of analysis evaluates the total value of a project using the current cash flows which are then discounted according to given rates. Economic assessement demands a clear understanding of the direct and indirect impacts of proposed project and thus includes environmental costs and benefits. It can further be linked to participatory approaches and demand assessement and can focus on women issues and broader health/livelihood effect of water use.

**References:**

* *WIT Transactions on Ecology and the Environment, Vol 142, © 2010 WIT Press*
* www.witpress.com, ISSN 1743-3541 (on-line).
* World Health Organization. Environmental health in emergencies and disasters [Internet]. 2003 Available from: <http://tinyurl.com/886slz3>
* . Piers, B., T. Cannon, I. Davis, B. Wisner. At risk: natural hazards, people’s vulnerability, and disasters. London: Routledge; 1994.
* <http://www.epa.gov/epaoswer/osw/basifact.htm#solidw>.
* CDC. Third national report on human exposure to environmental chemicals. Atlanta: Centers for Disease Control and Prevention; http:// www.cdc.gov/exposurereport (accessed June 14, 2007); 2005.