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Case 9 : Combating Food Borne Illnesses Through Safe Food Handling Practices in the United Nations/African Union Mission in Darfur (UNAMID), Sudan

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CASE 9

Combating Food Borne Illnesses Through Safe Food Handling Practices in the United Nations/African Union Mission in Darfur (UNAMID), Sudan (A)

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INTRODUCTION

The Head of Field Medical Services (HFMS) of the United Nations/African Union Mission in Darfur (UNAMID), Sudan was woken up from sleep on November 16, 2010 by the ringing of the telephone. The unexpected call was from New York and was related to the recent statistics indicating a high incidence of gastro-enteritis emanating from UNAMID. The caller thought it would be a good idea to look at its etiology particularly as it related to water and food borne diseases. He directed the HFMS to investigate the recent upsurge in cases of food borne diseases; which had gone from an average of 8-10 cases per week normally to between 134-151 cases per week in the last three weeks. The HFMS who had over the past months been brainstorming about the issue decided to develop a strategic plan of action. This would entail developing a design to investigate the causes, effects, and impact of food borne diseases in UNAMID as well as implementing mitigating measures to curtail its spread.

FIRST STEPS

The HFMS, a seasoned physician and an astute administrator, was very worried. His extensive knowledge and experience in the management of field medical facilities in peacekeeping missions had triggered this anxiety. He knew the devastating impact that gastro-enteritis had on the individual, as well as organizational impacts in terms of human and material resources. Essentially, resources committed by the Medical Section to prevent an occurrence of this kind of would be wasted, should the situation escalate. He recalled that at different occasions he had expressed dissatisfaction with the state of hygiene and safety in some of the missions' cafeterias. In fact, before his last rest and recuperation/annual leave, he had resolved to tackle the problem headlong. The recent statistics substantiated his personal observations and resolve.

He met with Dr. Maurice Ezeoke, Director, UNAMID Level II Hospital, to share his vision and concerns regarding the recent development. After discussions, he charged Dr. Ezeoke to assemble and coordinate a team of experts to address the problem. They discussed the benefits of adherence by UNAMID's food vendors to food hygiene and safety norms as enshrined in the UN Guidelines for Food Safety Management in Peacekeeping Missions. In the HFMS directive to Dr. Ezeoke he outlined the following:

> The risk factors for food borne illnesses are known; hence a comprehensive approach to mitigate the causative factors would not be too difficult to fashion out. It has been scientifically proven that food poisoning is caused by physical,

chemical, and microbial contaminants, and presence of allergens in food. Naturally one is concerned about sources of the food raw materials, food preparation techniques, food storage temperatures, servicing, personal hygiene and health status of food handlers, pest control, and hygiene of the food premises. The main task was to investigate this upsurge in food borne diseases and come up with sustainable mitigating measures aimed at reducing its risk factors.

Dr. Ezeoke knew the enormity of this additional task and the seeming urgency attached to it. The message was not lost on him in view of the fact that more than 70% of the "mission components" (individuals working for UNAMID) patronized the cafeterias. Within three days of being saddled with this responsibility, he had constituted a task force on UMAMID Food Hygiene and Safety. The task force members were Dr. Ezeoke himself, who was to act as team leader and coordinate all activities of the team, the Public Health Practitioner, the Food Quality Inspector, an Arabic speaking Medical Officer, and a representative from the Engineering and Environmental Protection Section (EEPS). Their mission was to develop a plan designed to investigate the source of food borne diseases and to mitigate the impact as well as curtail the spread of gastro-enteritis.

FOOD BORNE DISEASES

Food borne diseases constitute a global public health concern which often results in high morbidity and mortality if not promptly and properly handled (Open Lean, n.d.). In addition to a lack of potable water, poor personal hygiene, and poor environmental sanitation, consumption of contaminated foods had been attributed to being a major risk factor for its spread (Open Lean, n.d.). Statistics showed that diarrheal diseases with the attendant dehydration and high mortality rate in children less than 5 years, particularly in the developing countries, are its most common manifestation (Open Lean, n.d.).

CAUSES OF FOOD POISONING / FOOD HAZARDS

Food poisoning arises from the consumption of contaminated food. Food in this context includes ready-to-eat food such as cooked foods, fruits and vegetables that do not require further processing before consumption, as well as untreated water and beverages (Mayo Clinic, 2011). Contaminants can be by bacteria and/or by their toxins (Stevenson and Nash, 2011). It can also be by non-bacteria such as chemicals, metallic and physical contaminants, food allergens, mycotoxins, poisonous plants and fish (Stevenson & Nash, 2011). Contamination of food could occur at multiple points in the food chain: anywhere from the farm gate, handling, transportation, and food receiving and preparation, to storage and serving.

BACTERIA FOOD POISONING

Salmonella species, Staphylococcus aureus, and Clostridium species are some of the pathogenic bacteria that have been associated with food poisoning (see Exhibit 1). While the presence of these bacteria in foods do not necessarily cause noticeable changes in the physical appearance of food, they are, however, responsible for food borne illnesses (Stevenson & Nash, 2011).

Apart from bacteria and their toxins, other microorganisms associated with food borne illnesses or food poisoning are viruses and molds which are transmitted from person-to-person through food, air, and water (Center for Disease Control and Prevention, 2012). Food borne illness has also been associated with the contamination of foods with fomite – these are objects such as human hair, and skin: clothing, door handles, keys, etc. which serve as medium for transmissible microbes. Food borne disease symptoms may manifest within hours, days, or

weeks after the consumption of contaminated food. This is due to the fact that only a small population of pathogenic microbes is required in food and water to trigger disease conditions (Stevenson & Nash, 2011). Food poisoning is an expeditious disease condition which occurs soon after consumption of food that has been contaminated by pathogenic microorganisms and/or their toxins (Open Lean, n.d.).

NON-BACTERIA FOOD POISONING

Use of sub-standard food ingredients, non-adherence to safe food handling practices, lack of basic food preparation skills, and sabotage are some of the factors which have been attributed to non-bacterial food poisoning (Open Lean, n.d.; Stevenson & Nash, 2011). Nonbacterial food poisoning is classified as below:

- **Chemical food poisoning**
  This occurs due to consumption of contaminated foods – mostly agricultural produce with residual agricultural inputs such as pesticides, insecticides, and herbicides; spillage of detergents, fumigants, and other cleaning materials into foods; presence of residual antibiotics in poultry and meat products; contamination of soil and water (surface and underground); disproportionate use of food additives, deliberate addition of chemicals into food, and utilization of substandard intermediate food raw materials during food preparation (Open Lean, n.d.). The symptoms of chemical poisoning are vomiting, diarrhea, nervous disorder, and joint pains (Stevenson & Nash, 2011), among others.

- **Metallic food poisoning**
  Food poisoning from metallic sources may arise when acidic foods (within pH range 1-6) such as fruit juices are packaged in metallic materials such as tin, lead, copper, and zinc (Boychuk, 1977). The free radicals of these acidic foods and metals would interact to produce poisonous by-products which could make food unwholesome and subsequently constitute health problems when consumed (Boychuk, 1977). In addition to this, consumption of agricultural produce, fish (caught from polluted water), and animals which have absorbed metals during grazing could equally cause adverse health conditions (Boychuk, 1977).

- **Poisonous plants**
  Consumption of plants such as leaves of bitter cassava variety, inappropriately processed beans, wild potato, poisonous mushrooms, and tomato leaves, among others, could result in food poisoning with abdominal pain, nausea, and vomiting symptoms (Stevenson & Nash, 2011).

- **Mycotoxins**
  Storage of foods such as cereals, spices, herbs, nuts, and spices under inappropriate atmospheric conditions could trigger growth of molds on such foods. The presence of molds in foods leads to the production of mycotoxins and subsequent contamination of such foods. Consumption of contaminated foods with mycotoxins, a byproduct of Aspergillus and Penicillin species, could also lead to diarrhea and vomiting (Stevenson & Nash, 2011).

- **Physical contamination**
  Physical contamination of foods could occur at multiple points during food handling: the farm gate, slaughtering, point of purchase, and processing stage: during storage,

packaging, and distribution as well as mishandling by the end user (University of Nebraska Cooperative Extension, 2005). Physical contamination of foods involves the introduction and presence in food of harmful extraneous materials which may trigger on-set of disease in the consumer (University of Nebraska Cooperative Extension, 2005). Some of the sources of physical contaminants in foods are stone, jewelries, hair, and fingernails. Others include: raw materials, packaging materials, processing equipment, pests, rodents, dirty environment, inappropriate construction of food premises, and defective production processes (University of Nebraska Cooperative Extension, 2005).

- **Allergen**
  Variations in the human body chemistry are responsible for adverse immunological response when individuals consume certain constituents contained in foods (National Institute of Allergy and Infectious Diseases, 2010). Food items such as eggs, milk, fish, peanuts, soybeans, gluten, sesame seeds, and a host of others have been reported to cause allergic reactions such as nausea, skin flushing, diarrhea, vomiting, sore red itchy eyes, and running nose (Stevenson & Nash, 2011). It is noteworthy that diarrhea and vomiting are symptoms which are common to food allergy and food poisoning (National Institute of Allergy and Infectious Diseases, 2010).

- **Poisonous fish**
  Consumption of toxic fish such as ciguatera and scombrotoxic which are reef-dwelling fish and dark fleshed fish respectively have been reported to cause diarrhea, vomiting, and respiratory problems (Stevenson and Nash, 2011).

Though pathogenic bacteria are responsible for most of the food borne illnesses, the presence of non-bacterial contaminants in foods also causes food poisoning.

DR. MAURICE EZEOKE

Dr. Ezeoke graduated from the Nigerian Military School, Zaria in 1971. He headed to Ahmadu Bello University, Zaria to study Medicine and graduated in 1978. In late 1982, he proceeded to the University College Hospital (UCH), London, United Kingdom for his post-graduate studies in Surgery. During pursuit of his studies in the UK, he was at various times an anatomy demonstrator (from October 1982 to June 1983); honorary surgical registrar (between July 1983 and December 1984) at the UCH, London; honorary surgical registrar, Stoke Mandeville Hospital Aylesbury (January 1985 to September 1985); substantive surgical registrar UCH, London (September 1985 to December 1985); and senior house officer (SHO) Accident & Emergency, Chase Farm Hospital, Enfield, Middlesex, London and SHO Orthopedics, Central Middlesex Hospital London. He continued his career in the UK for two more years after his post graduate studies to gain experience as a surgeon. During this period, he held Locum Tenens appointments in St. James Hospital, Balham, London, St. Mary's Hospital and Queen Elizabeth Hospital, both in Portsmouth.

Dr. Ezeoke, a Fellow of the Royal College of Surgeons in Ireland, Fellow of the International College of Surgeons, and Fellow of West African College of Surgeons, returned to Nigeria and served the Nigerian Army in a variety of capacities. He was the Chief Medical Officer for the Economic Community of West Africa Monitoring Group (ECOMOG) Forces in Liberia between August 1990 and February 1991. Dr. Ezeoke rose to the rank of Brigadier General and Director, 68, Nigeria Army Reference Hospital Yaba (NARHY), Lagos before retiring in the year 2006

after a distinguished military career. He had several academic publications to his credit including "A study of Environmental Sanitation in Zaria City".

Dr. Ezeoke joined the United Nations/African Union Hybrid Mission in Darfur (UNAMID) as the Director of the Level II Hospital in September 2008. By virtue of his appointment, he had oversight functions to ensure maintenance of hygiene, health and safety standards by the food vendors operating in UNAMID premises in Darfur region especially in El Fasher. In addition to his clinical and administrative functions, he had been very innovative and unrelenting in ensuring that the highest level of food safety was attained in the UN's most dynamic and complex peacekeeping operations in the world.

CRISIS IN SUDAN

Sudan is a North African Islamic state divided into western and eastern parts by the river Nile (Collins, 2008). It covers approximately 2,505,813 sq km and shares borders with Egypt in the north; Ethiopia, Red Sea, and Eritrea in the east; South Sudan in the south; Central African Republic in the southwest; and Chad and Libya in the west and northwest respectively (Sudan.net, 2011). It is made up of eighteen states from the following territories: Blue Nile, Darfur, Kassala, Khartoum, Kordofan, and Northern territory. Sudan has been engulfed in an unresolved political impasse between the northern and southern parts due to successive governments' exploitation of religious and ethnic diversities. This culminated in two civil wars between 1955 to 1972 and 1983 to 2005 respectively (Enough, 2014).

CONFLICT IN DARFUR

Darfur occupied the northwestern part of Sudan and was made up of the following regions: South, North, West, East, and Central with capitals in Nyala, El Fasher, El Geneina, Zalingei, and Al Dein respectively. The major contributory factors to the Darfur crises were: land ownership disputes between Sudanese Arabs (Elites in power) and Non-Arab Sudanese (Dafuris); ethnic cleansing; and the social movement for democracy. Systemic marginalization of the Darfuris by the Khartoum central government became a full blown dispute in the year 2003 when the non-Arab Darfuris under the auspices of Darfur Liberation Movement engaged the Government of Sudan (GoS) in armed hostilities due to perceived oppression, non-provision of physical infrastructures, and lack of political patronage (Enough, 2014).

The crises caused massive displacement of people from their native homes and subsequent concentration in Internally Displaced Peoples Camps (IDPs). The humanitarian crisis only worsened with the IDPs and defied all mediatory and political interventions. The African Union Mission in Sudan (AMIS) initially established and funded by the African Union (AU) failed to put the crises in check, a situation which attracted the attention of the global community and necessitated the establishment of the United Nations/African Union Hybrid Mission in Darfur (UNAMID), Sudan, jointly funded by the United Nations and the Africa Union.

PARTIES TO THE DARFUR CRISES

The parties to the Darfur crises were the Sudanese Government and its security outfits, including the military, police, and national security. These GoS institutions were supported by the Janjaweed (an Arab militia group with strong ties to the government) (African Union/United Nations Hybrid Operation in Darfur, 2014).

Sudanese Arabs from the northern part of the country constituted membership of the Janjaweed militia group while rebel groups such as SLA/WA, SLA/MM, and JEM drew their members from Fur, Zaghawa, and Masalit ethnic tribes who are non-Arab Muslims. It was estimated that

thousands of peoples were killed and about 1.8 million were internally displaced (African Union/United Nations Hybrid in Darfur, 2014).

AFRICAN UNION – UNITED NATIONS HYBRID MISSION IN DARFUR (UNAMID)

In efforts to nip the crises in the bud, the United Nations Security Council passed Resolution 1769 on July 31, 2007 mandating the African Union – United Nations Hybrid Mission in Darfur (UNAMID) to take over from AMIS on or before the end of December, 2007.

According to UNAMID (2014), the mandate of UNAMID is to:

1. Protect civilians, its personnel, facilities, installations and equipment, and ensure the security and freedom of movement of its own personnel and humanitarian workers;
2. Support early and effective implementation of the Darfur Peace Agreement, prevent the disruption of its implementation and armed attacks, and protect civilians, without prejudice to the responsibility of the Government of Sudan; and
3. Facilitate humanitarian assistance to the massively displaced civilians. (African Union/United Nations Hybrid in Darfur, 2014).

UNITED NATIONS OPERATIONAL DEPLOYMENT CONCEPT

The Department of the Peacekeeping Operations (DPKO) of the United Nations operated the following three phases of deployment: Mission Start-up Phase; Mandate Implementation Phase; and Transition Phase. UNAMID was on the implementation phase at the time as all the "mission components" (individuals working for UNAMID) were operating at near full capacity.

COMPONENTS OF UNITED NATIONS MISSION

The UN mission components were uniformed (military and police) personnel and civilians. The UNAMID deployment at the time was made up of the following:

Mission Components	**Strength** (number of individuals)
Troops	14,390
Military Observers (MILOBs)	332
Police (Advisors and Formed Units)	3,272
Civilian International Staff	1054
Local Civilian Staff	2,941
United Nations Volunteers (UNV)	403

Source: African Union / United Nations Hybrid Operation in Darfur, 2014.

UNAMID STRUCTURE

The missions operated offices in the entire Darfur region. UNAMID deployed in sectors along regional lines. The mission's headquarters was located in El Fasher, North Darfur. The Sectors and their respective headquarters were: Sector South (Nyala), Sector West (El Geneina), Sector Central (Zalingei) and Sector East (Al Dein) (see Exhibit 2). A number of military team sites and camps for Internally Displaced People (IDP) were established and controlled by each of the Sectors.

DARFUR SECURITY SITUATION

The United Nations Department of Safety and Security (UNDSS) classified the security levels in peacekeeping missions into six levels:

Level 1 – Minimal
Level 2 – Low
Level 3 – Moderate
Level 4 – Substantial
Level 5 – High
Level 6 – Extreme

The security level in Darfur according to the UNDSS was Level 4 – Substantial (i.e. significant security mitigation measures, strict control of exposure, and restriction of movement of UNAMID staff members are in place). This implied that the activities of the UN agencies, UNAMID, and Non-Governmental Organizations (NGO) were restricted and could only be conducted with strict compliance with security advice from the UNDSS, missions' security adviser, and clearance from the Government of Sudan (GoS). There were sustained incidences of carjacking, abduction, rape, physical attack, banditry, and all sorts of criminality targeted at civilians as well as UN personnel throughout the entire Darfur region.

STAKEHOLDERS IN UNAMID CATERING SERVICES

Lack of access to food raw materials and absence of nutritious food items occasioned by the geographical location and dynamic security situation in Darfur made it practically impossible for staff members to meet their nutritional needs. The non-availability of safe and nutritious foods to staff members on UNAMID premises posed a very serious challenge to their dietary needs. Because of this lack of food raw materials, many staff members depended on the cafeterias for their daily need of food. To create a well-controlled system of catering services, UNAMID management instituted a competitive procurement process coordinated by the Procurement and Contract Management Sections to engage the services of three successful vendors for the provision of catering services based on some guidelines and controls.

In the light of the foregoing, the stakeholders in the UNAMID catering services were:

- **Facility Management Unit (FMU)/Engineering & Environmental Protection Section (EEPS)**
  This section was the requisitioner for catering services, hence, it was directly involved in the procurement process leading to the selection of catering vendors; provided cafeteria facility and equipment to the service providers; and maintained the provisioned equipment and facilities;

- **Medical Section**
  Conducted food hygiene and safety inspections of the mission's cafeteria to ensure compliance with safe food handling practices, trained food handlers in food handling practices in collaboration with the mission Quality Control Inspector, conducted medical examinations, and issued certificate of fitness to food handlers;

- **Quality Control Inspector (QCI)**
  Conducted scheduled as well as unscheduled inspections of the mission's cafeteria and vendors' storage facilities to ensure that service providers strictly adhered to food health, hygiene, and safety standards in accordance with the dictates of the Principles of Hazard Analysis and Critical Control Points (HACCP) and Good Manufacturing Practices (GMP). The QCI in collaboration with the Public Health Unit of the Medical Section conducted periodic food safety training for food handlers;

- **Welfare Section**
  This Section was responsible for the psychological wellbeing of staff members in peacekeeping operations and thus collaborated with the FMU to ensure delivery of efficient and effective catering services to staff members;

- **Procurement & Contract Management Sections**
  Involved in the selection of vendors through a transparent and competitive bidding process and ensured strict compliance by the selected service providers to the provisions of the performing contracts; and

- **Food Vendors**
  Selected through competitive procurement bidding process to provide catering services in the mission, headquarters, and the Sectors.

UNAMID FOOD VENDORS

The three selected indigenous food vendors operating in the mission's headquarters in El Fasher and the Sector headquarters in Nyala, Zalingei, El Geneina, and El Dein were:

1. Pancrop Commercial Co. Ltd;
2. Crimson Light Restaurant; and
3. Tajuj for Development & Investment Co. Ltd.

The catering contract between UNAMID and the food vendors was to operate functional catering services in UNAMID headquarters in El Fasher and the Sector headquarters and to also provide breakfast, lunch, and dinner on a daily basis.

UNAMID provided at no cost to the service providers a fully furnished one hundred man catering facility at each site comprised of the following kitchen equipment: rice boiler, grill, deep fryer, stove, refrigerators, refrigerated containers (for perishable food items), storage containers for dry food items, furniture, utilities (i.e. power and water), and a solid waste disposal plant. In addition, the service providers were at liberty to provide, at their own cost, other relevant equipment or services necessary for smooth operation and management of the facilities under the contracts.

CAUSES OF FOOD CONTAMINATION AT UNAMID

Previous cases of food borne diseases in the mission had been linked to microbiological, environmental, and behavioral factors. Some of the causes identified through direct observation were:

1. **Unsafe food handling by food handlers** – due to ignorance, improper handling of food materials occurred at the point of purchase and during transportation, preparation and service. Microbes were suspected of being introduced from raw meat, poultry, and seafood to high risk ready-to-eat protein containing foods such as milk and milk products, fruits and vegetables, and cooked ready-to-eat foods that required refrigeration at a temperature of 4 degrees.

2. **Poor personal hygiene by food handlers** – UNAMID catering service providers did not provide food handlers with protective equipment (hair restraint, hand gloves, and apron) and thus this increased the chances of introduction of microorganisms such as Staphylococcus aureus from the nose, skin, and hair into food by the food handlers.

3. **Equipment** – deep cleaning and disinfestation of food preparation equipment, utensils, and food contact surfaces were done periodically rather than on a daily basis as required by the food vendors; hence, they served as a potential source of microbial food contamination.

4. **Poor air quality** – the heat extractor installed in UNAMID one hundred man catering facility was to aid the removal of steam, smell, and odor during food preparation but had malfunctioned. This was due to a lack of spare parts and infrequent servicing, and thereby caused retention of warm, damp, and still air in the kitchen. This situation encouraged the introduction of airborne microbes into raw and cooked foods in the kitchens with the attendant health implications when such infected foods were consumed.

5. **Dust/Sandstorm** – Darfur is located in the heart of the Sahara desert which is characterized by sand dunes with frequent sandstorms (haboob) that caused physical contamination of prepared and unprepared foods by sand.

6. **Unwashed fresh fruits and vegetables** – UNAMID food vendors did not wash procured fruits and vegetables thoroughly and repeatedly with potable water thereby causing retention of soil and bacteria on the outer layers of the fresh foods. When such fruits and vegetables were cut or peeled under ambient temperature, the microbes inherently present on the outer layers multiplied and caused food contamination.

7. **Presence of pests** – due to the warm temperature and poor environmental sanitation, there were a lot of flies in Darfur. Though UNAMID cafeterias and kitchens were fitted with electric insect killers, constant opening of the cafeteria doors and windows provided avenues for the infestation of the facilities by flies. These flies perched and inoculated prepared and raw foods, cooking utensils, and contact surfaces, with pathogenic microorganisms. Some of the facilities were also infested with cockroaches, rats, and weevils which transmit pathogenic microorganism easily.

8. **Poor waste collection and disposal** – food remnants were not promptly collected and disposed of by the food vendors in UNAMID premises. These improperly handled food remnants had been used in error in some instances, and attracted pests, rodents, cats, and dogs. All of these scenarios have been closely linked to food contamination. In addition, waste collection bins were not always washed (inside and outside), not fitted with garbage collection bags, and not covered, thereby exposing the contents to pests and rodent infestation.

9. **Location of lavatory close to the cafeteria facility** – in most UNAMID camps, washrooms were situated close to the cafeteria facilities, a situation which predisposed offensive odor and swarming of flies in and around the cafeteria facilities.

10. **Poor food preparation method** – the employees of UNAMID food vendors were mainly indigenous people who did not have any knowledge regarding the requirements for basic food hygiene, health, and safety standards. To compound the problem, the food handlers were not trained upon their engagement in catering

activities by their employers, hence, they had limited knowledge about safe food handling practices. They thus were regular sources of food contamination.

11. **Non-maintenance of ready-to-eat food at prescribed temperature** – ready-to-eat foods were recommended to be held between 5 degrees Celsius and 63 degrees Celsius to prevent the replication of vegetative spores of microbes contained in foods. However, UNAMID food vendors did not adhere to this recommendation. Prepared foods that were supposed to be kept on the hot food presenters maintained at 63 degrees were mostly left in the cooking pots to cool under ambient temperature. Fruits and vegetables for salad that were supposed to be refrigerated at 5 degrees were also left under ambient temperature. The implication for these ready-to-eat foods held outside the recommended temperatures was that microbes and their spores contained in the food would multiply and cause food spoilage.

12. **Poor food raw materials transportation and receiving** – delivery of raw meat, fish and poultry products, perishables (fruits and vegetables), bottled water and beverages to UNAMID kitchens was done with mini buses and trucks that did not have the facility to ensure cold chain delivery. The food items were piled up in layers regardless of whether they were raw, fresh, or dry. This situation caused heat buildup, incipient/latent damage in perishables, and ultimately resulted in an outset of enzymatic and microbial degradation of food constituents. Raw fish, meat, and poultry products transported under such conditions suffered similar fate and in most cases had very high microbial load, which resulted in food contamination. On delivery, raw food items that were supposed to be refrigerated or frozen were left at room temperature for hours before they were refrigerated or cooked, thereby resulting in contamination and, when prepared, defective and unwholesome food.

13. **Fumigation** – the food vendors rarely fumigated the cafeteria environment and thus, there was a heavy presence of pests (flies, ants, and cockroaches), rodents, cats, dogs, and other stray animals in and around the cafeteria premises.

14. **Irregular Cleaning** – the level of hygiene in the mission cafeterias was not particularly high. Some of the vendors did not engage in deep cleaning of the equipment and facilities and, thus, the kitchen floor, wall, contact surfaces, and the cafeteria environments were generally dirty in such cafeterias.

15. **Non-provision of changing room for food handlers** – food handlers in cafeterias that were not provided with changing rooms, kept their personal effects such as clothing and shoes in the food storage rooms. This practice had been linked to the contamination of raw and intermediate food raw materials with pathogenic microorganisms.

NEXT STEPS

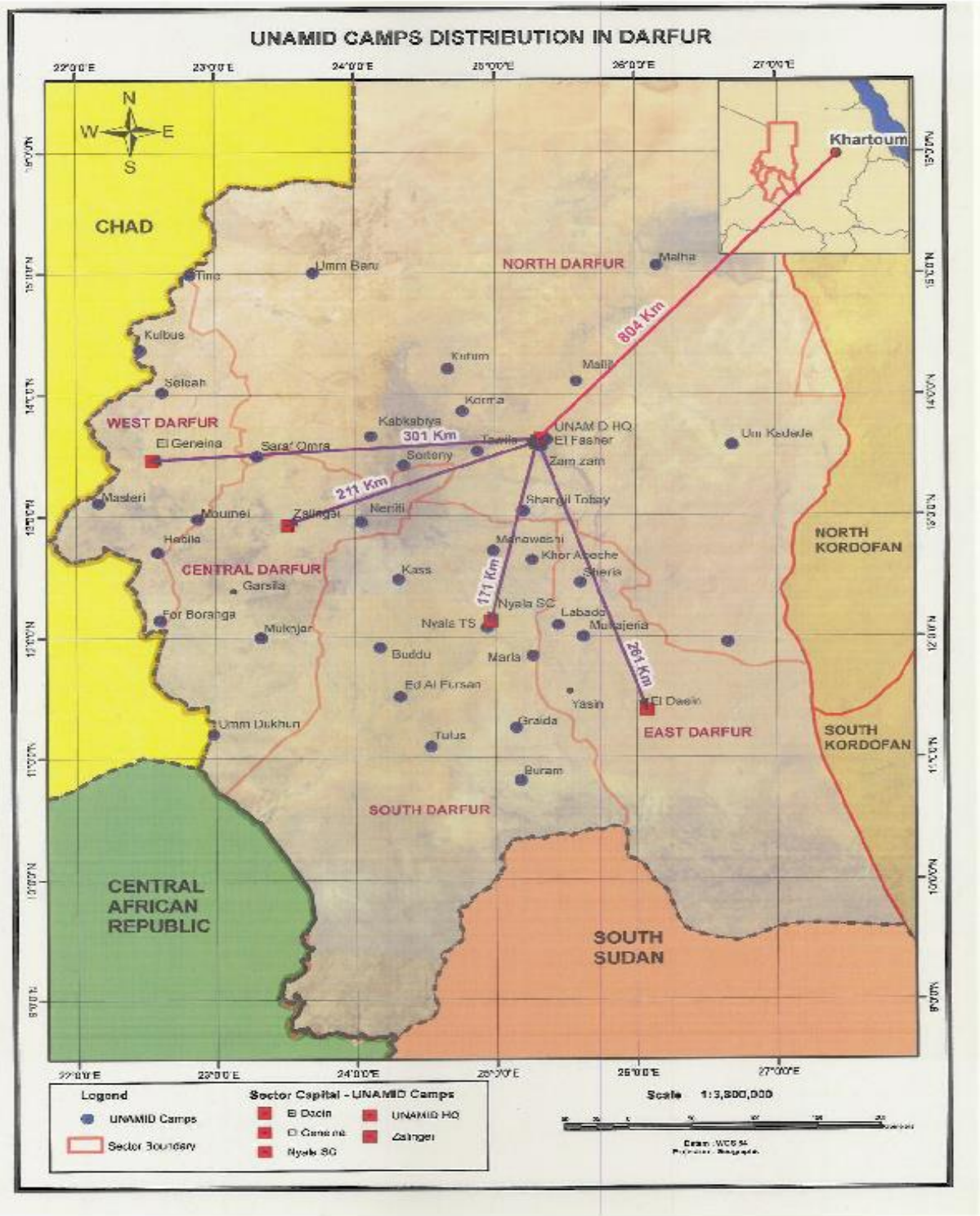
Dr. Ezeoke constituted a task force on UNAMID Food Hygiene and Safety with the Public Health Practitioner, the Food Quality Inspector, an Arabic speaking Medical Officer, and a representative from the Engineering and Environmental Protection Section (EEPS) as its members. Their mission was to develop a plan designed to investigate the source of the current food borne diseases and to mitigate the impact as well as curtail the spread of gastro-enteritis. As the team leader and coordinator of all the task force's activities, where should Dr. Ezeoke begin? What were the root causes of this most recent outbreak and what were possible solutions?

EXHIBIT 1
Causative Organisms for Food Borne Diseases

Causative organisms	Disease	Sources	Incubation period
Campylobacter jejuni (90% of cases) and Campylobacter coli (10% of cases)	Campylobacter enteritis	Animals, untreated water, raw meat, offal, poultry and untreated milk	1 -11 days Normally 2-5 days
Escherichia coli (E. coli 0157)	E. coli	Raw meat & milk; food, sewage, water, fruits and vegetables	1-6 days
Listeria monocytogenes	Listeriosis	Cooked/chilled products, fruits and vegetable salads, dairy products, soil, water, feces	3-70 days
Salmonella typhi and Salmonella paratyphi	Typhoid and Paratyphoid	Raw fruits and vegetables, raw milk, salad, contaminated water, feces of infected people and shell fish	7-21 days for both strains
Shigellasonnei	Bacillary dysentery	Raw fruits and vegetables, raw milk, salad, contaminated water, feces of infected people and shell fish	1-7 days 4 days most common
Norovirus	Viral gastroenteritis	Sewage-contaminated water, water-filtering shellfish, raw fruits and vegetables, person to person (fecal oral route)	1-2 days
Hepatovirus	Hepatitis A	Sewage-contaminated water, water-filtering shellfish, raw fruits and vegetables, person to person (fecal oral route)	10-50 days

Source: Stevenson & Nash, 2011.

EXHIBIT 2



Source: UNAMID Geographic Information Systems (GIS) Unit.

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CASE 9

Combating Food Borne Illnesses Through Safe Food Handling Practices in the United Nations/African Union Mission in Darfur (UNAMID), Sudan (B)

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CHARTING A NEW COURSE

In view of the myriad of problems associated with the operations of UNAMID food vendors and the high prevalence of food borne illnesses, there was need to design non-medical interventions to mitigate the risk factors for food borne illnesses in the mission. When faced with a similar situation in the ECOMOG camp during the Liberia civil war in the early 90s, Dr. Ezeoke, a former ECOMOG Chief Medical Officer, had successfully managed the near crisis through non-medical interventions. His success was founded on the prompt identification of the risk factors and introduction of interventions to prevent an outbreak. He developed the concept of "Wholesome Food, Better Health and Business" which was an abridged version of the Food Safety Management System (FSMS) which itself was based on the seven principles of Hazard Analysis and Critical Control Points (HACCP) and Good Manufacturing Practices (GMP).

PROPOSED INTERVENTION

Dr. Ezeoke consulted with stakeholders in the UNAMID food catering contract with the view to charting a way forward. He coordinated a series of meetings with them during which he explained the concept of the "Wholesome Food, Better Health and Business". He noted that this concept achieved resounding success when it was implemented during the ECOMOG days. Based on the identified risk factors for food borne illnesses in UNAMID and the peculiar nature of Darfur, he advocated for the adoption of the "Wholesome Food, Better Health and Business" concept.

CHANGE AGENTS

Dr. Ezeoke identified that in order to successfully reduce the risk factors for food borne illnesses he needed to introduce "Wholesome Food, Better Health and Business" in UNAMID cafeterias. He realized that to ensure successful adoption of the initiative, the mission would need to ensure proper training of staff members (who were remotely connected to the maintenance of hygiene, health, and safety standards in UNAMID cafeterias) in ISO 22000 (Food Safety Management System) to enable them to coordinate and drive the change. In light of the foregoing, Dr. Ezeoke recommended to the mission's management that the Public Health Physician, Quality Assurance Inspector, and an Arabic speaking Medical Doctor should be sponsored to participate in the Chartered Institute of Environmental Health (CIEH), Level 3 Award Certification in Food Safety for Catering Supervision. The trio successfully completed the training, received their respective food safety certifications, commenced the training of food handlers in sequential groups, and conducted scheduled as well as unscheduled inspections of

the food vendors' facilities within the UNAMID camps. The aim was to observe compliance with the impacted knowledge on safe food handling practices.

WHOLESOME FOOD, BETTER HEALTH AND BUSINESS

This concept was designed to enable UNAMID catering vendors to adhere to the dictates of the Food Safety Management System (FSMS) through the application of safe food handling practices and record keeping. This was with the purpose of assisting the food vendors to operate within the stipulated food norms. The concept revolved around cleaning of food premises, proper cooking of food, storage of foods at low temperature (chilling), cleaning and disinfestation, maintenance of personal hygiene by food handlers, medical certification and training of food handlers, and effective supervision.

SAFE FOOD HANDLING PRACTICES

Due to the scope and nature of catering and retail businesses in a dynamic field environment the basic safe handling practices that were germane were as follows:

a. **Cooking** – In addition to being a food preservation method, cooking improved food palatability and made food safe for consumption. Proper cooking of food ensured destruction of microorganisms and their spores. Monitoring and documentation could not be effectively carried out in catering as in typical HACCP systems where the use of calibrated thermometers was employed to measure the cooking temperature. Instead visual checks had to be carried out to ensure attainment of the desired result to ensure safe food.

b. **Low temperature storage** – This was a food preservation technique aimed at rendering microorganisms and their spores contained in foods inactive through storage of foods at below 5 degrees Celsius. The ideal temperatures were as follows:
   - Refrigeration of perishable foods at temperatures between 1 and 4 degrees Celsius.
   - Chilling of raw meat, raw fish, and poultry products at temperatures between -1 and 1 degree Celsius.
   - Cooling of prepared hot food to 5 degrees Celsius with blast chiller prior to refrigeration to prevent replication of pathogenic microorganism.
   - Freezing of food at below 0 degree Celsius to reduce the quantity of moisture for microbial activity and to inhibit enzymatic activities.

c. **Cleaning and disinfestation** – Cleaning of the food preparation premises was to be done with detergent and hot water to ensure effectiveness of the cleaning process. This included cleaning the kitchen walls, surfaces, and floor to remove dust, dirt, grease, and food leftovers. This was in addition to cleaning the cooking utensils, cafeteria environment, and storage facilities. Cleaning should also be complemented by disinfection with food grade chemicals to reduce microbial load in the food premises. Sanitizers (chemicals combining detergent and disinfectant activities) could equally be used.

d. **Prevention of cross contamination** – Cross contamination of foods should be avoided through the following steps:
   - Prevention of contact between raw poultry products, meat and fish and ready-to-eat foods (cooked foods, salad, etc.) particularly in the cold storage facility.
   - Use of different kitchen equipment (knives, cutting boards, cooking utensils) to process and prepare raw poultry products, meat, and fish.

- Prompt sorting, washing, and refrigeration of fresh fruits and vegetables for salad preparation.
- Soaking cleaning cloths for food contact surface cleaning in sanitized water and washing thoroughly after each usage.
- Prompt collection and disposal of food wastes.

e. **Training of food handlers** – Training of food handlers on safe food handling practices should be carried out by the Public Health unit of the Level II hospital in the mission headquarters and the Sectors at least twice a year.

f. **Medical certification of food handlers** – Medical fitness of food handlers should be tested by the Medical Section in all UNAMID premises and issuance of certificate of fitness to those who passed the tests. Those who failed the medical tests should be treated at any of the mission's health facilities and only be allowed to resume work once they passed another medical examination.

g. **Maintenance of personal hygiene** – During food preparation, food handlers must be compelled to use protective equipment such as apron, hair restraint, and hand gloves to prevent introduction of microorganisms into foods. Supervisors were to ensure compliance by hourly visits and supervision.

CHALLENGES

Through direct observations of the cafeterias in the mission headquarters and the Sectors, the food safety team noted that less than 40% of the food handlers were complying fully with the dictates of the "Wholesome Food, Better Health and Business" initiative. They also observed that some had a lackadaisical approach to the concept while others did not even attempt to change from their usual unsafe food handling practices (see Exhibit 1).

Most of the food vendors and food handlers complained that the safe food handling practices they were being asked to practice were too stringent, complicated, and slowed down their operations. Citing a language barrier and low level of education of the food handlers, the vendors posited that the food handlers were finding it difficult to process and comprehend the food safety norms. In addition to this, the food handlers were reported not to be amenable to corrections due to local customs, traditional beliefs, and culture regarding food production.

Other major factors working against the success of the initiative were the dearth of manpower and the lack of spare parts by the Engineering and Environmental Protection Section (EEPS) to effectively replace or repair faulty catering equipment. The non-maintenance of infrastructures and the failure to collect and dispose of waste promptly played a complementary role.

A very potent factor for the near failure of the initiative in the mission was that, the three man food safety team was grossly inadequate to effectively cover all the cafeterias in the mission headquarters and the Sectors. Given the nature of the compulsory six weeks Rest and Recuperation (R&R) break for staff members, members of the food safety team had limited time to work together because of their R&R cycle.

The mission management provided the required support and encouragement for the successful implementation of the initiative. However, the reluctance of the food vendors and handlers to adhere to safe food handling practices and the inability of the mission to maintain the cafeteria infrastructure and equipment due to lack of manpower were the big hurdles Dr. Ezeoke and the "Change Agents" need to cross.

RESULTS

Available epidemiological statistics for the years 2010 to 2014 pointed to the fact that appreciable progress had not been made due to the low compliance level by the food vendors and handlers (see Exhibits 2-6). Dr. Ezeoke, however, observed that reported cases of food borne illnesses from UNAMID cafeterias whose food handlers complied partially with the dictates of the “Wholesome Food, Better Health and Business” initiative had been reduced considerably by up to 46% while incidences of food borne illnesses in those cafeterias whose food handlers were not complying were still very high.

DECISION

Leveraging the improved hygiene, health, and safety standards recorded in some of the UNAMID cafeterias, Dr. Ezeoke was convinced that for the initiative to take a firm root in the mission there was a need for management to strengthen the Public Health Unit of the Level II Hospital. This could be done through the recruitment of additional qualified inspectors to complement the efforts of the current food safety team. He was however, mindful of the current review of the mission’s civilian component to save costs. He realized that making recommendations to the management through the HFMS for the recruitment of additional qualified inspectors was seemingly insurmountable given the current downsizing by the mission; and yet he could not leave the food situation the way it was and not try to avert possible outbreak. This remained his major dilemma.

He was at a crossroad and scheduled a meeting with the HRMS to chart a way forward. What should he propose?

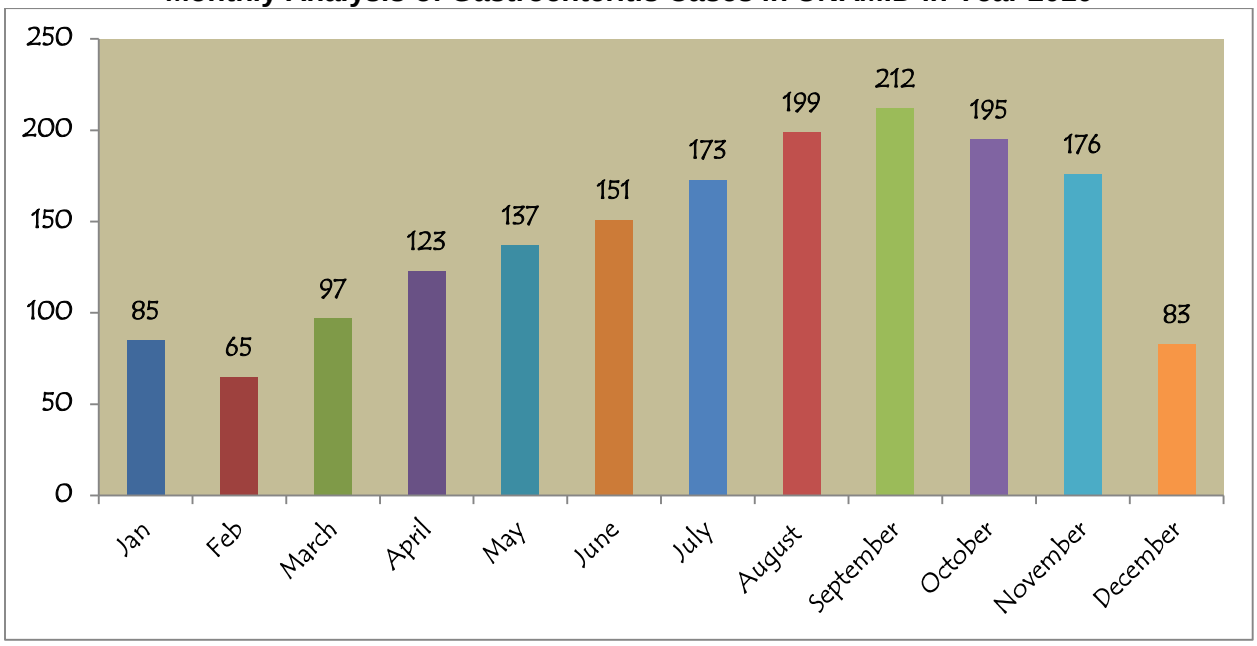
EXHIBIT 1
Differences between Compliant and Non-Compliant Cafeterias in Safe Food Handling Practices

Non Compliance with Safe Food Handling Practices	Compliance with Safe Food Handling Practices
Dirty and unkempt cafeteria environment	Cleaned cafeteria environment
Waste collection bins without lids	Covered waste collection bins
Dirty waste bins	Cleaned waste collection bins
Dirty kitchen and equipment	Cleaned kitchen and equipment
Broken down equipment	Functional equipment
Poor air quality	Good air quality
Poor temperature control	Proper temperature control
Food handlers without protective clothing	Food handlers with protective clothing
Dirty and disorganized food storage room	Cleaned and properly arranged food storage room
Keeping of personal effects in food preparation area	Personal effects kept in provided personal lockers in changing room
Undisposed waste	Properly disposed waste
Presence of pests and rodents in and around the cafeterias	Absence of pests and rodents in and around the cafeterias
Keeping of raw meat, fish and meat products in the same cold storage facility with ready-to-eat foods	Keeping of raw meat, fish and meat products in a different cold storage facility than ready-to-eat foods
Sorting and washing of fresh fruits and vegetables	Properly sorted and washed fresh fruits and vegetables
Absence of wiping cloth soaked in sanitized water for cleaning of food contact surfaces	Presence of wiping cloth soaked in sanitized water for cleaning of food contact surfaces
Thawing of frozen raw meat, fish and meat products in cold stagnant water	Thawing of frozen raw meat, fish and meat products under warm running water
Dirty kitchen walls, floors and contact surfaces	Clean kitchen walls, floors, and contact surfaces
Food handlers preparing food with bare hands	Wearing of hand gloves by food handlers during food preparation
Food handlers with long and dirty nails	Food handlers with properly manicured nails
Food handlers with unkempt facial hair	Food handlers with properly trimmed facial face
Blocked grease traps and drainages.	Cleaned and properly maintained grease traps and drainages

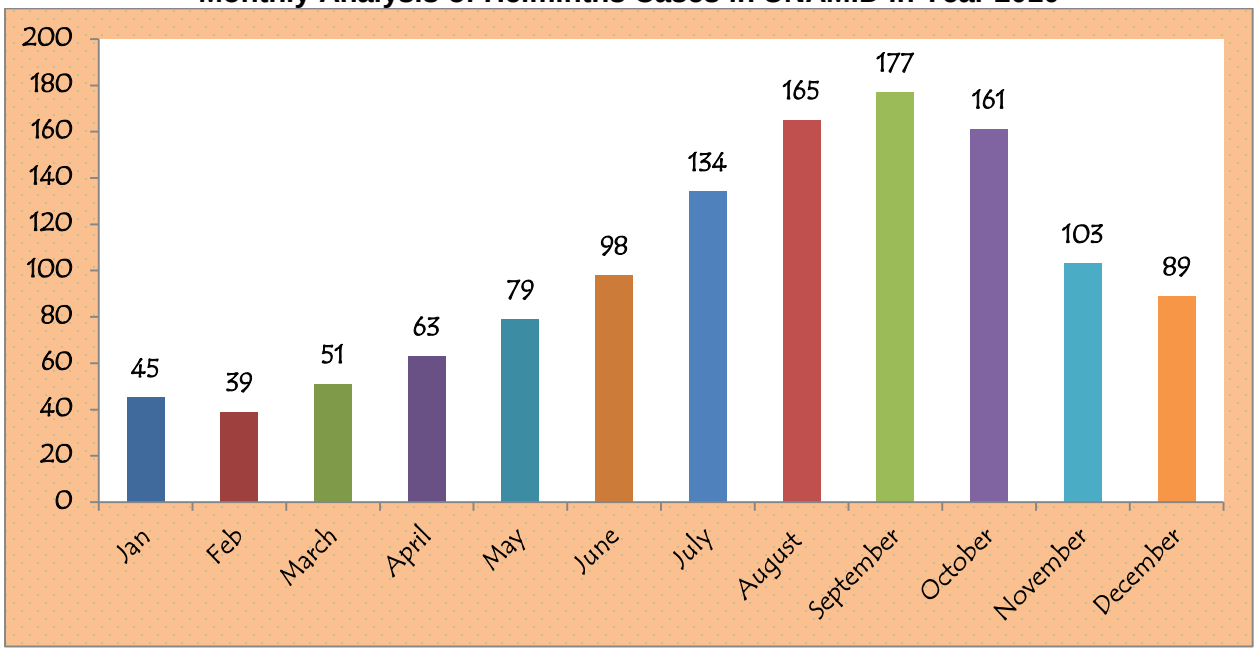
Source: Developed by author based on observation of food preparation activities by UNAMID food handlers.

EXHIBIT 2

Monthly Analysis of Gastroenteritis Cases in UNAMID in Year 2010



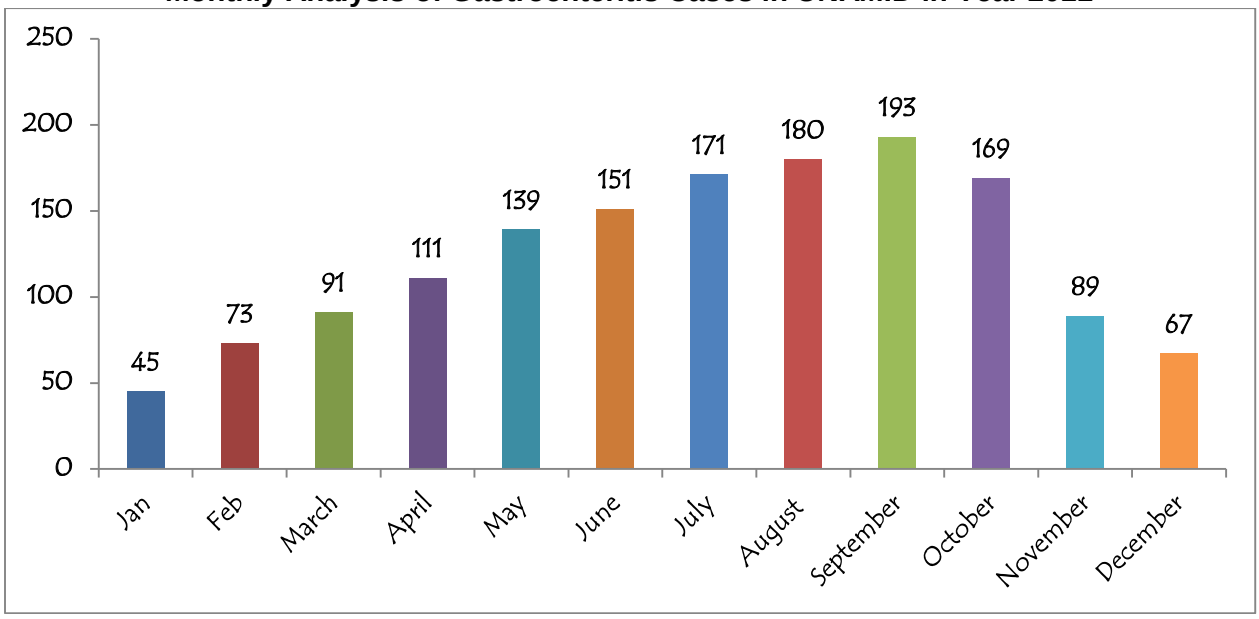
Monthly Analysis of Helminths Cases in UNAMID in Year 2010



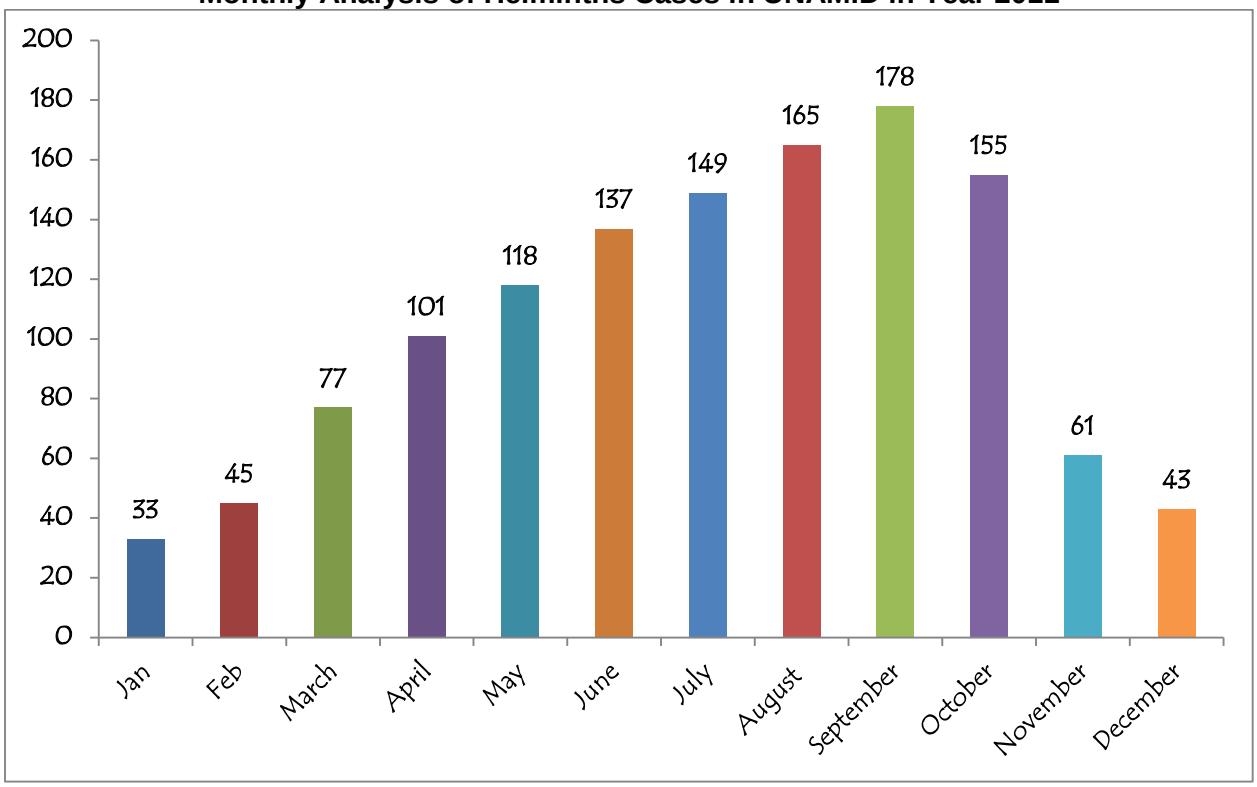
Source: Graphics developed by author based on unpublished data from UNAMID Medical Section.

EXHIBIT 3

Monthly Analysis of Gastroenteritis Cases in UNAMID in Year 2011



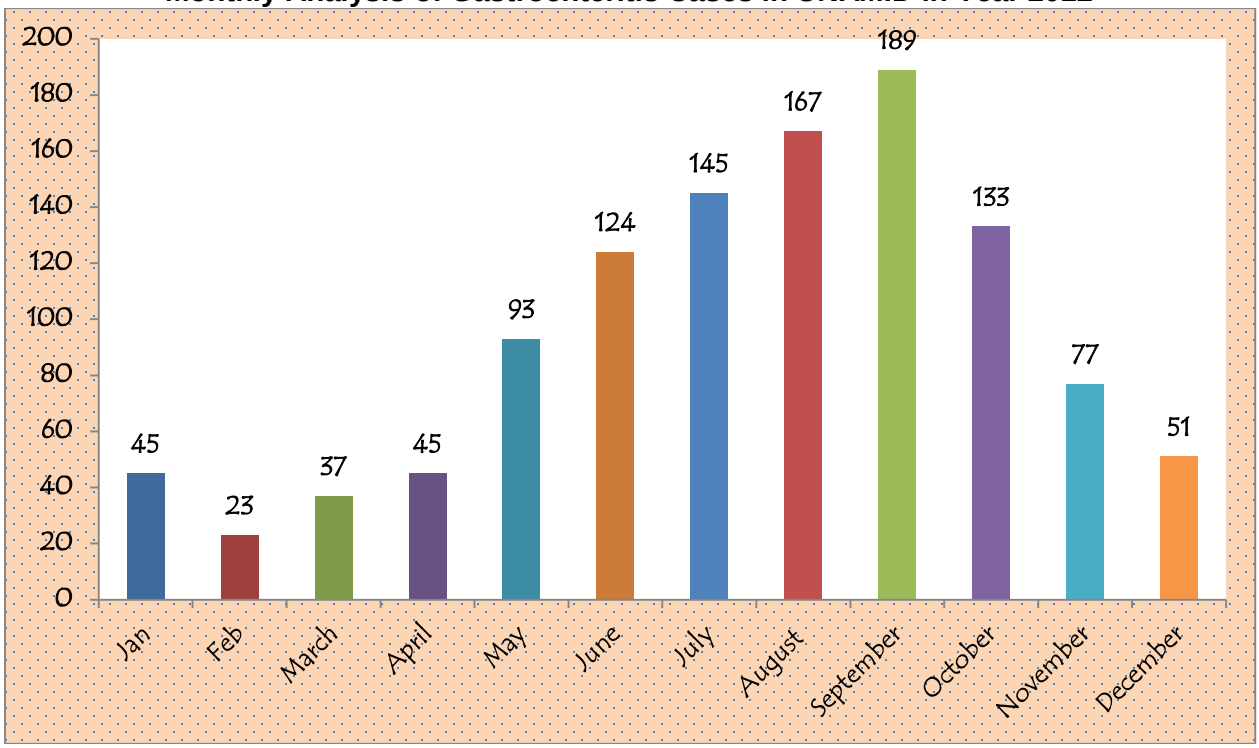
Monthly Analysis of Helminths Cases in UNAMID in Year 2011



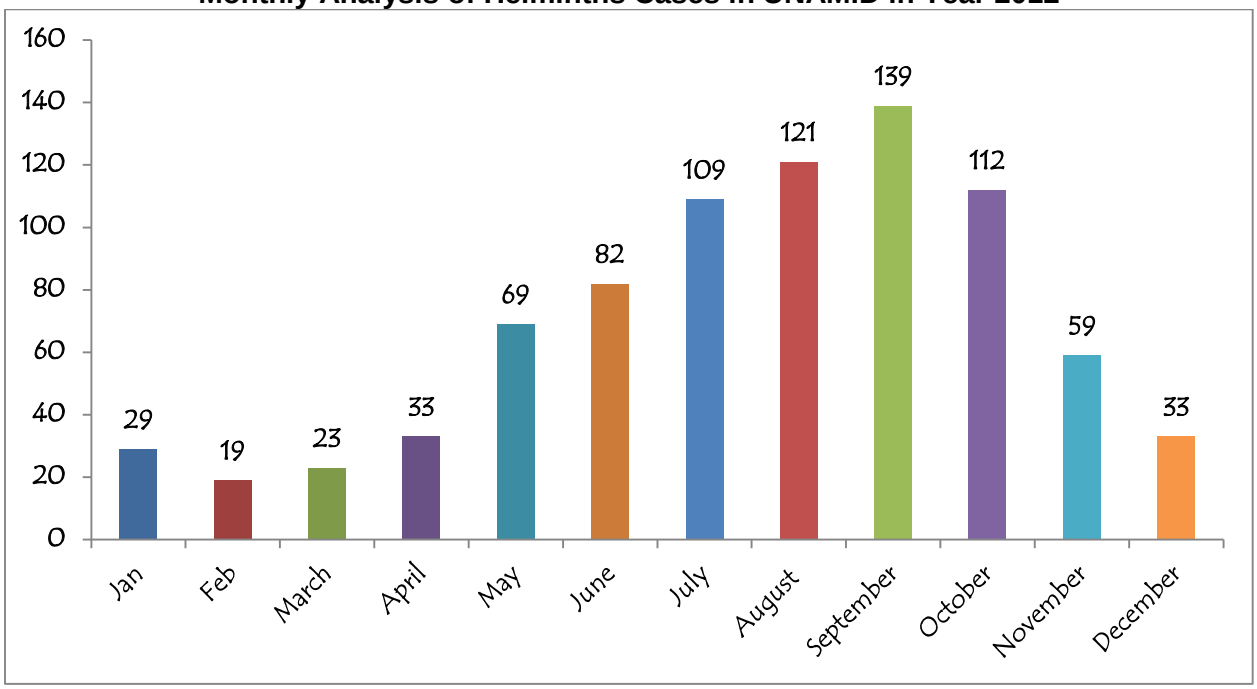
Source: Graphics developed by author based on unpublished data from UNAMID Medical Section.

EXHIBIT 4

Monthly Analysis of Gastroenteritis Cases in UNAMID in Year 2012



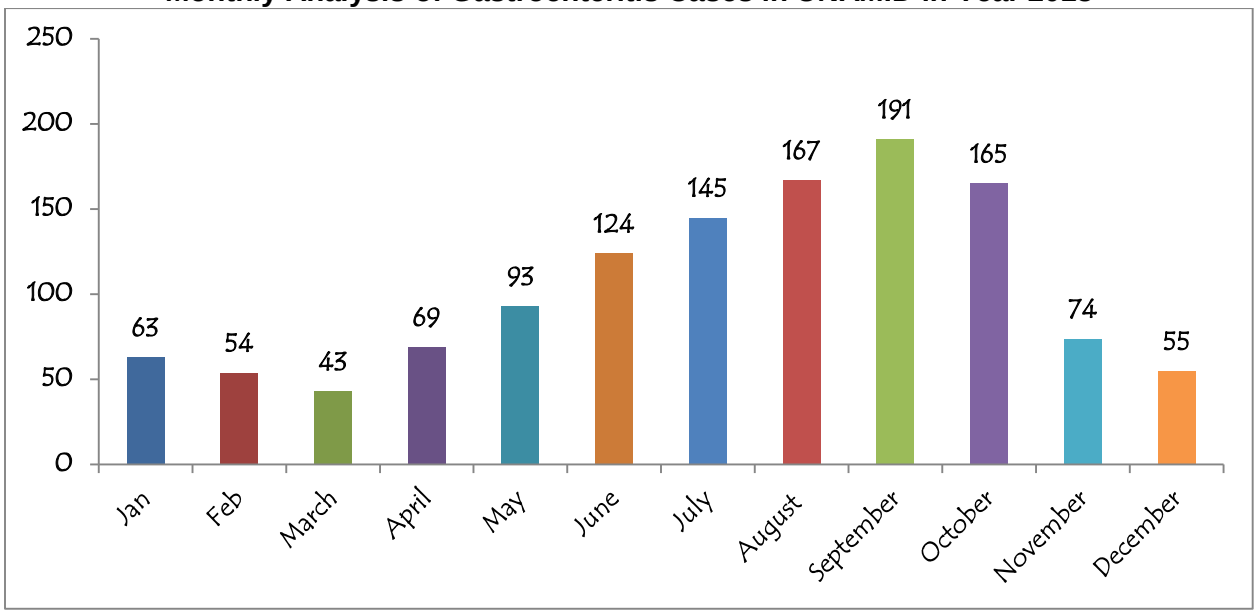
Monthly Analysis of Helminths Cases in UNAMID in Year 2012



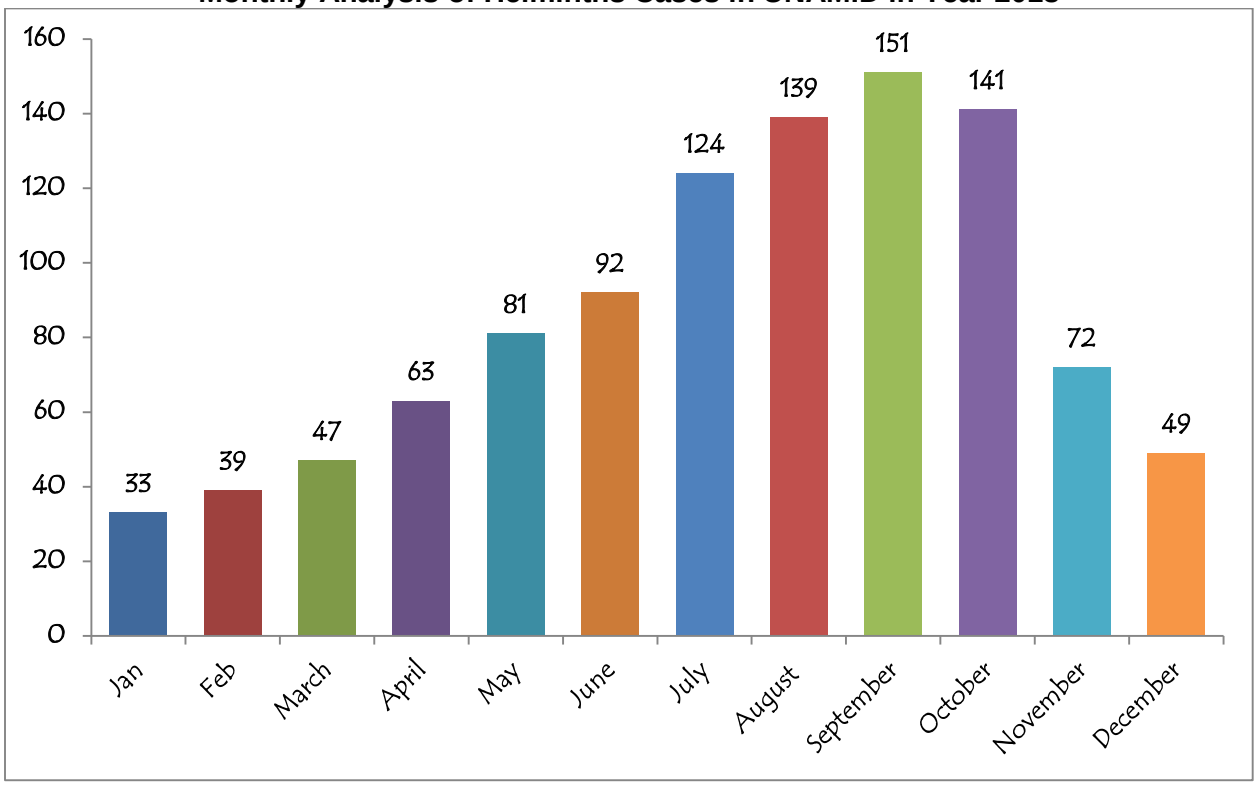
Source: Graphics developed by author based on unpublished data from UNAMID Medical Section.

EXHIBIT 5

Monthly Analysis of Gastroenteritis Cases in UNAMID in Year 2013



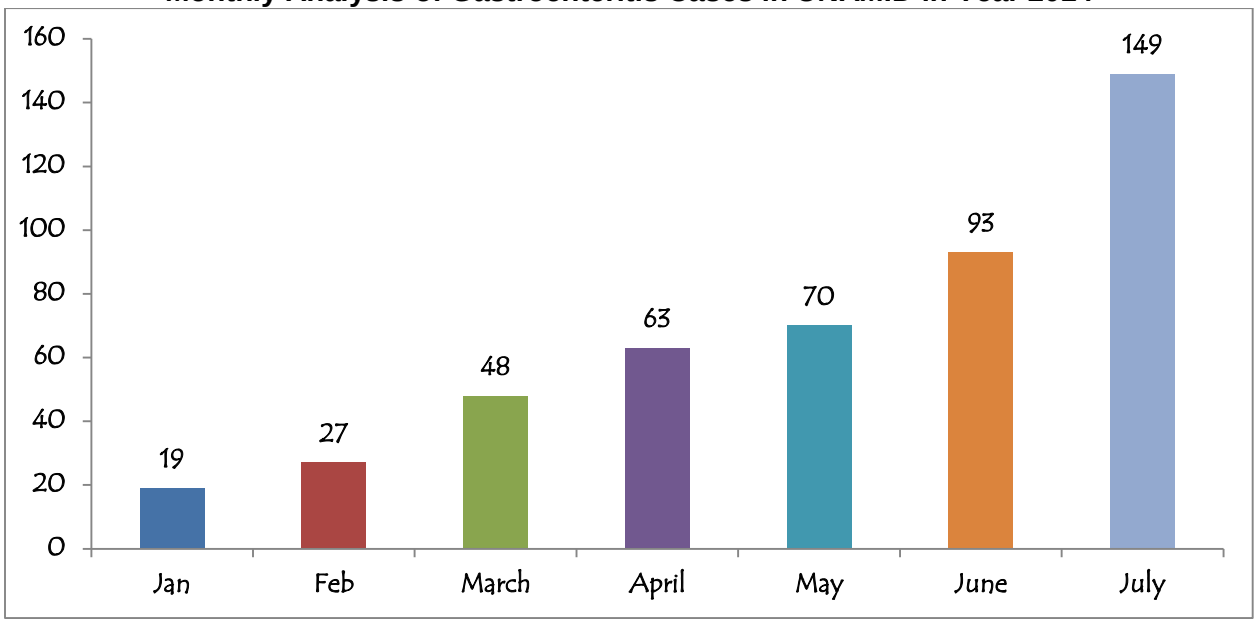
Monthly Analysis of Helminths Cases in UNAMID in Year 2013



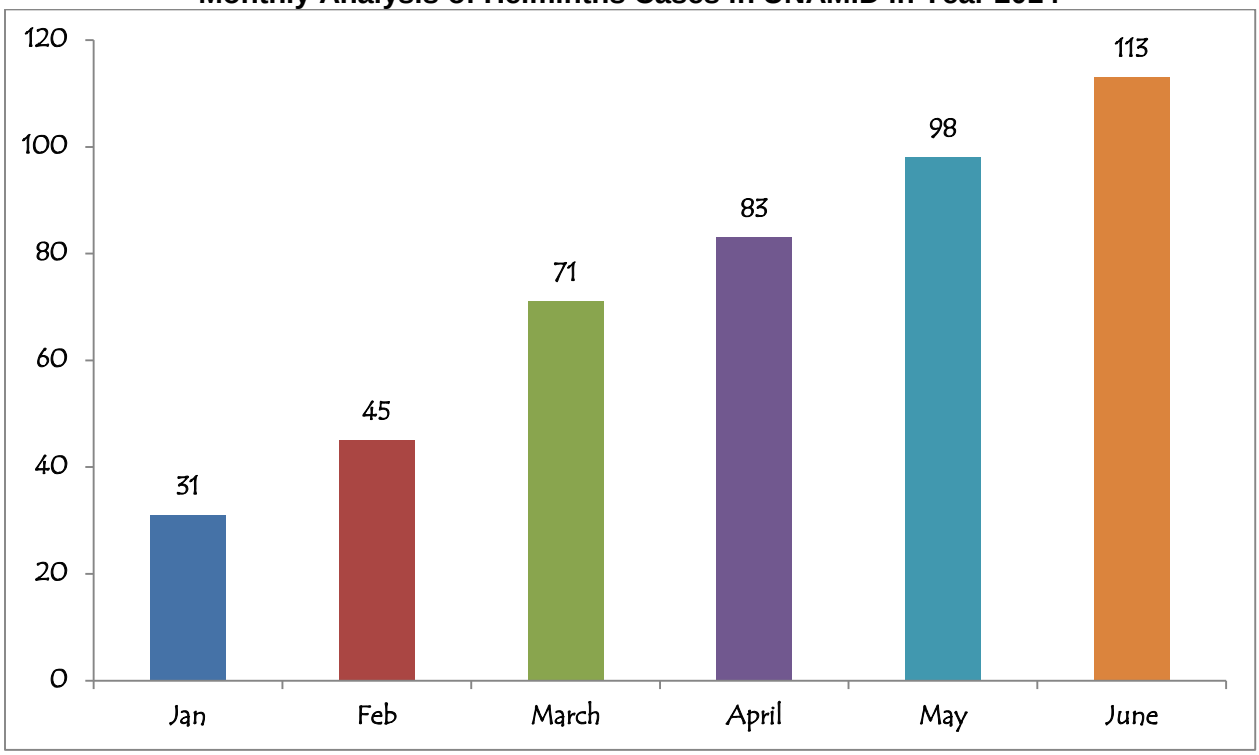
Source: Graphics developed by author based on unpublished data from UNAMID Medical Section.

EXHIBIT 6

Monthly Analysis of Gastroenteritis Cases in UNAMID in Year 2014



Monthly Analysis of Helminths Cases in UNAMID in Year 2014



Source: Graphics developed by author based on unpublished data from UNAMID Medical Section.

INSTRUCTOR GUIDANCE

Combating Food Borne Illnesses Through Safe Food Handling Practices in the United Nations/African Union Mission in Darfur (UNAMID), Sudan

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BACKGROUND

Given the statistics showing high incidence of gastro-enteritis emanating from United Nations/African Union Mission in Darfur (UNAMID), the Head of Field Medical Services (HFMS) in Darfur was directed by New York to investigate the causes, effects, and impact of food borne diseases in the mission as well as mitigating measures to curtail their spread. As a result of this development, the HFMS met with Dr. Maurice Ezeoke, Director of UNAMID Level II Hospital, and charged him to assemble and coordinate a team of experts to address the problem. Dr. Ezeoke constituted a task force on UMAMID Food Hygiene and Safety. The task force was to develop a plan of activity aimed at addressing the issue.

In Case B, the concept of safe food handling practices known as “Wholesome Food, Better Health and Business” which was subsequently introduced in UNAMID cafeterias is introduced. In spite of the support and encouragement from the mission’s management, the food safety team driving the change observed that less than 40% of the food handlers were complying fully with the dictates of the initiative. Based on identified factors for the poor uptake of the initiative, Dr. Ezeoke needed to make recommendations to the mission’s management for immediate implementation.

OBJECTIVES

1. Develop awareness about the risk factors for food borne illnesses.
2. Develop non-medical interventions to mitigate the risk factors for food borne illnesses.
3. Understand the importance of safe food handling practices in commercial catering operation.
4. Use strategic planning to drive continuous process improvement.

DISCUSSION QUESTIONS

1. What are the social, economic, cultural, and health impacts of safe food handling practices?
2. What are the steps to prevent food contamination during food handling in commercial catering operation and retail businesses?
3. What are the personal hygiene and health requirements related to food handlers?

KEYWORDS

Food safety; international; dynamic environment; food borne illness.