Non-Government Organizations and the Fight Against Ebola

Identifying the Types of Aid Most Provided by Non-Government Organizations During the 2013-2015 Ebola Crisis



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Bennett Cook

Non-Government Organizations and the Fight Against Ebola

Identifying the Types of Aid Most Provided by Non-Government Organizations During the 2013-2015 Ebola Crisis

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This senior comprehensive project has met the minimum requirements

of the Global Health Studies

major for a Bachelor of Sciences Degree

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Abstract

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Title: Non-Government Organizations and the Fight Against Ebola

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The purpose of this project is to identify what was the most given type of aid by non-government organizations (NGOs) was in response to the 2013-2015 Ebola virus outbreak in the countries of Sierra Leone, Liberia and Guinea. The types of aid were split into 20 separate categories. Data was collected on 67 NGOs who were listed on The Center for International Disaster Information's website. The actual data was retrieved from the websites and affiliate sites of the NGOs being examined. The format of the data was usually self-reported, and was in other varying formats depending on the organizations. The data was then put into a spreadsheet on Microsoft Excel for analysis. It was determined at the end of the study that providing community education to communities who were at risk of coming into contact with the virus, or who already had been affected by the virus, was the most frequently given type of aid by NGOs. Several other areas of aid that had large contributions of aid were training healthcare workers and providing personal protective equipment. Several patterns were also found within the community education data regarding how the community education was provided or supplemented. It was found that many NGOs also made use of pamphlets and radio messages to educate populations about the virus.

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Introduction: The History and Pathology of the Ebola Virus

The purpose of this comprehensive project is to examine the allocation of resources by NGOs (non-governmental organizations) during the Ebola virus disease outbreak of 2013 in the three countries of Liberia, Guinea and Sierra Leone. The management of these resources, as well as the types of aid given, play a large role in the healthcare community's current and future understanding of how to deal with pandemic diseases, as well as the effectiveness of the aid. Understanding the effectiveness of the aid is crucial to the global community, as it guides the response of NGOs, government organizations and individuals and ensures the deal with outbreaks in the most efficacious way possible (Kekulé, 2015). As is discussed later, the 2013 Ebola virus disease outbreak is a good case study when talking about aid, due to several successes in the global response, as well as failures (such as the failure of nations to send aid workers immediately, whereas in some cases it took months) (Gates, 2015). While a majority of NGOs provided just donations of raw supplies, most of the burden of dispersing the supplies and coming up with a response plan to the outbreak fell to organizations like the Red Cross or Médecins sans Frontières. These organizations focused on actually treating the sick as well as providing the public with knowledge about the current situation of the outbreak. Infection control however, was undoubtedly the most important measure taken during the outbreak, and supplies like protective equipment for doctors proved to be invaluable (Vetter, et al., 2016).

The Ebola virus disease is caused by several genuses of viruses from the *Filoviridae* family that cause similar conditions known as hemorrhagic fever in several species of mammals, but usually manifests itself most violently in humans and primates. It is a close relative of the Marburg virus, a virus with similar symptoms but one which only affects primates. Almost all

members of the *Filoviridae* family of viruses are biosafety level 4 pathogens. Biosafety levels range from one to four. A level four biosafety pathogen has several criteria, the major ones being that the disease is often fatal, there is a high risk of transmission and for which there are few if any treatments or vaccines to prevent the disease (Centers for Disease Control and Prevention, n.d.). Additionally, all the viruses in this family are indigenous to the African continent, with the exception of the *Cuevavirus* genus, and the *Reston Ebolavirus* (Kiley, et al., 1982) (Ebola Virus Disease, 2016a). The genus *Ebolavirus* has five species, four of which cause serious disease in humans. The four species that are of concern were subsequently named after the areas they first occurred in.

The most widely known is the *Zaire Ebolavirus,* one of the two strains responsible for the first outbreak, first isolated in 1976. The second is the *Sudan Ebolavirus,* first described in 1977 (Bowen et al, 1977). Third is the *Tai Forest Ebolavirus* identified in 1998 (Pringle, 1998). Fourth is the *Bundibugyo Ebolavirus*, identified in 2008 *(*Centers for Disease Control and Prevention, 2016a*) (*Kuhn, 2010*).* The fifth and final strain is the *Reston Ebolavirus*, which although not threatening to humans, caused a massive panic when a shipment of monkeys from the Philippines (*Macaca fascicularis*) arrived to a facility is Reston, Virginia in 1989. The monkeys began showing signs of Simian Hemorrhagic Fever, and began to die rapidly. However, after testing done by scientists at the U.S. Army Medical Research Institute of Infectious Diseases, it was determined the monkeys were carrying a highly infectious, and possibly airborne strain of the Ebola virus. The monkeys were euthanized and the employees were put under quarantine until it could be confirmed they did not have the virus (Centers for Disease Control and Prevention, 1989) (New York Times, 1989). Although no humans died in this outbreak, it illustrated to the public the need for caution when importing animals from infection prone areas.

The symptoms of Ebola virus disease are usually severe, and start anywhere from two to 21 days after initial infection with the virus. A problem that was encountered in many early outbreaks of Ebola virus disease was that the initial symptoms are very similar to other regionally common diseases, such as typhoid or malaria. Typically, a few days after initial infection, headaches, muscle pains, fatigue, fever, and diarrhea occur. Eventually, more aggressive symptoms begin to occur, such as loss of kidney and liver function, loss of the blood's ability to clot, and internal bleeding. This bleeding usually leads to severe damage to the internal organs, which can result in death (Centers for Disease Control and Prevention, 2014).

The virus targets many cell structures in the body, including liver cells, cells in the immune system, and endothelial cells. The glycoprotein produced by the virus once it has attacked the cell disrupts cell adhesion and permeability, which is critical for any solid structure in the body. When this process attacks blood vessel cells, the virus causes the vessels to become leaky, leading to hemorrhaging and internal bleeding. In the liver cells, the body can no longer remove toxins from the blood, and by infecting the immune system, whose cells travel everywhere in the body (Kelsey, 2014). The virus builds up in these cells that travel throughout the body, producing copies of itself until the cell bursts, releasing the virus' glycoproteins to nearby internal structures, causing them to leak. The Ebola virus targets white blood cells, destroying them and the body's ability to fight off infection. At the same time, the virus uses a similar mechanism as the HIV virus to block the immune systems signals to neutrophils, which act as alarms to rally the immune system to attack a threat (Hoenen, 2006). After the immune system is weakened, the virus spreads to other cells causing it to replicates extremely quickly, and at the time of death a person can have 1 billion copies of the virus per cubic centimeter of blood (Tam, 2014). In comparison, an untreated HIV patient can have about 50,000 to 100,000

per cubic centimeter and a person with untreated Hepatitis C can have between five and twenty million particles per cubic centimeter (Brodwin, 2014).

The Ebola virus is extremely contagious via person to person contact. It can be transmitted sexually, as well as through contact with almost all human bodily fluids, including tears and sweat, which is a relatively uncommon mode of transmission for illnesses. An effective treatment for Ebola virus disease has not yet been found, and the only treatment that is usually given is rehydration therapy and fever reducing agents, although two vaccines are currently undergoing human safety tests (World Health Organization, 2016a). Most recently, it has been discovered that a natural reservoir for the Ebola viruses is likely a species of fruit bats, and this played a large role in the 2013 outbreak (Centers for Disease Control and Prevention, 2015b). This discovery was key in our understanding of how the virus passes into certain human populations, and preventative measures can be taken to minimize the likelihood of another serious outbreak.

The virus can also remain with people who have survived for some time. A study on survivors of the disease in Freetown, Sierra Leone, determined that the disease can persist in semen for up to 9 months (WHO Ebola Response Team, 2014). The actual virus on its own, similar to other viruses, can only survive a few hours outside of a fluid or host, but it can remain active in fluids for several days at room temperature (Centers for Disease Control and Prevention, 2015a).

The first emergence of the Ebola virus disease was first documented during an outbreak of the disease in what is now the Democratic Republic of the Congo in 1976. At the Yambuku Missionary hospital in the northern area of the region, a 44 year old patient was admitted on September 1 who was showing severe symptoms that were characteristic of malaria. An

important detail that emerged later in the investigation was that the subject had purchased bushmeat about a week earlier. The practice of eating the scavenged carcasses of dead animals, known as bushmeat, has since been thought to be the cause of many cases of the disease when the meat is that of a primate, as they also harbor the pathogen. The patient received several injections to help combat his symptoms, which only became progressively worse. The needles were not properly sterilized and were then used to treat other patients, which allowed the disease to spread rapidly. Many patients at the hospital began to contract sore throats and rashes, which was followed by headaches and vomiting. This usually culminated in severe internal bleeding, usually in the gastronomical area. Soon after, the disease spread to the missionary hospitals staff, killing 11 of the 17 personnel within a month (World Health Organization, 1978).

The hospital was then closed, but by this time it was too late, and the virus had spread to the capital city of Kinshasa. This resulted in the government quarantining many areas and patients, and a month later an international commission was formed to investigate the emergence of this unknown, highly contagious, and lethal pathogen. By this point the disease had spread to several villages in Sudan, and although the international teams were able to isolate samples of the virus from the blood and liver of surviving and afflicted patients, an etiology of the disease could not be found. The outbreak was officially declared over in December of 1977, but many questions about the disease remained. At the end of the seven-week outbreak 318 probable cases of Ebola infection were recorded, with 280 deaths. This added up to a fatality rate of 88% in the DRC and a 53% fatality rate in Sudan, making it one of the deadliest outbreaks of Ebola virus disease on record, and at the time, the highest untreated mortality rate of any disease besides rabies (World Health Organization, 1978).

Three years later in 1980, the Ebola virus disease struck in southern Sudan again in Nzara, one of the villages where the previous outbreak had spread to. In August, a man was admitted to the hospital with a high fever and was not given precautionary isolation treatment. Days later he developed the characteristic gastrointestinal bleeding. His family soon after contracted the disease and died. Shortly after, another family contracted the disease. The next month the village they resided in was quarantined, and the WHO began an area surveillance program to try and isolate the disease. The outbreak was over quickly, but not before 34 people were infected and 22 had died, which indicated the disease had a 65% mortality. Again, the initial cause of the outbreak at the time was unclear but due to studies done by the Sudanese government and the WHO a very important detail was confirmed: the disease very likely not airborne. This was confirmed by observing that people in close proximity to the victims who did not have physical contact with the victim did not contract the disease (Baron, 1983).

After the outbreak of 1980, there was over a decade before the disease would emerge again, but it did in Gabon in 1994 in December. In the Taï National Rainforest, the disease struck 33 people who were spread out at three gold panning encampments near the edge of the forest. All of the afflicted persons went to a hospital in Makokou. The hospital was poorly equipped and treated the infections as yellow fever. In the next month 16 more cases were reported from people in the surrounding areas who likely contracted the disease from a portion of the initial 33 who were infected, but left the hospital against the doctor's advice. By the time the Centre International de Recherches Médicales de Franceville (CIRMF), a medical organization operating in Gabon, had assembled a team to investigate the outbreak, many of the villagers had fled the area in fear, as they had heard about the deadly virus. By March, 49 people had contracted the virus, and 29 had died, indicating a 59% mortality. The outbreak was officially

declared over in February of 1996 by the Gabonese government, but this was not the case. Months later in the spring of 1996, 18 people who skinned a chimpanzee that was found dead became extremely ill, and the village chief decided to send them to the hospital in Makokou. Four of the patients died within 48 hours. These bodies were returned to the village for burial, but safety precautions were not used and two people who handled the bodies contracted the virus. In this instance, 31 people were infected, and 21 died, with a case fatality ratio of 67%. From October to August, several hunters from a logging camp in the Taï Rainforest died with symptoms that matched the description of the virus. Many chimpanzees were also found dead, and samples from one tested positive for a new strain of the Ebola virus. In this final instance, many of the sick fled the medical personnel and sought the advice of spiritual healers, believing the hospitals could not help them. Unfortunately, this likely spread the disease further and by the end of the outbreak in the hunter's camps, 60 cases had been reported with 49 deaths, producing a mortality of 75%. In the 1995-96 Gabon outbreaks, the consuming of bushmeat was widely attributed by health organizations to be the cause of the epidemic (Georges, 1991).

At this same time in 1995, another outbreak of Ebola virus disease hit the DRC. This outbreak was especially difficult to track and control due to political unrest within the country. Infrastructure was poor, and health services were very lacking. This was due to frequent political unrest and cuts to many facets of the economy in order to facilitate higher military spending. This outbreak was different from the rest though, as it captured the world's attention through the media (Heymann, 1999). The outbreak occurred after a 36 year old man underwent an operation for a perforated bowel. The physicians noted he had unusually large amounts of internal hemorrhaging and he soon passed away due to complications related to the hemorrhaging. Four days later, all the medical personnel who had attended to him became seriously ill. It was later

noted that latex gloves and sterilizing fluid were in short supply and many not have been used. In May, the CDC confirmed based on samples that it had received, that this outbreak in the DRC was indeed the Ebola virus disease. Immediately afterwards all health facilities in Kikwit were closed and all people believed to have been exposed were put into quarantine. However, because of lack of food and running water, many of the doctors and patients fled the quarantine zone and the city. The government requested immediate international aid and a team was formed of experts from the DRC, WHO, CDC, Institute of Tropical Medicine, Médecins sans Frontières (Belgium), South African Medical Institute, Red Cross, Institut Pasteur (Paris), and Sweden. By this time, it was largely to late, and at the end of the year 317 people had been infected and 245 people had died. This produced a mortality of 81%, making it the second most deadly outbreak at the time, besides the initial outbreak of 1976 (Muyembe- Tamfum, 1999).

Similar to the previous outbreaks, a long period of three years passed with no reports of the Ebola virus disease, but then in October in the year 2000, the disease reemerged in Uganda, and became the second most widespread outbreak of Ebola virus disease in history. On October 8, the Ministry of Health in Uganda received word of a rash of cases involving symptoms similar to the Ebola virus disease in the Gulu district. By this time much of the African continent was actively monitoring all cases with Ebola virus like symptoms to try and prevent another outbreak. By the time the report was made 12 people had died, and all of them had attended a traditional funeral for someone who had died who had Ebola virus like symptoms. All of them had come into contact with the body. A team was dispatched four days later by the Ministry of Health to collect samples, and within days it was confirmed to be the *Sudan Ebolavirus*.

The WHO and CDC were immediately notified, and they began a lengthy ground campaign which focused on educating the public about the spread of the disease through radio,

pamphlets, and posters, as well as public speakers. They also trained "scouts" to travel to each village in the surrounding areas and to report back daily with any information about a possible infection. The WHO also set up isolation wards in cities, as well as field laboratories to test for the virus. The government of Uganda also set up several major task forces to deal with the epidemic, the National Task Force, the District Task Force, and the Interministerial Task Force. The Interministerial handled social and international relations in relation to the outbreak, while the other two forces implemented programs directly (Okware, et al., 2002). However, the disease spread quickly, and by the end of the epidemic 195 cases had been lab confirmed. Four hundred and twenty five were suspected, of these cases 224 died, producing a mortality of 53%. However, it has been concluded the campaigns by the Ugandan government and by international forces were highly effective in disseminating information, and that if they had not responded in a timely manner, the outbreak would have been much worse (Okware et al, 2002).

After this outbreak, sporadic outbreaks occurred throughout the 2000s, with at least one outbreak being reported every year except 2005, 2006, 2010, and 2011 (Centers for Disease Control and Prevention, 2016b). On December 30, 2013, it was reported that there had been a death of a two year old child due to Ebola virus disease in Guéckédou, a town in Guinea close to the borders of Sierra Leone and Liberia (World Health Organization, 2016b). In the following month, another case was reported in Macenta. By the 22nd of March, 59 people had died of the disease in Guinea alone, and cases were beginning to be reported in Liberia (National Broadcasting Company, 2014) (Briand, 2014). Alarmed at the sudden spike in cases, the government of Guinea appealed to Doctors Without Borders (DWB) for aid. DWB had been working in Guinea already on the prevention of HIV and malaria, but quickly switched focus, and declared the cases of Ebola virus disease to be an epidemic. By the 24th of March DWB had

sent 33 tons of medical supplies to Guinea, in anticipation for the coming epidemic (Médecins Sans Frontières, 2014). However, as the months dragged on and the death toll skyrocketed, DWB found it harder to deliver aid as countries shut down borders, and superstitions that they themselves were spreading the disease made it too dangerous for them to operate with certain areas. Many citizens would actually flee at the sight of their vehicles, and sometimes would resort to violence to drive them away (Nossiter, 2014) (British Broadcasting Corporation, 2016). By the end of March, 71 people had died in Guinea, and the Red Cross, CDC, and DWB had begun the familiar practice of promoting public awareness within Guinea, as well as setting up isolation centers for the infected in Guéckédou (Centers for Disease Control and Prevention, 2016c).

At the beginning of May, the WHO announced that 239 people had been infected, and 169 people had died as a result of the virus, making it one of the worst Ebola virus disease outbreaks on record in only a few months (World Health Organization, 2015). In June, Sierra Leone closed its borders with it's neighboring countries, as well as many schools across the nation, and deployed the national guard to help with quarantine and border patrolling efforts (Fofana, 2014). Despite warnings from doctors without borders, the WHO still had not declared it a public health emergency of international concern, which prompted much criticism later as to why they did not take the outbreak more seriously. In August of 2014, doctor Kent Brantly, an American working in Liberia, contracted the disease and was evacuated to Atlanta in the United States for treatment (American Broadcasting Company, 2014). By this point an infected man had flown to Nigeria, and had died in quarantine, and may have spread the virus. This led to fears in the United States that the returning health workers might spread the deadly virus. However, the doctor and another American who was flown back for treatment received an experimental

treatment for the disease, as they knew there were no alternatives. The drug, Zmapp, was found to have improved their condition, but it was not yet ready for mass production, nor had it had any official human trials (Dennis & Bernstein, 2014). On August 8th, shortly after a second American health worker had contracted the virus, the WHO declared the pandemic to be a public health emergency of international concern. Afterwards the virus began appearing much more frequently.

By mid-2014, hundreds of new cases a week were being reported in the countries of Guinea, Liberia and Sierra Leone. On January 14, 2016, the WHO declared the pandemic to be officially over, and that no new cases had been reported for 42 days (World Health Organization, 2016c). The death toll was staggering. Over 11,000 people had died, tens of thousands more had been displaced, and over 28,000 cases had been reported. Foreigners who had travelled to the affected countries spread the virus to several countries outside of the African continent, but luckily they were quarantined, and the virus did not spread (British Broadcasting Corporation, 2016) (World Health Organization 2016b).

Vaccines also bring with them concerns about the ethics of experimental medicine. The first experimental treatment with the early stage vaccine was given to two United States citizens who had become infected with the virus and were evacuated to the United States for treatment. This presented two issues which generated a great deal of discussion. The first issue was whether the infected Americans should have been brought back at all, as many feared the virus could escape quarantine and start an outbreak within the United States. The second issue was over who should receive the experimental treatments first, whether or not it was ethical to test the experimental vaccines on human beings, and why was it not offered to critically ill people in the three affected countries in Africa (Kass, 2014). Although the WHO issued a statement in which

it advocated the use of the experimental vaccines in Africa under certain conditions, the response from the aid workers on the ground have been mixed. This is because there is already a great deal of animosity between locals and foreign healthcare workers. If the vaccines fail to be as effective as thought or if they cause dangerous side effects, it could enlarge the growing rift in the trust of the locals toward the international aid efforts (Hoenen & Feldman, 2014).

Despite the tremendous amount of aid pledged by the world to help fight the Ebola outbreak, there were many problems actually distributing aid supplies or treating patients due to several issues. The most important of these issues is that at the time of the outbreak the medical and political infrastructure in the three affected countries was unstable, leading to many miscommunications and errors. Liberia was recovering from a civil war, and critical healthcare funding had been redirected to military spending in order to keep the peace. At the height of the outbreak there were only 30 trained Liberian medical personnel to serve over six million people (Southall, DeYoung & Harris, 2017). Funds were also misappropriated by the government and it became very difficult to trace where exactly aid went to once it was on the ground, especially monetary contributions. In one incidence, an audit of Sierra Leone's Ebola fund showed that the government had misplaced or lost millions of dollars' worth of aid, with no way to clearly trace where the money went. Even after this audit, only 34% of the recommendations to fix the problems so this could not happen again were not implemented (Audit Service of Sierra Leone, 2014). Many of the missing money was not authorized to be spent, or was spent to pay hazard pay to individuals who were assisting in dangerous work involving infected persons.

Although the local country's governments mismanaged funds and aid, the international organizations had problems as well. Many organizations and even governments (such as the United States) pledged large amounts of monetary aid, but by the end of the outbreak, many

organizations and nations had not delivered the full amounts promised. At the end of the outbreak, 2.89 billion USD had been pledged, but only about a third of the aid actually reached the countries it was pledged to (Grepin, 2015). Aid was also not evenly dispersed. In one report it was found that the amount of aid available to each person with Ebola virus disease in Liberia was $110,000 USD, whereas in Guinea each case only received $86,000 USD per case and the cases in Sierra Leone had $49,000 USD per case (Grepin, 2015). This highlights the important question/issue of which country needed aid the most, and whether it was ethical to deny equal amounts of donations to these countries.

The goal of this study was to look at what were the largest areas of aid provided by NGOs. NGO's were picked to study for several reasons. The first is the diversity of the aid they supply as a whole, as some are very specifically oriented towards a certain goal while others may not have a goal at all and may be responding to a general request for aid by governmental organizations. The second is that NGOs are often underwhelmingly reported in the news when it comes to relief efforts (although there are exceptions for the bigger organizations), especially when compared against large governmental and national organizations like the WHO, CDC and the UN. They come up with innovative responses to crisis that government channels often overlook. NGOs have opportunities to assist in outbreaks and in other disasters by giving large donations of supplies, liquid cash and sometimes even personnel to agencies working on the ground. They can also provide support on the ground by teaching communities about specific needs when responding to a disaster, and assisting local governments develop framework for more coordinated responses (Tambo, 2014).

Methods

Procedure:

The type of aid each organization provided (according to the best available public data) was entered into a spreadsheet which covered 20 different areas important to aid (See Appendix A). These areas were chosen after a review of all the organizations on the Center for International Disaster (CIDI) website's list and the types of aid they provided. Aid was defined as services or items provided to the Ebola relief effort. The areas are listed here: Sanitation supplies donated, provided training for workers/responders, provided personal protective equipment (abbreviated as PPE), broadcasted radio messages with information regarding the virus, established handwashing/sanitation stations, established aid centers, donated food, provided survival kits/first aid kits, "gifts"/other (this category is for donations whose descriptions did not fit the other categories, or were too vague to be specifically categorized), directly assisting government organizations, donated miscellaneous medical supplies, provided counselling to those impacted by the outbreak, provided educational services to individuals and communities affected by the outbreak, distributed pamphlets with information regarding the virus, provided vehicles to aid in responders efforts to combat the outbreak, provided computers to aid centers or to places in need, provided phones/communication services, provided beds, provided solar panels, and provided direct aid/medical services to the infected (See Appendix A). These categories were chosen after an examination of the literature surrounding the global response to the Ebola outbreak, which highlighted which types of aid proved to be most essential, and which a majority of NGOs and government organizations provided.

The information was initially put into a 20 column x 67 row chart for analysis. The rows represented the organizations and all the columns except the first represented the types of aid given. The organizations were arranged down the first column in mostly alphabetical order. The results were then grouped into different tables for further analysis. The results from each column were tallied to show which areas of aid had a larger number of contributions from the listed NGOs, and which had less (See Appendix A). From here, three separate data sheets were made. One was for the original purpose of showing which areas of aid had the largest contributions from NGOs. The second data sheet showed the amount of different kinds of aid that each individual organization from the list had given. This data sheet was a 2 column x 67 row spreadsheet. The results were then put into a bar graph. This bar graph was not used and discarded after revisions were made.

The third data sheet showed data on the diversity of the NGO's contributions as a whole and what percentage of them as a group gave more varied types of aid. This also showed which organizations were more focused on a single area, or only contributed to one area. This was done by seeing which organizations only helped in one criteria, then which in two criteria, then three etc. And then summing the organizations. The data was put into a 2 x 11 data sheet, and then into a sideways bar graph. Initially it was possible to have a 2 x 20 chart, but no organizations (0%) had more than 11 areas of aid, so the chart was cut off at 11. This data and graph were also not utilized in the final paper. Instead three separate charts were made.

These three charts split the organizations into three sections based on the amount of aid they provided (types). The first was a 2 x 39 chart which represented all organizations who gave one to four types of aid. The second was a 2 x 23 chart representing the organizations who gave five to eight types of aid. The third was a 2 x5 chart representing the organizations who gave

nine to twelve types of aid. The limit of 12 was set because the highest number measured was 11 and because fitting all the organizations onto one graph was not feasible.

An additional graph was made to look at combined areas of aid as it related to community education. Data was analyzed in a 2 x 3 chart. The first row was for organizations who provided community education, and sent out radio messages. The second row was for organizations that provided community education and disseminated pamphlets. The third row was for organizations that provided community education while also disseminating pamphlets and utilizing radio messages.

Data Points:

The 67 organizations that were the subjects of focus in this study were all listed by The Center for International Disaster Information on their website. All data pertaining to these organizations was retrieved from their websites, or websites of affiliated organizations, and rarely outside news organizations, in a self-reported format. If full data could not be retrieved from the direct link from the CITI site to the organization's link or from using search functions within the organization's site, a number of search terms were used in Google. These terms were the following: "[organization's name] Ebola"; "[organization's name] Ebola response"; "[organization's name] Ebola aid"; "[organization's name] Ebola updates"; "[organization's name] Ebola contribution"; "[acronym for organization] Ebola"; "[acronym for organization] Ebola response"; "[acronym for organization] Ebola aid"; "[acronym for organization] Ebola updates". A majority of the data was from the site of the organization directly or from affiliate sites. When searching for the information, as many affiliate sites were checked as possible up to 10. If all the information on the pages pointed to the same data, only the first website (the official website of the NGO) was cited. The format of the data collected from the sites varied from

graphs and statistics with actual numbers to press releases where only the type of aid provided was identified. In some instances, data was collected from digital media released by the organization on Youtube.com. Information from non-affiliate sites was only used when the original organization did not provide enough data, or if their page pertaining to Ebola had been deleted or altered to the point where no such data existed. All data was finished before December 21, 2016.

Results

The final compiled data showed that providing community education, providing personal protective equipment, and training workers were the common types of aid given (Figure 1). These were the only three types that 30 or more organizations out of the 67 provided. Providing beds, solar panels and computers were the three least provided types of aid, with all having two or less organizations providing them.

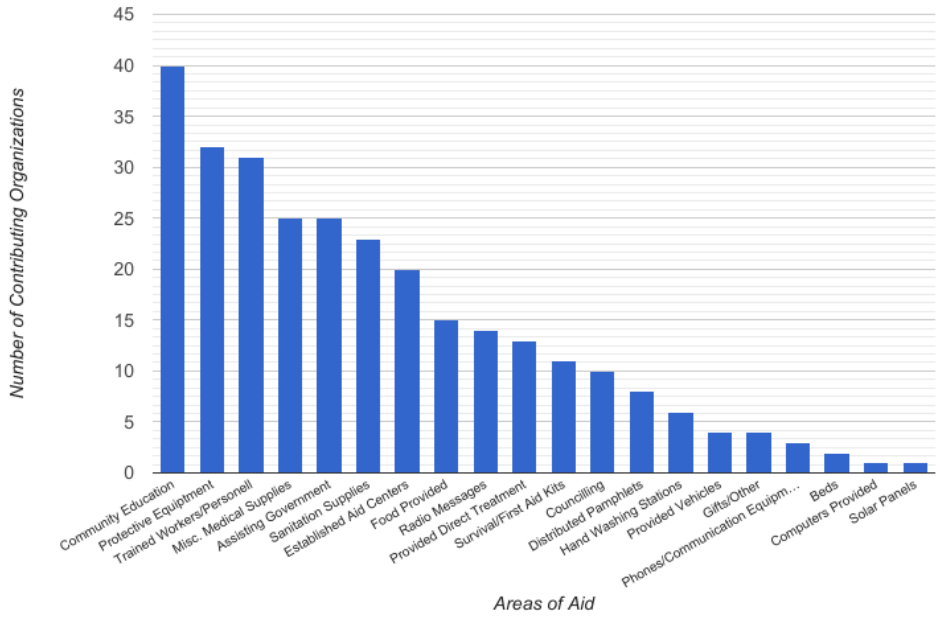


Figure 1. Total amount of types of aid provided by all non-government organizations. Ranked from highest to lowest (See Appendix A).

As figure 1 shows, 40 of the organizations provided some level of community education (59%). Thirty-two of the organizations provided protective equipment (47%). Thirty-one of the organizations provided healthcare/worker training (46%). Twenty-five of the organizations provided miscellaneous medical supplies (37%). Twenty-five of the organizations assisted governmental organizations directly (37%). Twenty-three of the organizations provided sanitation supplies (34%). Twenty of the organizations established aid centers (29%). Fifteen of the organizations donated food supplies (22%). Fourteen of the organizations sent out radio messages regarding the virus (20%). Thirteen of the organizations provided direct treatment to the infected (19%). Eleven of the organizations donated first aid/survival kits (16%). Ten of the organizations provided counselling to survivors (14%). Eight of the organizations distributed pamphlets with information regarding the virus (11%). Six of the organizations established hand

washing stations (8%). Four of the organizations provided vehicles (5%). Four of the organizations provided miscellaneous gifts or other types of aid that did not fall into the other criteria categories (5%). Three of the organizations provided phones or other communication equipment (4%). Two of the organizations provided beds (2%). One organization provided computers (1%). One organization provided solar panels (1%).

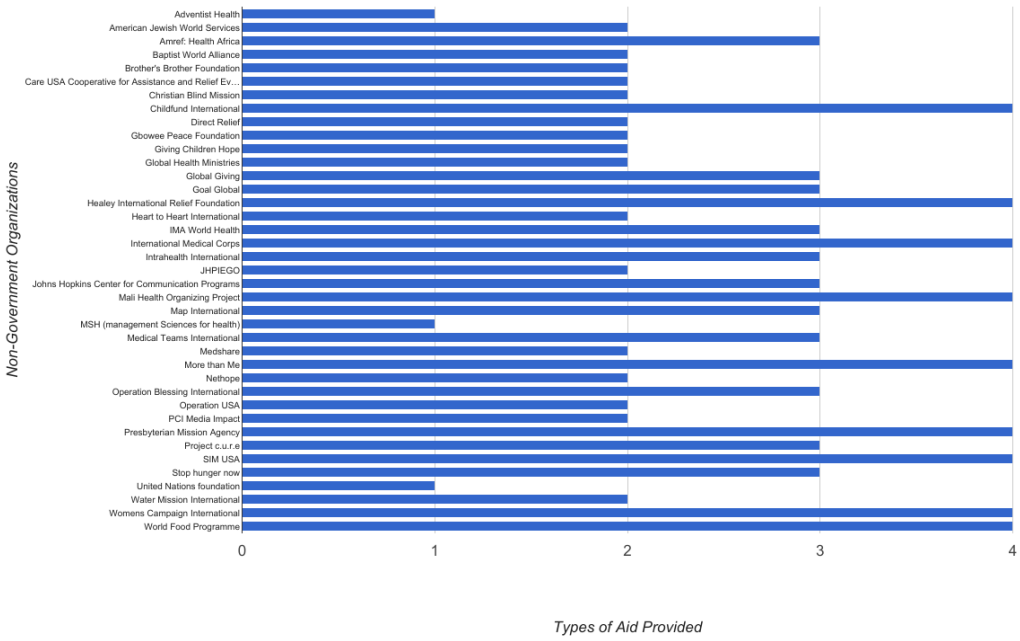


Figure 2. All organizations who contributed one to four types of aid to the Ebola outbreak.

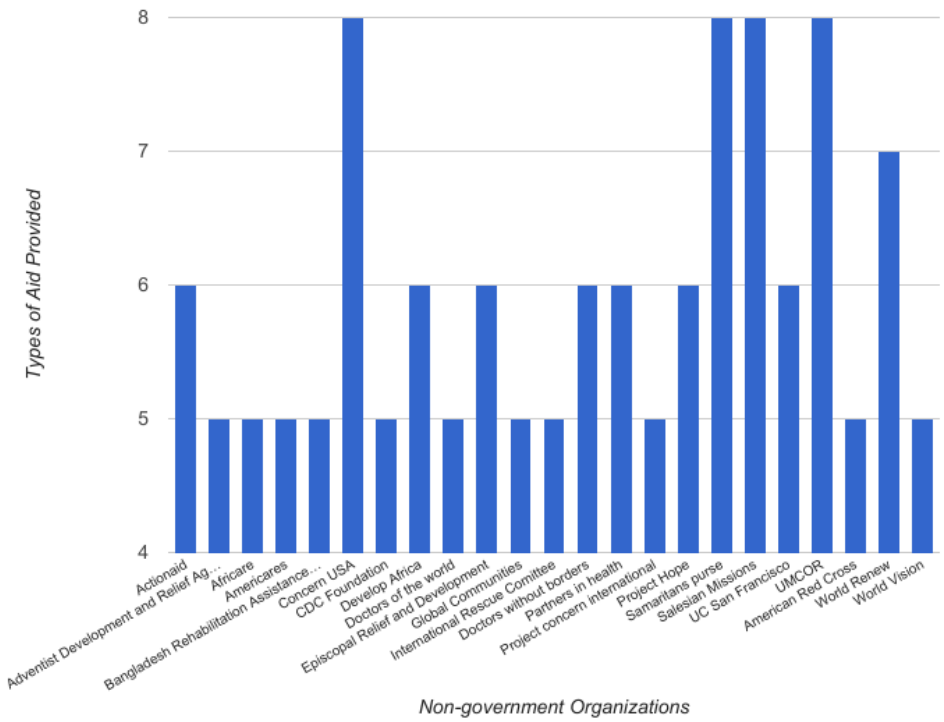


Figure 3. Showing all organizations who gave four to eight different types of aid.

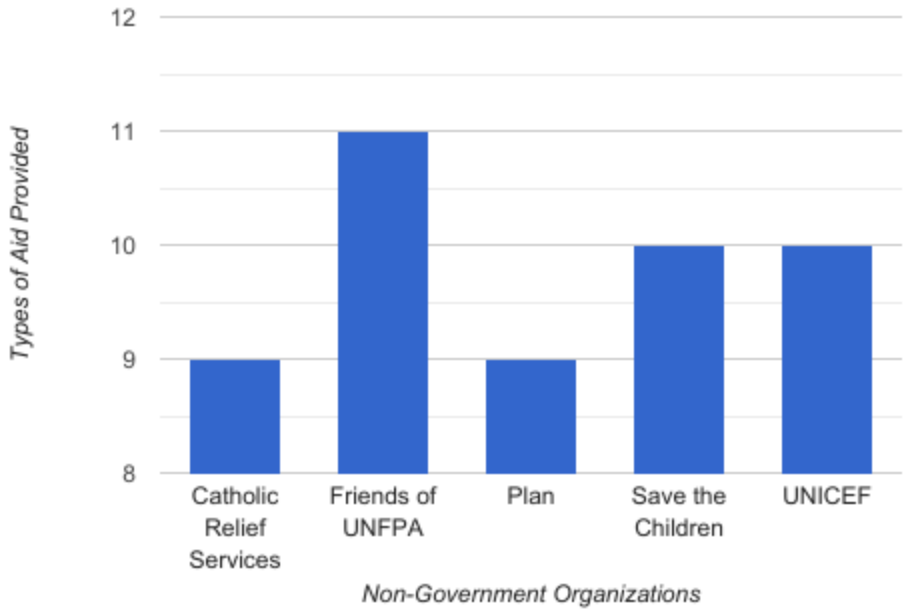


Figure 4. Showing all organizations who provided 8-12 different types of aid.

A majority of organizations in the study fell into the lowest of the three sections of aid (1-4) with 58% of organizations meeting the criteria (fig. 2). The second highest concentration of organizations was in the five to eight bracket, with 34% of the organizations meeting these criteria (fig. 3). The least populated bracket was the last (9-12) with only 7% of organizations meeting the criteria (fig 4).

The highest possible variety of aid contribution number in this study was 20. This is because there was 20 categories of aid possible. The largest number for diversity of aid was 11, which was from the Friends of UNFPA organization (Fig. 4). The lowest number of one was attributed to three organizations: The Adventist Health organization; Management Sciences for Health; and the United Nations Foundation (Fig.2).

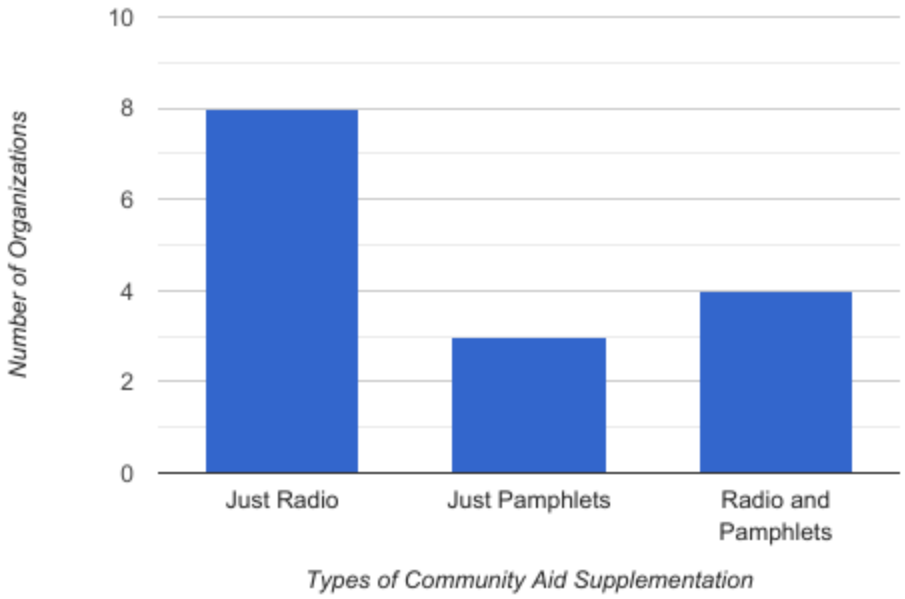


Figure 5. Showing which organizations provided community education and also utilized radio messages exclusively, pamphlets exclusively, or both.

When looking at community education, 20% (8) of organizations who provided community education also utilized radio messages, but did not use pamphlets. 7% (3) of the organizations that provided community education distributed pamphlets, but did not use radio messages. 10% (4) of organizations that provided community education utilized both radio messages and pamphlets to disseminate information (fig. 5). Overall 37% of community education providing organizations supplemented their direct community education efforts with either radio messages, pamphlets or both. The actual significance of the means by which the organizations provided community education was not assessed in this study.

It was also found that 26% (18) of the organizations assessed were found to be faith based.

Discussion

The types of aid and the amount of aid given by each of the 67 NGOs varied greatly. Although three organizations provided only one type of aid, this is attributable to the nature of these organizations. An example would be the UN Foundation, whose only function was to collect monetary donations and funnel them into UN affiliate agencies and the WHO. The Management Sciences for Health organization was mainly a planning organization who aided the local government as well as health workers build a framework for response, and put forth many plans to be implemented, but did not directly implement the plans they put forth. The Adventist Health Organization was part of a larger network of Adventist groups and similarly to the UN Foundation it collected donations to go towards its parent organizations.

The organizations in the top third of aid variety are very large and well-staffed, with two of them being directly backed by the United Nations (Friends of UNFPA and UNICEF). The others are some of the largest NGO international aid organizations in the world. The Catholic Relief Services organization is a large catholic organization that gives aid to over 130 million people worldwide and has a budget of over $700 million (USD) (Catholic Relief Services, 2015). Plan International is one of the largest organizations dealing with children in the worst with a budget that surpasses 600 million euros (PLAN International, 2016). Save the Children is another organization specializing in children whose annual revenue is around $2.1 billion (USD) (Save the Children, 2015). With impressive backings and budgets like these, it is expected that these organizations would be in the top bracket.

The data collected showed that community education was the most provided type of aid. As discussed in the introduction, the level of mistrust toward foreign aid and healthcare workers

was extremely high, and grew higher as the outbreaks scope widened. This was fueled by the lack of results in the people who were undergoing treatment, as well as the fact that the virus continued to infect new communities and patients despite the efforts of the local and international governments. The next logical step for many NGOs was to enlist locals who still trusted the scientific communities approach to the virus to educate others within their community, as the local populations would be much more likely to trust one of their own. The NGOs also enlisted the help of local leaders (especially high ranking religious or town officials) to spread the message to the communities they presided over.

Community education also helped curb the immense fear the virus brought with it, as the education programs in many cases were fighting to dispel popular misconceptions about the disease, especially regarding transmission and symptoms of infection. By educating the communities on the correct information regarding the virus, this could lead to an increase in the validity of reported cases, as well as leading to more cases being reported to health workers overall. With a disease like Ebola, the importance of reporting an infected person as soon as the symptoms appear cannot be understated, as quarantine efforts and treatment can begin earlier which can save many lives.

Proper burial techniques are also an essential part of educating the communities. As mentioned in the introduction, many cases of Ebola virus have been linked to improper burial techniques and handling the body of someone who has died from the virus (Southall, DeYoung, & Harris, 2017). By educating the communities about these dangers, they can take precautions for safer burials by using simple techniques like wearing gloves and minimizing contact with the corpse.

Other less direct methods of education were also effective and utilized by 37% of NGOs in this study who provided community education. Radio transmissions with information regarding the status of the outbreak and general information about the virus were broadcast to rural areas that would have been very difficult to reach (Media Foundation for West Africa, 2016). The 30% of community education providing NGOs who utilized radio messages to help educate communities did so in a variety of formats such as via songs, radio discussions, or PSAs from local leaders. Pamphlets were used by 17% of community education providing NGOs and distributed throughout cities, towns and near points of travel to help bring information about the disease to areas where radio could not reach, potentially saving many lives.

The second highest area of aid contributed was personal protective equipment. As knowledge about the Ebola virus spread, it became increasingly known that direct contact with the infected must be minimized as much as possible. This however, was very difficult as the dead had to be buried, and actions like checking temperatures and transporting and treating the infected almost certainly necessitated direct contact. The risk was minimized through the use of PPE's such as suits, gloves and visors. However, due to the high risk of infection from the disease, almost all PPE's had to be burned or otherwise destroyed after use to ensure the complete elimination of the virus particles. The WHO estimated that the average person working with the infected goes through seven sets of PPE per day (Bartsch, Gorham & Lee, 2015). This means that a single doctor working full time during the crisis went through at least 49 sets per week. Thus, this necessitated an enormous amount of PPE for all healthcare workers and even pedestrians who were trying to avoid infection. Despite being cheap to procure, and the large amount of donations, shortages persisted throughout the outbreak (World Health Organization, 2014).

Shortages of PPEs have disastrous consequences, as doctors cannot safely treat or transport infected persons without putting themselves at enormous personal risk. If doctors turn away patients because they are unable to treat them, the infection will likely spread, and animosity towards the doctors grows. If doctors choose to treat the infected despite a lack of PPE, this means potentially losing a doctor to the illness, and doctors were in critically low supply.

Training healthcare workers and personnel was also a vital part of the NGO response effort. Similarly to training community officials, training locals to participate in activities like contact tracing and screen allowed more trusted figures in communities to help fight the disease. Training local health workers also took the burden of doing less intensive medical work away from experienced physicians and specialists so they could focus on directly treating the infected.

The miscellaneous medical supplies category was identified as any medical supplies not for sanitation or PPEs, as they had their own category. It is possible that government agencies account for a large amount of these medical supplies, or that the NGOs had a much narrower focus. However, 37% is still a substantial amount, indicating that NGOs had an idea of the lack of medical supplies available within the three countries. It is also possible that NGOs who established aid centers did not list miscellaneous medical supplies as it would be assumed aid centers would be furnished with necessary supplies when they were built/established.

Assisting the government via planning services or assisting with the implementation of government programs proved to be a popular form of assistance. 37% of organizations gave direct assistance to a governmental agency, either local or international. Organizations like Management Sciences for Health provided planning services for international and local

government health workers, laying out concrete plans for Ebola response and highlighting areas that needed more attention (Management Sciences for Health, n.d.).

One of the most important items required for fighting the Ebola outbreak besides PPEs would most certainly be sanitation supplies (Bartsch, Gorham & Lee, 2015). These items came in many forms such as premixed bleach mixtures, sprays, wipes and other implements. Due to the high infectiousness of the Ebola virus there was a need for constant sterilization and sanitation of medical tools, health workers, buildings and patients. This was especially necessary for the doctors and the implements they used to treat patients, such as needles and thermometers. The sanitation of homes where a victim of the disease lived was also a high priority as the virus could survive for a period outside of a host, which put the victim's family and others at risk. It was slightly surprising to see sanitation was the sixth highest category of aid and not higher. However, similarly to other categories, this study does not look at the volume that was provided by the NGOs, but which ones provided it at all.

Of all the NGOs 20 (29%) established aid centers. This category includes anywhere infected people could be treated or managed. The types of aid centers varied from mobile treatment centers to full blown clinics or hospitals. The number of organizations that provided aid centers came as a bit of a surprise, considering the cost of building them. This type of aid is especially interesting because although clinics and aid centers were in short supply, it was mostly for lack of staff. Some of the organizations who provided aid centers also trained workers on site, and others such as Doctors Without Borders brought their own staff. Of the 20 organizations who established aid centers, 14 (70%) also trained healthcare workers. These healthcare workers likely were involved in contact tracing and had communication with the aid center, or worked within the actual aid center.

Food shortage was a major issue during the Ebola outbreak for the affected countries. The closing of borders caused many foods and goods to become scarce and people in quarantine were unable to retrieve food for themselves. Many relied on foreign donations of food to reach them via volunteers from these organizations (Hornby, 2014). To make matters worse, local farmers lost productivity as they were frightened to leave their families, or were stuck in quarantine. It was found that only 22% of the organizations donated food supplies, seeing as how it was such a vital need for the people in the three affected countries. However, the 22% is merely a number of organizations who donated food, and does not account for direct volume, so the amount of food given by these organizations may have been quite substantial.

An unfortunate reality about the aid given is that however effective it could have been, it was often mismanaged, lost or did not find a way to work with the cultural norms in the area to ensure its implementation or efficacy (Southall, DeYoung, & Harris, 2017). Even though the highest amount of aid given by NGOs was community education, the education often consisted of making sure the populace knew an outbreak was occurring, rather than going over safety details or dispelling rumors as was planned (Southall, DeYoung, & Harris, 2017). Issues arose with training workers as well. In some cases, workers were not trained properly or did not appropriately trace contacts. This was further complicated by patients who refused treatment or concealed their symptoms (Mardel, 2014).

About ¼ (19%) of the organizations provided direct treatment to the infected. It was a surprising result because caring for the infected tends to not only be extremely risky for those administering care, but if the organizations administering treatment also provide the medical supplies and furnishings, it can be extremely costly as well. Although it is true that the

organizations who were providing direct treatment tended to be missionary or well-funded, it was still impressive that so many NGOs played such a direct role in combating the virus.

The donation of first aid kits/survival kits was (16%). While this is small percentage, many NGOs were likely focused on more specific areas of aid. Survival kits proved useful, as they often contained items like facemasks and gloves, which could be used by the general populace to prevent infection. First aid kits were less useful, but likely contained fever reducers and sanitary wipes, which could be of some use for those suffering from the virus. The results of this may have also been slightly misleading, as some organizations simply stated they donated "medical supplies" which was another category in the study. The "medical supplies" that other organizations mentioned may have very well included first aid kits, or at least the components to create them, but there was no precise way of finding out at the time.

Counselling provided to Ebola survivors and the families of victims was provided by 14% of the NGOs in this study. Counselling is important to many Ebola survivors who face stigma from their local communities. Many communities fear the returning survivors are still infectious, or are in some way a blight in the community, survivors face threats of violence and exclusion from their communities (Yadav & Rawal, 2015). However, counseling usually produces less observable results and is time intensive in the face of such a rapidly expanding outbreak. This may account for the lower level of aid from NGOs, as many NGOs would want to make an observable impact.

This study faced numerous limitations. The first of which was that the actual aid data varied enormously in its format and availability. Many organizations created temporary websites during the outbreak but after the countries were declared Ebola free (or later) the websites were removed. This is evident as the original data for the website's introduction texts were cached in

Google's search results, but clicking the link led to a page with either a 404 error, or a similar message indicating the website no longer exists. This meant in order to collect data from one organization usually multiple different pages that talked about the organization's work had to be used. In some cases, data on organizations' activities was not entirely available on their websites, so affiliate websites and in some cases news releases had to be utilized to obtain the most complete results. However, as many of the websites have been taken down or the records are not entirely present, it is very likely that many organizations in this study did provide more types of aid than what is listed here.

Another limitation is that almost all the data (with the exception of data obtained from third party press releases) was self-reported by the organizations. It is very difficult to check if the claims these organizations make are true in many cases, especially in smaller organizations. Some organizations (especially larger ones such as UNICEF) did keep better records and data than others, and these usually presented their aid data in charts or graphs, which minimized the need to obtain data from outside sources or affiliate sources.

The final limitation was a possible overlap in the data categories of community education, distributing pamphlets and sending radio messages. While the last two could also be considered community education, an effort was made to specify community education as educating in a form without the use of radio messages or pamphlets, or they could be used to supplement education. The wording on many websites made it hard to tell exactly how they were educating communities about the virus. As mentioned before, the record keeping on many sites is not in an easily accessible format, so it is possible that there may be an overlap in the data, however a graph was included to attempt to make the overlap clearer. Another possible overlap is possible in the categories of "establishing aid centers" and "beds". It is likely that

organizations that established aid centers also had beds within, thus the “beds” category may be misleading. To avoid confusion, the beds category included only organizations that donated beds without establishing an aid center. This is a probable reason for the low level of bed donations in the raw data (2).

This project showed how large and varied the field of international aid can be. In the future, this project and projects like it can hopefully be used as a starting point for studies that wish to examine the more intricate details of aid given during health emergencies. The large amount of aid given toward educating people on the symptoms, preventative measures and current status of the Ebola virus disease proved to be the most interesting find within this study, due to the large amount of NGOs who contributed this type of aid. By identifying the largest types of aid given by NGOs, future studies can begin to examine more precisely why these types of aid tend to be the most given, or why some areas of aid receive less contributions than others.

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Appendix A

	Sanitation Supplies	Protective Equipment	Radio Messages	Trained Workers	Handwashing stations	Established Aid Center	Food provided	Survival Kits/ First aid kits	"Gifts"	Assisting government	Misc Medical Supplies	Counseling	Community education/awareness	Distributes Pamphlets/posters	Vehicles Provided	Computers Provided	equipment provided	Beds	Solar Panels	Direct Treatment
Actionaid (1,2,3)	x	x	x	x			x				x									
Adventist Development and Relief Agency (4,5,6)		x			x	x	x	x												
Adventist Health International (7)									x											
Africare (8)	x	x		x						x			x							
Americares (9,10)	x	x						x		x	x									
American Jewish World Services (11)										x		x								
Amref: Health Africa (12,13)				x						x			x							
Baptist World Alliance (14,15)							x						x							
Bangladesh Rehabilitation Assistance Committee (16,17,18)			x	x								x	x	x						
Brother's Brother Foundation (19,20,21)		x									x									

Care USA Cooperative for Assistance and Relief Everywhere (22,23)	x													x					
Catholic Relief Services (24,25)	x	x		x		x	x			x	x		x	x					
Christian Blind Mission (26)												x	x						
Childfund Internationa l (27, 28)		x				x					x		x						
Concern USA (29,30)		x	x	x	x					x			x	x	x				
CDC Foundation (31,32)				x		x				x					x	x			
Develop Africa (33,34)		x	x				x	x	x				x						
Direct Relief (35, 36)										x	x								
Doctors of the World (37,38,39)				x		x					x	x							x
Episcopal Relief and Developme nt (40, 41)	x	x	x				x				x		x						
Friends of UNFPA (42, 43)		x		x				x	x	x	x		x	x	x		x	x		
Gbowee Peace Foundation (44,45)	x												x						
Giving Children Hope (46,47)	x										x								
Global Health Ministries (48)		x																x	

Global Communities (49,50)	x	x		x						x			x						
Global Giving (51)											x		x	x					
Goal Global (52, 53)				x		x							x						
Healey International Relief Foundation (54,55)				x			x				x		x						
Heart to Heart International (56,57)						x													x
IMA World Health (58)		x								x			x						
International Medical Corps (59)				x		x						x							x
International Rescue Committee (60)	x	x		x		x							x						
Intrahealth International (61)				x						x			x						
JHPIEGO (62, 63)										x			x						
Johns Hopkins Center for Communication Programs (64)			x							x			x						
Mali Health Organizing Project (65)			x	x				x					x						
Map International (66,67)		x		x							x								
MSH (Management Sciences for Health) (68, 69)										x									

Doctors Without Borders (70,71)						x				x		x	x						x
Medical Teams International (72)										x	x		x						
Medshare (73,74)		x									x								
More than Me (75,76)						x		x		x			x						
Nethope (77)							x									x			
Operation Blessing International (78)	x								x				x						
Operation USA (79)	x	x																	
Partners in Health (80,81)				x		x					x		x				x		x
PCI Media Impact (82,83)			x										x						
Project Concern International (84,85)	x	x		x							x		x						
Plan International (86,87,88)	x		x	x	x	x	x			x			x	x					
Presbyterian Mission Agency (89)	x				x		x						x						
Project c.u.r.e (90,91)	x	x									x								
Project Hope (92,93)		x		x		x				x	x								x
Samaritans Purse (94,95)	x	x		x		x		x				x	x						x
Salesian Missions (96)	x	x	x				x				x		x	x					x

Save the Children (97)	x	x	x	x	x	x					x	x	x						x
SIM USA (98)		x	x			x													x
Stop Hunger Now (99,100)		x					x	x											
UC San Francisco (101)		x		x						x	x				x				x
UMCOR (102)		x		x		x	x	x			x	x	x						
UNICEF (103,104)	x	x	x	x		x		x		x			x				x		x
American Red Cross (105,106)				x						x		x	x						x
United Nations Foundation (107)										x									
Water Mission International (108)				x	x														
Women's Campaign International (109,110)	x			x							x		x						
World Food Programme (111,112)		x					x	x		x									
World Renew (113,114)	x	x		x		x	x				x		x						
World Vision (115,116)	x	x	x	x									x						

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