PUBLIC HEALTH & ENVIRONMENT BULLETIN

KCCA

KAMPALA CAPITAL CITY AUTHORITY

For a better City

DIRECTORATE OF PUBLIC HEALTH AND ENVIRONMENT

THEME: KAMPALA'S HEALTH AND ENVIRONMENT IN THE MIDST OF COVID-19

IN THIS ISSUE

Executive Director's Message

We are aware of the many hardships that this unusual and difficult time of COVID-19 and lockdowns has presented to our environment, public health services, businesses and lifestyles. It is important now more than ever we all work together and support each other.

Together, we not only set out to deliver quality services to the people of Kampala with an accountable and admirable image, we also set out to build capacity to prepare, respond and manage all public health threats or related events, COVID-19 inclusive.

There are encouraging signs countrywide with low community transmission, no deaths and remarkable recoveries. We can comfortably attribute these positive indicators to our efforts towards preventive measures such as hand washing, social distancing, face mask use, risk communication, efficient leadership and decision making. However, we must continue to prioritize our environment and public health by continuing to heed all orders from the public health officials.

Kampala Capital City Authority and our partners will continue to serve the public and ensure that we continue to build a safe and healthy Kampala City. We are proud to associate with this bulletin as it serves as a comprehensive source of environment and public health information that is influential for capacity building and authoritative action by all relevant stakeholders.

Eng. Andrew Kitaka
Ag Executive Director
Kampala Capital City Authority

Editorial Team's Message

Dear Reader,
We welcome you to the inaugural volume and issue of the KCCA-Public Health and Environment Bulletin.

The main aim of this Bulletin is to document and communicate the works, achievements, and key challenges with regards to Kampala's Public Health, Environment and other related events. The end goal is to disseminate this information to the policy makers, health professionals, the public, implementing partners and all stakeholders.

In this issue, we are excited to share with you a wide variety of articles focusing on Kampala's health and environment in the midst of COVID-19 including: articles on medical services, environment, sanitation, pollution and air quality, GIS and mapping. In a special way, we also present articles from some of our many implementing partners, information on Public Health Emergencies and upcoming Health days.

While thanking you, we invite you to share with us your ideas and feedback. Yes, we are excited to hear from you and ready to extend our Bulletin family. For further information with regards to anything in this bulletin please contact any of us: **andyabakira@kcca.go.ug, ekatana@kcca.go.ug**

Enjoy your reading!!
Thank you.

EDITORIAL TEAM

Daniel Ayen Okello
Director Public Health & Environment

Najib Lukoya Bateganya
Deputy Director Public Health & Environment

Sarah Zalwango
Manager Medical Services

Christopher Oundo
Supervisor Medical Services

Alex Ndyabakira
Epidemiologist

Elizabeth Katana
Epidemiologist

Public Health & Environment Director's Message

2020 will be remembered as a dynamic year in the world of public health, environment and preparedness for public health emergencies. COVID-19 has presented us with the challenge of responding and adjusting to a modern-day pandemic that has had unique approaches such as institutional quarantine, closing of borders and eventually a lockdown in Uganda.

The team at Kampala Capital City Authority has invested significant efforts and resources in the COVID-19 response, environment and public health in general. The activities have spanned from community risk communication, social mobilizations, trainings for staff and health workers, ensuring continuity of essential services in Kampala including operating a toll-free call center to respond to all medical emergencies during the lockdown, prioritizing transportation for mothers in labor, coordination of a public ambulance system, waste management, upscale of water, sanitation and hygiene coverage, assisting vulnerable groups such as street children, community surveillance and tracking of COVID-19 suspects, among others.

In this inaugural volume and issue of our quarterly public health and environment bulletin, we document and present to you key write ups from our efforts, challenges, and lessons learnt from supporting and sustaining Kampala's health and environment in the midst of COVID-19.

In this turbulent and difficult era of COVID-19, we hope that we have been able to diligently serve, monitor, build capacity, communicate, promote public health and nurture a healthy, conducive and sustainable community and environment in Kampala city. This bulletin is a documentation and communication of our works, achievements, challenges and advancements to the policy makers, health professionals, the public, implementing partners and all relevant stakeholders.

Finally, I would like to thank you, the contributors, the readers and editorial team, for your interest in this bulletin and I encourage you to send us your invaluable feedback and ideas.

Dr. Daniel Ayen Okello
Ag. Director Public Health & Environment
dokelloa@kcca.go.ug

World Blood Donor Day

14 June
World Blood Donor Day

Given these turbulent times of COVID-19 and in observance of the upcoming World Blood Donor Day, we should take some time off and donate some blood.

Blood donation is essential because we need to maintain adequate supply in the blood banks as security for the many patients that will need transfusions.

We can visit the Uganda Blood Transfusion web page (**https://www.ubts.go.ug/**), to find the nearest place to donate blood in your area.

Donate blood to save bleeding mothers, cancer patients, anemic children and accident victims.

#SAFEBLOOD SAVESLIVES.

Maternal Health Care Management At KCCA Health Facilities during COVID-19 Pandemic

Authors: *Clara Kokunda[1], Sarah Zalwango[1], Douglas Akii-Bua[2], Daniel A. Okello[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]MaNe Project, Directorate of Public Health and Environment, Kampala Capital City Authority

*Correspondence: ckokunda@kcca.go.ug

Background

Following the declaration of COVID-19 as a pandemic by the World Health Organization in March 2020, the Kampala Capital City Authority (KCCA) joined efforts with the Ministry of Health (MoH) and stake holders to prepare and respond. It is evident worldwide that the response to COVID-19 requires joint efforts beyond public health jurisdiction, but rather multi sectoral approaches and collaborations of stakeholders and governments.

Following confirmation of the first case of COVID-19 on 21st March 2020, the president and MoH passed directives and guidelines to contain and limit its spread. Key directives in Uganda's COVID-19 lockdown such as suspension of private and public transport have had an effect on access to health facilities and health service delivery. It's undeniable that all Ugandans have been affected, however, pregnant women, mothers in labor, children due for immunization and post-natal mothers were expected to experience greater challenges in the COVID-19 lockdown. To ensure continuity of maternal and newborn health services, KCCA put measures to, ensure mothers, especially those in labor, and the unborn and the new born children that needed urgent medical attention, were able to access health services and facilities.

Interventions On March 25, 2020, a 24-hour call center was set up and disseminated widely to respond to all public concerns during the COVID-19 lockdown through a **toll-free line 0800990000**. Clients who called in were linked to either ambulance services or community pick up services with the advice of a clinician. Ambulances were prioritized for emergencies such as mothers in labor while community vehicles were utilized for routine services including antenatal care services (ANC) and immunizations. Both the ambulances and community vehicles were strategically deployed in different locations across all the five Kampala divisions; like police, health facilities respond to emergencies in a timely manner and all these were offered to the public free of charge. In addition, two vehicles were allocated per facility to transport staff to and from their homes to places of work to ensure there was human resource to respond to the emergencies. Whereas other deparments such as OPD, eye clinic, dental,

reduced the human reources due to transport restrictions, maternal and child health (MCH) departments retained all their staff to continue with service delivery.

A functional interfacility referral system was set up where Kisenyi and Kawaala HC IVs were allocated an ambulance due to the client load they handle, averagley 25 to 30 deliveries per day. For close monitoring of the ambulance drivers, a register was introduced at the two facilities to track their movements. Other four ambulances were left mobile to handle the emegercies from other KCCA facilities (Komamboga HC III, Kisugu HC II and Kitebi HC III). Besides these interevtions, the KCCA MCH department went a head to condcut dialogues with all the 5 KCCA maternity centers and 4 PNFP hospitals (Lubaga Hospital, Mengo Hospital, Nsambya and IHK) to understand causes of emergecies, complications and delays around maternal /perinatal death reviews.

Lastly, a WhatsApp platform was created to assist in notifying emergency cases; identifying which health facility was ready to receive and manage the emergency and to request for ambulance services in time. Theatres at Kisenyi and Kawaala HC IVs were functionalized and boosted to reduce the bulk of emergencies on referral facilities such as Kawempe Hospital and to improve outcomes of emergencies by reducing the time to intervene.

Results

As of 7th May 2020, KCCA 24-hour call center had responded to 1,025 Emergencies and 2,075 community picks for clients who needed access to routine medical services such as cancer treatment, dialysis etc. 992 (96%) of the 1,025 emergencies transported were mater-nal and new born health management ie labor, miscarria-ges, and immunisation. In regard to the interfacility refer- rals, in the month of April alone, a total of 265 referrals from the lower units for further management were made. 27 % of the referrals were from Kitebi HC III, 26% from Kisenyi HC IV, 21% from Kawaala HC IV, 15% from Komamboga HC III and 11% from Kisugu HC III. In a period of four months (Jan-April), Kampala registered a total of 25,689 health unit deliveries with KCCA contri- buting 34% (8,666). The table below shows a trend
deliveries in Kampala Against KCCA facilities for Jan to April 2020
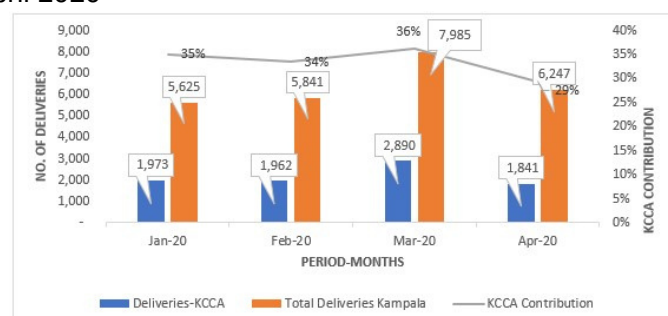
Figure 1:*Trend of deliveries in Kampala against KCCA HF- Jan to Apr 2020*

From the dialogue discussion held, two QI projects were initiated per facility; to reduce emergency through proper antenatal care and early identification of emergencies during labour through correct use of partogragh to monitor mothers during labor.

Conclusion

While COVID-19 has affected Kampala's medical services in several ways, it has also presented opportunities to examine the effectiveness of our health systems and approaches as a city. Health facilities will implement quality improvement projects aimed at early identification of risky mothers either at ANC or at labor. The risky mothers will be linked to be assessed by specialist either in Kawaala and Kisenyi HC IVs. KCCA plans to scale up management of maternal health emergencies at all health facility levels with inter-facility linkage systems in a phased manner with an aim to reduce patient flow at the higher-level facilities.

Digital use of Public and Private Ambulance Systems to Increase Timely Access to Care during COVID-19 Lockdown and Beyond

Authors: *Andrew Magunda[1,2],*Henry Kaula[1,2], Daniel A. Okello[2]

[1]Kampala Slum Maternal and Newborn Health (MaNe) Project, Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda

Correspondence to: amagunda@psiug.org; hkaula@psiug.org

Background

Since January 2020, COVID-19 has had several effects on the health systems of many countries and cities worldwide, Kampala inclusive. Some of the lockdown directives including curfew and the banning of both private and public transport have had a significant impact on the health care system and service delivery. The lockdown resulted in limited access to Maternal and child health services, and care for clients with acute and chronic medical illnesses. Consequently, some of the patients who were unable to or delayed to access health care during the lockdown either could have died or developed complications. These negative ramifications have highlighted the need for reliable and efficient emergency medical services thus re-emphasizing the extreme importance of enhancing digital health technologies for faster and better health care access and utilization.

The Innovation

The USAID-funded Kampala Slum Maternal and Newborn Health (MaNe) project and KCCA are developing a digital system to facilitate remote access, request, deployment and tracking of public and private ambulance transportation for all medical emergencies including community evacuations to health facilities, and referrals between health facilities. Using the ambulance online/digital application, all Kampala residents will know all the obtainable transport options including what ambulance is available, the services it offers, cost estimates of using it based on distances to be covered. All public, private not for profit and private ambulances in Kampala will be hosted on this real-time Kampala Digital Emergency Transport System. It will be linked to the emergency call and dispatch centre set up by KCCA through the MaNe project, to identify best positioned health facilities and nearest ambulances to handle the medical conditions at hand.

The benefits

This innovation will improve emergency medical services in Kampala especially through facilitating timely access to transportation from community to health facilities, and timely referrals between facilities. This service is also envisaged to improve equitable access to health care. Unlike before and during COVID-19, using this simplified application, KCCA is igniting a self-service health care system where any resident with a health emergency can directly access a range of ambulances without bureaucratic procedures. KCCA is aware of cost as a barrier to using ambulances by many of the urban slum dwellers and is planning a public-private partnership to help subsidize the transport of those who can't afford while public ambulances hosted on the system will be completely free.

In addition, Kampala's medical services are dominated by private health facilities and very few of them own ambulances. Before and during COVID-19, some of the private facilities may not have been able to attend to some complicated cases since they cannot easily refer them when need arises due to lack of ownership or inaccessibility of ambulances. Access to ambulance transport options will therefore give them the confidence and boost to offer care to all clients and use this ambulance system during referrals. Therefore, the small private clinics won't be pressured to invest in purchase of ambulances or any other vehicles to transport their clients during referrals because of the assurance that an ambulance will be a click or call away from reach.

Conclusion

The USAID support through the MaNe project, this Kampala digital emergency transport application system is seen as one of major technologically innovative responses to improve emergency medical services by preparing and launching KCCA into digital based health care access to avoid future reoccurrences amidst

possible pandemics, enhance digital access to health services and reduce typical delays in seeking care for medical and non-medical emergencies in Kampala.

Coordination of Toll-free Emergency Call Center and Ambulance System during the COVID-19 Lockdown in Kampala

Authors: *Douglas Akii Bua[1,2], *Doreen O. Alaleit[2], Elizabeth Katana[2,3], Sarah Zalwango[2], Daniel A. Okello[2]

[1]Kampala Slum Maternal and Newborn Health (MaNe) Project, Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[3]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda

Correspondence to: dbua@psiug.org; dokong@kcca.go.ug

Background
Uganda confirmed the first case of COVID-19 on March 21, 2020. In response to COVID-19, amongst other interventions, a coordination mechanism through establishment of a toll-free call center system was set up at KCCA to facilitate rapid case identification, tracing of contacts of confirmed cases and responding to other health emergencies including road traffic accidents, acute illnesses, women in labor, among others. This came in handy as the lockdown resulted in restricted movement of public and private vehicles and as such authorized public means of transport including ambulances and community pickup vehicles needed an efficient coordination mechanism. The KCCA call center was set up at City Hall on March 25, 2020 utilizing the available resources including three desk phones and computers with nine dispatchers working in 8-hour shifts. We aimed to ensure the continuity of essential medical services and to build the public's trust in public health authorities during the COVID-19 pandemic.

Methods
Two toll-free numbers were made available and were **0800990000** and **0204660998** and public awareness was made through constant media coverage, short videos about the toll-free line and the 24-hour operationalization of the services. The call center was manned by team of trained personnel that comprised of volunteer social workers as call attendants, epidemiologists, clinicians and or nurses. A training model was developed to train the call center team with working standard operating procedures and referral guidelines to be used during call processing. Software was designed where patient data was captured, triage and sorting of the calls was done to prioritize the need for urgent medical evacuation. A directory of the surveillance teams on ground and the stationed vehicles and ambulances were made available to the call center staff.

A deployment plan was established in order to cover areas within a radius of 40 Kilometers from the Kampala city center and this included Mukono, Wakiso and Mpigi. Responses were categorized according as COVID-19 and non COVID-19 related emergencies. The ambulances were reserved for high risk emergencies such as obstetrics, pediatric, accidents; while community pick up vehicles were reserved for chronic medical conditions such as those requiring dialysis, chemotherapy, antenatal care (ANC) or patient reviews. HIV/AIDS clients were catered for by coordinating delivery of drug refills to their homes with provision their ART numbers to the Infectious Diseases Institute (IDI) team. The call attendants responded to calls using the guidelines set up, the caller would be triaged and according to the condition or compliant, one of the following steps was taken; 1) Medical advice was given through the medical control or supervising clinician, 2) The ground surveillance team was alerted and linked to the location in case of a suspected COVID-19 patient, 3) An available ambulance or community pick up vehicle was dispatched to effect transport to the nearest health facility or interfacility transfer of clients, 4) All the calls were documented and daily summaries generated.

Results
As of 7th May 2020, KCCA team, the team had responded to a cumulative number of 7,681 calls, 882 (11.5%) COVID-19 related and 6799 (88.5%) non-related calls including 14.6% (992/6,799) as Maternal and newborn issues, 71.0% (4,830/6,799) were requests for ambulances and community pick up vehicles, 3.7% (249/6,799) calls related to violation of the presidential directives, 5.9% (398/6,799) called in asking for food aid among other calls. 30% (1,450/4,830) of the emergency calls resulted in dispatch of an ambulance service.

Conclusion
The call center has contributed a great deal in keeping intact the health care seeking and coordination of medical emergencies in addition to COVID-19 surveillance and response. This call center can be a benchmark for establishment of other call centers countrywide especially at the regional referral Hospitals. The call center with all its successes is also registered a number of challenges including lack of a switch board in order to be able to receive multiple calls, lack of a tracking system to locate the caller and few ambulances are available to respond to the large volume of emergency calls.

The 2ks: Cesarean Sections in Kawaala and Kisenyi HCIVs during COVID-19 Pandemic

Authors: *Douglas Akii Bua[1,2], Doreen O. Alaleit[2], Sarah Zalwango[2], Daniel A. Okello[2]

[1]Kampala Slum Maternal and Newborn Health (MaNe) Project, Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala,Uganda
[2]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda

*Correspondenceto: dbua@psiug.org

Background

Since January 2020, the country has registered an upward trend in the maternal deaths with Kampala contributing about 30% of the cases as of March 2020. The maternal death trends in Kampala from the DHIS2 indicates a rise in numbers over this period. Some of these deaths could be due to delays at the different levels of care.

KCCA operates the Public Health facilities of Kitebi HC III, Kisugu HC III, Komamboga HC III, and the two Health Centre IVs of Kisenyi and Kawaala herein referred to as the "2Ks". These perform deliveries in addition to other maternal, neonatal, child and adolescent health services. The cases that cannot be managed at the 2Ks are often referred to Kawempe National Referral Hospital. Amidst this COVID-19 pandemic, Kampala Capital City Authority(KCCA) upscaled the capacity of these facilities to perform caesarean sections through boosting human resource and logistical support. The performance of cesarean section in these facilities will help to reduce the load and waiting time for mothers who would ideally be referred to Kawempe National Referral Hospital and likely improve both the maternal and neonatal outcomes. We sought to determine the extent to which these two facilities are performing cesarean sections, representing referrals to the National referral Hospitals averted. We compared the output from each of the 2Ks in terms of the number of cesarean sections performed and owing to the fact that these two facilities only perform cesarean sections only during day, the cases that require cesarean sections during the night shift are referred.

Methods

We abstracted data from the theatre registers for the 2Ks for the months of February- to April 2020 with indications for both Elective and Emergency Cesarean Sections. The 2Ks were purposively selected due to their ability to do Cesarean Sections, and the high volumes of cases that are handled. We reviewed all the cesarean section cases irrespective of whether they were referrals in or decisions to perform the cesarean section made at the facility. The facilities were enhanced with catalytic supplies and arrangement to have anaesthetic officers available to provide safe anesthesia.

We did not explore other parameters such as the technique used or the type of anaesthesia given for the procedures. Data was summarized and analyzed using Microsoft Excel.

Results

There was general increase in the number of the cesarean section cases done at both Health Centers IVs with Kisenyi HCIV having more cesareans done. The emergency cases by far superseded the elective cases especially during the Month of April 2020 for both facilities. In the period under review, these two facilities averted 178 referrals for Cesarean section at Kawempe National Referral Hospital and 95 cases in the month of April alone. There was an increasing trend over the Months for Kisenyi HCIV as compared with Kawaala with a slight trough in the Month of February 2020 as noted in the figures 1 and 2 below
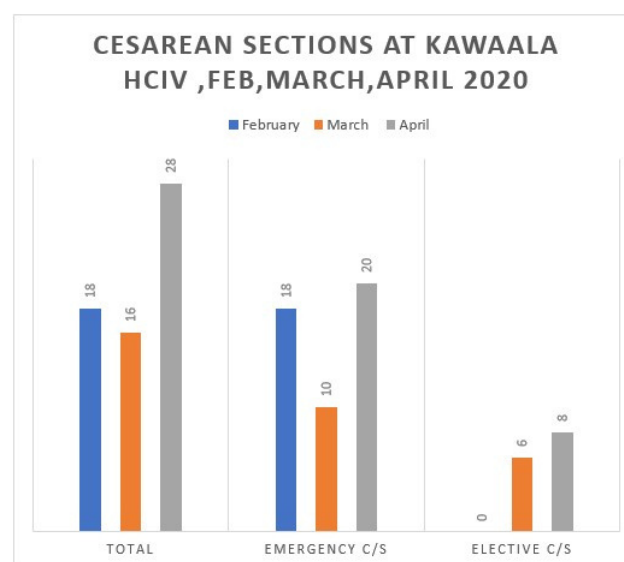

Figure 1:Cesarean Sections at Kawaala HCIV for the months of Feb, March and April 2020
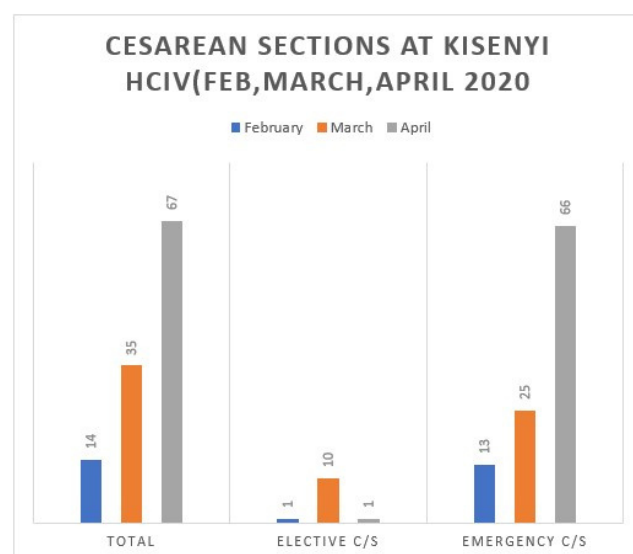

Figure 2:Cesarean Sections at Kisenyi HCIV for the months of Feb, March and April 2020

Conclusion

Functionalizing the operation theatres at the 2Ks has to a great extent reduced referral to Kawempe National Referral Hospital. This shows the capability of these facilities to handle maternal and newborn emergencies with the output depicted.

The 2Ks are delivering these outputs even when the theatres are functional only during the day shift and not at night. Operationalizing of the theatre for 24-hour coverage will further reduce the referrals to Kawempe National Referral Hospital since most of these cases can be handled at the level of Health center IV. The output was even higher at the peak of the COVID-19 outbreak amidst all the existing challenges including human resources, equipment and some consumables to enhance operations.

Guaranteeing Treatment for TB Patients in Kampala during the COVID-19 Pandemic in Uganda

Authors: *Herbert Kisamba[1], Sylvia M. Nakibuuka[1], Christopher Oundo[2], Kenneth Mutesasira[1], Abel Nkolo[1], Daniel A. Okello[2]

[1]USAID, Defeat TB Project, Kampala, Uganda
[2]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda

*Correspondence: hkisamba@defeat-tb.urc-chs.com

Background

Tuberculosis (TB) is caused by a bacteria Mycobacterium tuberculosis and often affects the lungs. Despite being a preventable and curable disease, 1.5 million people die from TB worldwide each year – making it the world's top infectious killer. According to the World health Organization, Uganda is among the high burden TB/HIV countries in the world. About 1 in every 5 TB cases in Uganda are in Kampala City. Kampala had over 8000 active TB patients and a treatment success rate of 92% by the end of Jan-March 2020 quarter. USAID Defeat TB project has since September 2017 been supporting Kampala Capital City Authority (KCCA) to increase TB case notification, case detection, and treatment outcomes through health system strengthening.

The world is battling with the COVID-19 pandemic since December 2019 with Uganda reporting a first case in March 2020. Several measures were instituted across the country in response to the pandemic. Among such measures was the national lockdown coupled with the suspension of public transport and restrictions on motorcycle use which could affect TB patients' access to medicines and adherence to TB treatment. To ensure continued assess to TB medicines and other services, Defeat TB with KCCA initiated specific interventions within Kampala.

Intervention

Defeat TB project together with KCCA's directorate of public health disseminated Ministry of Health COVID-19 guidelines to all TB treatment centres in Kampala. Using the guidelines, health workers were oriented on how to effectively integrate COVID 19 control measures with TB care activities at the facility level.

To ensure continuity of TB services during the lockdown, clients flow and health worker's role allocation at health facilities was revised. Health workers focused on performing roles essential for effective tracking of TB patients drug refills. Telephone airtime was provided to health workers for communicating with patients and between health facilities to ease drug refills. Health workers listed patients due for TB drug refills and reminded them of the refills. Those unable to pick drugs from health facilities due to travel difficulties shared their location details. TB drugs were delivered to patients' homes or neighborhood using Motorcycles and or Defeat TB project cars, for those within the radius of 30 kilometres. Defeat TB supported health workers to review TB drug stock prior to each clinic day. In case of low stock, TB drugs were redistributed   between facilities to ensure availability at all health facilities.

For continuity of TB diagnosis services, Defeat TB project contracted 3 hub riders to reinforce movement of sample from the community and between health facilities. In addition, distribution of TB diagnosis logistics like, sputum mugs were done to TB diagnostic units that were running low on them.

Key Results

Access to TB medicines by TB patients remained above 80% during the first month of the lockdown for patients receiving TB care at KCCA health facilities. At 10 randomly selected, high volume TB facilities, the weekly proportion of patients expected to receive TB drug that received them remained high at a weekly average of 88.75% during April 2020 (figure 1).
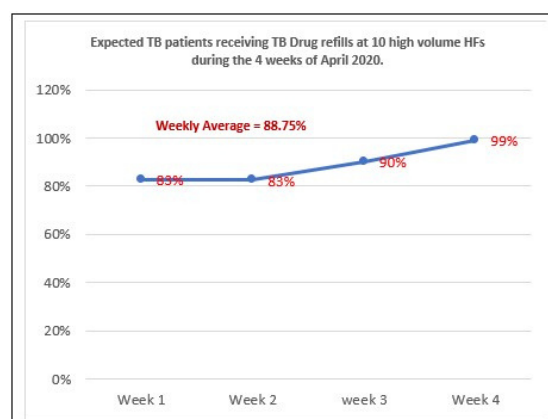

Figure 1

(continued on next page)

Figure 1:Trend in expected TB patients receiving Drug refillsat 10 high volume facilities during April 2020

Similarly, monthly retention of TB patients on treatment remained comparably high during the first month (April 2020) of national lockdown as had been during a few months before the lock down (figure 2).
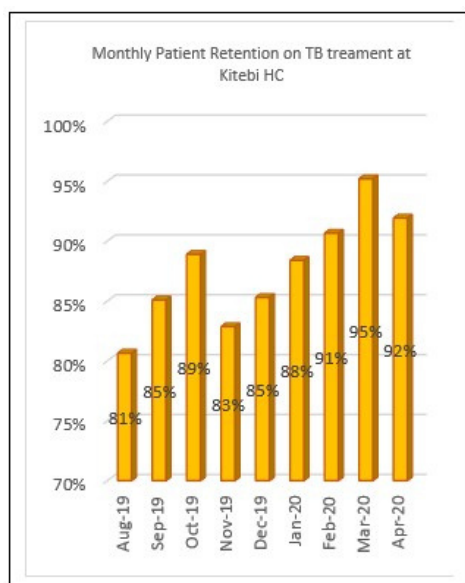

Figure 2:Trend in expected TB patients receiving Drug refillsat Kitebi HC III before and during the lockdown

In the process, learning has emerged about; health care worker role allocation, patient locator approaches in the community and TB patient support systems in the comm-unity. All this has been useful for provision of TB care services.

Conclusion

The coordinated efforts of KCCA staff and Defeat TB project coupled with cooperation of TB patients has ensured TB patient retention on treatment during the COVID 19 pandemic in Kampala. The lessons learned will continue to guide TB patient retention in Kampala and other neighboring districts.

Electronic Management of Medical Supplies - a Case for Active Stockpiling for Preparedness

Authors: *Julius Mubiru[1], Elizabeth Katana[1,2], Daniel A. Okello[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda

*Correspondence: jmubiru@kcca.go.ug

Public health emergencies (PHEs) are usually unpredictable and as such, preparing for them requires maintenance of stockpiles of medical supplies required for the response.

This allows immediate deployment of these supplies, also called Medical Counter Measures (MCMs), as soon as the PHEs occur.The Covid-19 pandemic has clearly highlighted the importance of MCMs.

Stockpiling is one of the strategies the Ministry of Health (MoH) has established for management of MCMs. This requires health facilities, district stores and central warehouses to have parallel inventory systems that separate MCMs from supplies used for routine services to ensure the MCMs are reserved for PHEs. MoH also has a web-based electronic Emergency Logistics Management Information System (eELMIS) which tracks the location and stock levels of different MCMs throughout the supply chain. COVID-19 is a novel disease and definitely not on the MoH list of priority diseases for PHE preparedness. However, most of the supplies required for its response, such as Personal Protective Equipment (PPE) and dis-infectants, are already among the MCMs required for many other highly infectious diseases on the list, such as the Viral Hemorrhagic Fevers (VHFs), stockpiling well for these probably would have prepared us better for the COVID-19 response. Without stockpiles, the first possible option is using supplies for the routine services. This approach is limited because many supplies are either not routinely stocked at the health facilities or stocked in small quantities owing to much lower need for routine services. In addition, such diversion can deplete supplies rapidly, thereby creating a shortage for the routine services. Stockpiling overcomes this by ensuring an immediate response to a PHE and can be mounted without the need to encroach on supplies for routine services. The second possible option is to order supplies through the National Task Force (NTF), using the eELMIS. This is a system which was set up with ensuring swift ordering and delivery of supplies as one of its objectives. During the covid-19 pandemic, National Medical Stores (NMS) were unable to supply all the items required in sufficient quantities due to the ongoing global logistical shortages and challenges. To bridge the gap, our third possible option is to undertake private procurement. However, commodities are still in short supply and highly overpriced on the market, partly due to the breakdown in supply chains as lockdowns were implemented, and panic buying by the public. Once the COVID-19 pandemic is contained, it would be wise to use any leftover commodities to establish stockpiles of MCMs. We can utilize the eELMIS and MoH supply chain system to source MCMs that will be used to establish stockpiling for PHEs to ensure better preparedness. In addition, we can upscale trainings for supply chain mana-gement of MCMs to health facilities to enable them esta-blish and manage stockpiles in anticipation of PHEs.

KCCA and Bloomberg's Partnership for Healthy Cities Strive to Create a "Smoke-free" Kampala

Authors: *Elizabeth Katana[1,2], *Alex Ndyabakira[1,2], Angella Nshimye[1], Andrew Kitaka[3], Daniel A. Okello[1]

[1] Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2] Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda
[3] Executive director's office, Kampala Capital City Authority, Kampala, Uganda

*Correspondence: ekatana@kcca.go.ug and andyabakira@kcca.go.ug

In 2019, KCCA joined the Bloomberg's Partnership for Healthy Cities. This Partnership is supported by Bloomberg Philanthropies in partnership with the World Health Organization and Vital Strategies, a prestigious global network of 70 cities including Kampala whose mayors have committed to saving lives by preventing Non-Communicable diseases (NCDs) and injuries including cancer, diabetes, heart diseases and chronic lung disease through proven interventions.

Majority of the world's population is living in urban settings and 68% of the world is expected to live in cities by 2050. NCDs and injuries kill almost 46 million people globally each year. They are responsible for 80% of global deaths. Through this partnership, cities are uniquely positioned to transform the fight against NCDs and injuries by implementing policies to significantly reduce exposure to risk factors. Cities and their leaders play a critical role in developing, implementing and enforcing policies to create health environment for healthier populations.

In this Partnership, each of the 70 member cities including Kampala selected one of the 14 interventions to prevent NCDs and injuries: create a smoke-free city, ban tobacco advertising, raise tobacco taxes or fees, tax sugary drinks, set nutrition standards for foods served and sold in public institutions, regulate food and drink marketing, create healthier environments, reduce speeding, increase motorcycle helmet use, reduce drink driving, increase seat-belt use, promote active mobility, prevent opioid-associated overdose deaths, public health data and monitoring systems.

According to the Tobacco Atlas, more than 10,637 Ugandans are killed by tobacco-caused disease every year much as smoking is prohibited in Kampala's public places. In its first phase of the partnership, KCCA is focusing on creating a smoke-free city with a target to reduce the prevalence of smoking in public places by 95% by December 2020. We are proud of this partnership as it has provided technical assistance to this cause, designed appropriate interventions, communication and public relations support, networking and capacity building to assist Kampala to make public places smoke free, healthier and helping the citizens to give up the deadly habit.

For more information visit:
partnershipforhealthycities.bloomberg.org

World No Tobacco Day
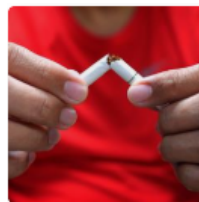
Campaign
World No Tobacco Day – 31 May 2020
📅 31 May 2020

According to the World Health Organization, Tobacco kills more than 8 million people each year. More than 7 million of those deaths are the result of direct tobacco use while around 1.2 million are the result of non-smokers being exposed to second-hand smoke. It is estimated that over 80% of the world's 1.3 billion tobacco users live in low- and middle-income countries. In commemoration of this year's World No Tobacco Day, please continuously encourage a smoker to quit. Studies show that when smokers become aware of the dangers of tobacco, most want to quit. WHO urges influencers in pop culture, on social media, in the home, or in the classroom who reach and connect with youth to expose the tobacco industries' manipulative tactics to create a new generation of tobacco users. We need to empower youth to stand up to Big Tobacco by dispelling its lies and refusing to use its products.

The Effect of COVID-19 Lockdown on Air Quality in Kampala city, Uganda.

Authors. Alex Ndyabakira[1,2]*, Elizabeth Katana[1,2], Sadam Yiga[3], Andrew Kitaka[4], Daniel A. Okello[2]

[1] Uganda Public Health Fellowship Program, Ministry of Health, Kampala Uganda
[2] Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda.
[3] Executive director's office, Strategy management and business development, Kampala Capital City Authority
[4] Executive director's office, Kampala Capital City Authority, Kampala, Uganda

*Correspondence: ndyabakira@gmail.com

Background

Exposure to ambient air pollution increases morbidity and mortality, and is a leading contributor to the burden of many global diseases. In 2016, World Health Organization (WHO) estimated that air pollution account-ed for 4.2 million deaths globally and 36,000 deaths locally. Air pollution disproportionately affects cities in the developing world, where pollution levels usually exceed WHO guideline limits. Although many substances are known to potentially contaminate air, the WHO has

identified carbon monoxide (CO), particulate matter (PM), ozone (O_3), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) as the pollutants with greatest public health importance.

WHO relies on the air quality index (AQI) to assess the status of ambient air in cities. The ambient air concentrations of PM, CO, O_3, NO_2, and SO_2 are weighted to construct the AQI. Typically, 50 is the AQI cut off for air considered healthy for all people, and values exceeding 100 are considered unhealthy. PM of diameter <2.5 μm (PM2.5) is considered more hazardous to health than larger PM due to its potential to cross from the lungs into the blood stream.

During the COVID-19 pandemic, Uganda instituted multiple measures to reduce the risk of transmission of disease. These included a 'lockdown,' starting on 18 March 2020 and modified over time, that drastically reduced the number of automobiles and plants/industries operating in the city. We used this unique opportunity to assess the air quality in Kampala city and the impact of the lockdown.

Methods

We assessed AQI, including PM2.5 and NO_2 at 25 different sites of different land use areas in Kampala from 1 February to 9 May, 2020. Air pollutant concentrations were measured over 24-hour periods using 25 air quality monitors of clarity, Node-s (Cellular) model, stationed in such a way to cover different land use patterns in the city. The monitors can assess PM2.5 concentrations in the range of 0-1000 μg /m^3, NO_2 in the range of 0-3000 parts per billion (ppb), and have real-time temperature and humidity gauges in the range of -200C to 70 0C and 0-100%, respectively. The operations of the monitors can be visualized on a computer via the internet. Data were directly downloaded from the monitors through a web application using a laptop computer. For this analysis, we used data from the monitoring station at Kampala Capital City Authority (KCCA) headquarters. Data analysis was conducted using STATA 13.

Results

Using the data from the KCCA headquarters monitoring station, the mean (± standard deviation (SD)) ambient temperature over February-May period was 25.6 ± 0.16 °C (maximum 29.4 °C, minimum 21.8 °C). Mean humidity was 71.6% ± 0.61 (maximum 82.9%, minimum 45.0%). Archived temperature and humidity data from the other 24 monitors show a similar average temperature and humidity. The concentrations of PM2.5 show a drastic decline beginning immediately at lockdown (Fig. 1). The 24-hour mean concentration of PM2.5 during the pre-lockdown period (February-March 20th) and during lockdown (Apr-May 8th) period is 51.8 ± 2.9 μg/m3

and 28.1 ± 1.6 μg/m^3 respectively, representing a 41% drop in PM2 levels during the lockdown. However, the 24-hour mean concentration of PM2.5 during lockdown, 28.1 ± 1.6 μg/m^3 remains above the WHO cutoff of 25 μg/m^3. The mean concentration of NO_2 reduces by 85% during lockdown. Comparing pre-lockdown and lockdown period there was a 34% improvement in air quality in Kampala city. The mean air quality index during the lockdown period was 117.6, which exceeds 100, the WHO cutoff for sensitive people. Comparing lockdown period (Apr-May 2020) with the same period of Apr-May 2019, shows that the drop in pollution levels is unique to lock down period.
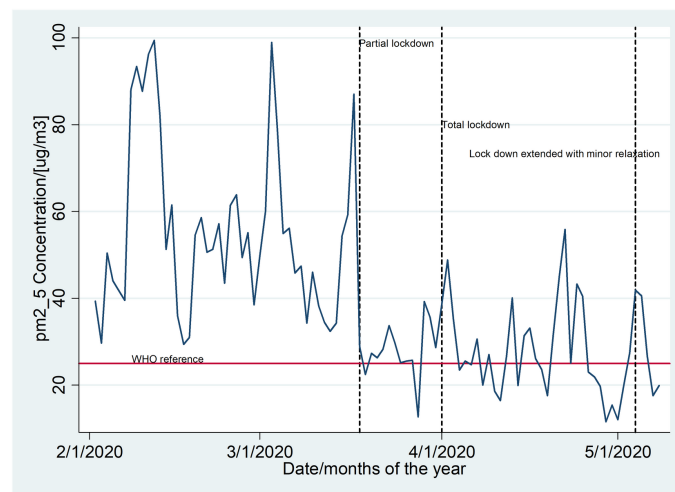
Figure 1:A graph showing ambient air concentration of PM2.5 against time.

Conclusion

Lockdown due to COVID-19 pandemic resulted in immediate significant reduction in ambient air pollution, and improved air quality in Kampala city. The sustained low air pollution levels throughout the observation period confirm adherence to lockdown restrictions. This demonstrates the significant contribution that automobiles and industries make to the air quality in Kampala city. Emissions controls for automobiles and industries can go a long way to reducing air pollution. Strategies that can reduce the number of automobiles and plants/industries in Kampala city can greatly improve air quality.

Air Pollution Monitoring in Kampala city

Authors: *Sadam Yiga[1], Alex Ndyabakira[2,3], Najib L. Bateganya[3] ,Daniel A. Okello[3], Andrew Kitaka[4]

[1]Executive director's office, Strategy management and business development, Kampala Capital City Authority
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala Uganda
[3]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[4]Executive director's office, Kampala Capital City Authority, Kampala, Uganda

Correspondence: syiga@kcca.go.ug

Clean air is essential for good health, however due to drivers burning fossil fuels in vehicles, industry energy usage, dusty roads, open waste burning among others our air gets polluted with external substances like dust, gases, liquids among others. Air pollution can be both outdoors (outside buildings) and indoor in buildings where we spend time home, offices, hospitals, classrooms among others. To help us understand the risk of air pollution, World Health Organization (WHO) through evaluation of various scientific evidence identified key pollutants with significant impact on human health. These include Particulate matter (PM) with sizes less than 2.5 and 10 microns; nitrogen dioxide (NO_2), ozone (O_3) and Sulphur dioxide (SO_2) from combustion of fossil fuels in vehicles, industries; dust and open burning of waste.

Estimates by WHO show that 91% of global population lives in areas with air quality that exceeds the guidelines limits[1]. In addition, 4. 3 and 3.8 million annual deaths are estimated to be due to outdoor and indoor air pollution respectively[2]. Uganda is not an exception to health impacts caused by poor air quality. In 2016, WHO estimated that Uganda had 13,416 and 23,364 ambient and indoor air pollution related deaths[2]. The deaths were as a result of diseases caused or exacerbated by exposure to air pollution.

Kampala City is a fast growing City with a resident population of 1.5 million and day population estimated to be 3 million people. This has affected heavily the City's services through urban planning, pressures on roads by heavy traffic jams, poor waste management, industries in residential areas among others. These factors serve as drivers for air pollution in the City.

A mix of measures by various stakeholders including government, the public and development partners will be required to ensure clean air for Kampala City. Kampala Capital City Authority (KCCA) in collaboration with Makerere University and United States government Embassy, have been collecting and analyzing air pollution data using passive and continuous monitors. The results show high levels of particulate matter 2.5, 10 and NO_2 pollution both exceeding WHO guidelines limits. The sources of particulate matter have been identified as dust, vehicle emissions and open waste burning. Indoor air pollution is mostly due to use of biomass for cooking. Nitrogen dioxide emissions are mainly from vehicles, and some stationary sources including industries around the City. Areas with high traffic in Kampala have high levels of NO_2 due to vehicle emissions (Figure 1).
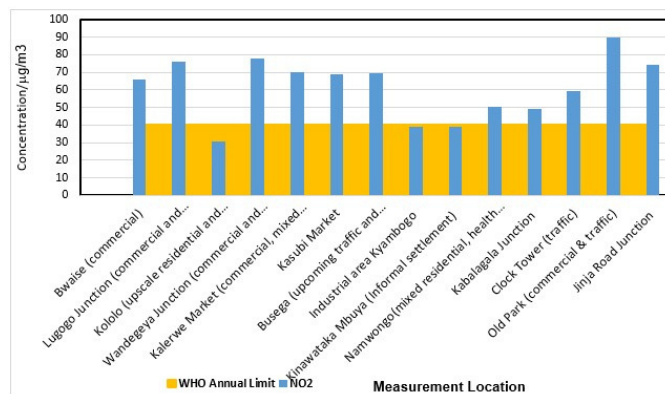
Figure 1:Baseline NO_2 levels in selected sites in Kampala city, 2018

With support from European Union, KCCA developed a monitoring network to collect data on air pollution and identify sources of air pollution so as to develop interventions to reduce the emissions for public health and environment protection. Five air quality monitoring sites were selected from each of the five divisions of Kampala, making a total of 25 air quality monitoring stations. The sites were selected based on land use pattern, level of traffic, access, security and population density in the area (Figure 2).
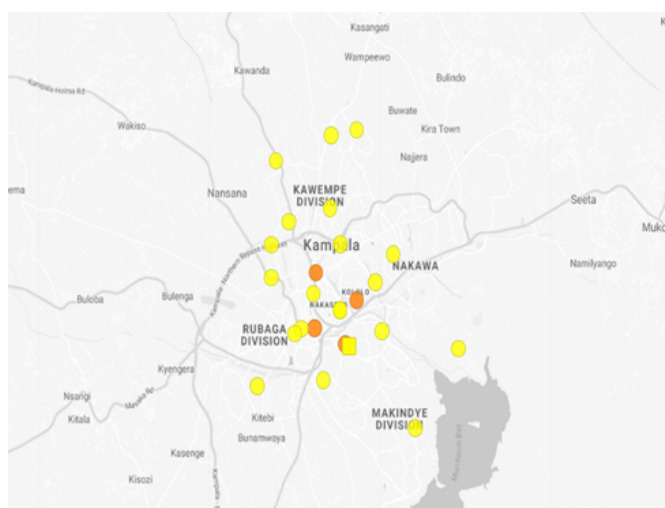
Figure 2:Distribution of continuous air quality monitoring stations in Kampala Capital City Authority

Monitoring air quality and implementing interventions to reduce pollutant sources are key to achieving clean air for Kampala. This will be beneficial to public health but will also improve the City's competitiveness to attract tourism and investment opportunities that contribute to improved local economic development.

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Public Health Emergencies

Aside COVID-19 Pandemic, other Public Health Emergencies have occurred from January to May 2020.

Uganda
February 2020, 8 laboratory confirmed cases of yellow fever in Bullisa (3), Maracha (1) and Moyo (4); including 4 deaths (Case Fatality Rate of 50%)

Elsewhere
- April/May 2020, Ebola Virus Disease in The Democratic Republic of Congo
- May 2020, Measles in Burundi
- May/April/February 2020, Middle East Respiratory Coronavirus (MERS-CoV) in The Kingdom of Saudi Arabia
- April 2020, Measles in Mexico
- April/March 2020, Dengue fever in France
- April 2020, Yellow fever in Ethiopia, Republic of South Sudan
- March 2020, Middle East Respiratory Coronavirus (MERS-CoV) in Qatar
- March 2020, Measles in The Central African Republic
- February 2020, Dengue fever in Chile
- January 2020, Middle East Respiratory Coronavirus (MERS-CoV) in The United Arab Emirates

COVID-19 Community Surveillance: Experiences from an Urban Setting in Kampala City

Authors: *Louis Nyende[1], Yahaya Kayemba[1], Alex Ndyabakira[1,2], Daniel A. Okello[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda

 *Correspondence: lnyende@gmail.com

COVID-19 was declared a global pandemic on March 11, 2020. Uganda confirmed its first case on March 21, 2020. Ministry of Health (MOH) instituted a number of strategies to curb its spread. These included active search for all at risk people such as international travelers and contacts for screening and testing, banning of cross border movement of people, and restrictions on mass gatherings. In the Kampala urban division of Makindye, active COVID-19 community surveillance was initiated on March 23, 2020.

Coordination meetings were hosted routinely and remotely, most of the time via internet on a WhatsApp platform dubbed "Makindye COVID-19 response team". The surveillance activities were part of the division COVID-19 response that was coordinated by the division task force.

The task force was broad based comprising fifteen members of which six were surveillance officers (among them nurses, laboratory & data personnel), two were health inspectors/educators, two Data officers, two social workers, two clinicians (physician and clinical officer) and one laboratory officer. Response phone numbers for the division medical officers and Kampala Capital City Authority (KCCA) emergency response center toll-free/hotline numbers were disseminated widely to the community through mass media and on KCCA website/ social media platforms, to enhance response to calls and alerts on COVID-19 suspects and high-risk travelers. Incoming community alerts were continuously shared in the division surveillance WhatsApp group and dispatched to the teams to initiate response. In addition, MOH shared a list of high-risk travelers and contacts of confirmed cases for follow up. The teams were reconstituted with members from the UPDF to boost the exercise. In the community, the village health team member (VHT) introduced the team to the household head before surveillance activities could proceed. A daily report was com-piled and submitted to the KCCA central command center.

By May 7, 2020 we had responded to 205 community alerts, tracked 485 high risk travelers and 14 contacts of confirmed cases. We collected 117 samples from community alerts, 232 from high risk travelers and 14 from contacts of confirmed cases.

Figure 2:Laboratory personnel picking samples in one of the urban centers as part of the surveillance activities.

The key challenges faced by the teams included incorrect phone numbers that were given by the Ministry of Health for some of the high-risk travelers and contacts.

When the team called or sought to verify the number given, the names were different. Some of the contacts switched off their phones and this made tracking difficult. Other contacts out rightly refused sample collection.
In the future, for similar epidemics, we should consider upscale of online or remote platforms for adequate planning and trainings for community surveillance teams and enhanced communication strategies that can ensure and promote community acceptability.

Hepatitis Day Message

Hepatitis B is a potentially life-threatening liver infection caused by the hepatitis B virus (HBV). It is a major global health problem, estimated to have resulted in 887,000 deaths in 2015. It can cause chronic infection and puts people at high risk of death from cirrhosis and liver cancer. A safe and effective vaccine that offers a 98-100% protection against hepatitis B and is readily available country-wide. Preventing hepatitis B infection prevents the develop-ment of complications including the develop-ment of chronic disease and liver cancer.

World Malaria Day Message

According to the World Health Organization, in 2018, 6 countries accounted for more than half of all malaria cases worldwide: Nigeria (25%), the Democratic Republic of Congo (12%), Uganda (5%), and Cote d'Ivoire, Mozambique and Niger (4% each). In commemoration of the World Malaria day on 25 April, 2020, the need for continued investment and sustained political commitment for malaria prevention and control was highlighted. During this year's Malaria day celebrations, WHO underlined the critical importance of sustaining efforts to prevent, detect and treat malaria, alongside all other endemic illnesses such as TB, HIV/AIDS, Typhoid, Hepatitis B, etc. while aggressively responding the COVID-19 pandemic. The Ministry of Health's National Malaria Control Program (NMCP) has tackled urban malaria control in Kampala city by upscaling interventions that included filling puddles, introducing larvivorous fish in water bodies such as ponds, streams etc., improving drainage, vector control through spraying and use of appropriate insecticide treated nets and advocating for malaria control funding.

World Air Quality Awareness Week (May 4-8, 2020) Message

This celebration encourages countries and most especia-lly cities and urban centers such as Kampala to care about pollution and air quality. The goal of this year's celebration was to encourage cities to check their Air Quality Index (AQI) daily. Kampala Capital City Authority in partnership with Makerere University and the US Embassy are closely monitoring Kampala's air quality in real time. This is to ensure that we have reliable and accessible data that can be used as a vital step to improv-ing Kampala's air quality and helping city dwellers take actions to protect their health especially in the most polluted areas.

Upscaling Coverage of Handwashing Facilities in Response to the COVID-19 Pandemic in Kampala

Authors: *Richard Mutabazi[1], Jude Byansi[1], Alex Ndyabakira[1,2], Eva Nalwanga[1], Daniel A. Okello[1], Najib L. Bateganya[1], Allan Nkurunziza[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda

*Correspondence: **rmutabazi@kcca.go.ug**

Background

Proper hand washing is known to provide primary prevention against a wide range of diseases. There is indisputable evidence that regular hand washing with soap and water or alcohol-based sanitizers prevents the spread of COVID-19. Improved hygiene through hand washing with soap and water can single-handedly reduce the risk of diarrhea by (42-48)% (Mbakaya et al., 2017). Following the confirmation of the first case of COVID-19 in Uganda on 21st March 2020, there have been enhanced campaigns and intervention strategies to improve hand washing practices among dwellers of Kampala city. This article presents the approaches we designed and implemented to scale up access to hand washing facilities in highly congested urban environments within Kampala City. In addition, the authors provide some critical insights on the sustainability of scaling up the hand washing facilities and campaigns during and the beyond COVID 19 pandemic

Approaches for Scaling Up the citywide Hand washing Campaign

First, the Water, Sanitation and Hygiene (WASH) subcommittee of the Kampala city COVID-19 Task Force was established coordinated by the Directorate of Public health and Environment. The task force comprised of environmental health officers, epidemiologists, medical officers, social workers, health inspectors, communication specialists, together with multiple partners. The team made hand washing a priority intervention having been identified as a key COVID-19 prevention measure globally. The key intervention strategies included: Identification of vulnerable communities who included the transient public and communities in the informal settlements; mobilization of internal and external resources for implementation of priority interventions; Identifying locations to place handwashing stations in public spaces; Installation program was done in corroboration with the Covid-19 Task forces within each Kampala division.

Achievements

The WASH task force ensured that all KCCA facilities (the KCCA headquarters, 8 KCCA Health Centres, 5 urban division administrative offices, 2 stores, 1 mechanical yard, 1 guest house, employment Bureau) were installed with hand washing stations and supplied with water and liquid soap. For each facility a staff was nominated to ensure the hand washing stations are replenished with water and soap at regular intervals and all people accessing the premises were required to wash hands. Standard operating procedures (SOPs) were put in place to guide hand washing. In addition, 343 locations across the city were identified where hand washing stations were supposed to be installed. These were selected based on high concentration of transient populations. These locations included entrances to markets, passenger pick up points, busy bus stops and taxi stages. All premises accessible to the public were required to install hand-washing stations at the owner's cost. These were routinely inspected by KCCA to ensure adherence to the hand-washing SOPs. Our actions are attracting both new and old partners joining in the drive to avail hand washing facilities. We are standardising designs for both fixed and mobile hand washing stations as new and innovative designs come up.

By mid-May, out of the 343 points identified, only 75 (22%) have been successfully installed with Hand washing stations of capacities ranging from 150- 500 litres. The distribution of public hand washing stations in the city is shown in the map below. It can be observed that there are many hand washing stations, evenly distributed across the city compared to the pre-COVID-19 pandemic era. The map does not include private installations. This has resulted into improved hand washing practices among the people in the city.

Figure :The distribution of public hand washing stations in the city

Conclusion
The coverage of public hand washing facilities at targeted points in Kampala city during COVID-19 was low at only 22%. Nevertheless, the Hand washing practices among Kampala city dwellers have improved remarkably due to increased risk communication and social mobilization. Some of the challenges that we have encountered included ensuring consistent and sustained supply of water, poor drainage systems and ensuring that the beneficiary institutions consistently provided amenities such as soap amenities such as soap, water, sanitizers etc. Beyond COVID-19 pandemic, there is need for innovative strategies to sustain these practices and improve provision of amenities.

Acknowledgements
Appropriate Technology Centre (ATC), Map Uganda, Water Aid Uganda, VIVA CONAGUA, MOVIT Uganda, Water for People, Uganda Water and Sanitation NGO Network (UWASNET), Uganda Hand Washing Initiative, National Water and Sewerage Corporation (NWSC), UNICEF, Rotary Uganda and many other partners and community members.

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Solid Waste Generation Trends during COVID-19 Pandemic in Kampala city

Authors: *Joel K. Mwesigye[1], Brian Bukenya[1], Alex Ndyabakira[2], Obed Lutakome[1], Jude B. Zziwa[1], Najib L. Bateganya[1]

[1]Directorate of Public Health and Environment,Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala Uganda

*Correspondence: jmwesigye@kcca.go.ug

Introduction
World Health Organization (WHO) declared the ongoing COVID-19 a public health emergency of international concern in January 2020. Uganda confirmed the first case on 21st March 2020 and a number of measures were instituted to curb its transmission effective from 19th March 2020. The current COVID-19 pandemic raises new challenges regarding municipal waste management practices and procedures. It is not uncommon that during such an outbreak, many types of additional medical and

hazardous waste are generated, including infected masks, gloves and other protective equipment, together with a higher volume of non-infected items of the same nature. Unsound management of this waste could cause unforeseen negative effects on human health and the environment. The safe handling, and final disposal of this waste is therefore a vital element in an effective emergency response. The following trends in waste generation have been observed since restrictions to contain COVID-19 pandemic were instituted. The case of Kampala is no different from measures taken by other cities to respond to the current coronavirus epidemic, clustered around six categories: Communication and awareness raising, Workplace and commuting; Social distance; Vulnerable groups; Local service delivery and Support to business. Within its mandate, KCCA has guaranteed municipal solid waste management, with more focus on free collection services in the vulnerable residential parts of the city but not necessarily separated for specific types of waste.

Figure 1:Free collection services in the residential parts of the city to minimize heaps of illegal dumpsites and open burning of unmanaged garbage in communities

In addition, landfill-based waste picking activities and resource recovery have been suspended.

Figure 2: Wastepickers-free waste disposal operations at Kiteezi Landfill

Citing adaptability and flexibility in our operations since mid-March 2020 in keeping operations going, more so than following a pre-existing plan, this article aims to explore the solid waste generation trends in Kampala during COVID-19.

1.   Reduction in waste generated
When the central government banned public/private transportation and instituted a lockdown on 1st April requiring people to stay home, non-essential commercial activities were severely negatively affected. The drastic reduction in commercial activities in the central business (CBD) and surrounding suburbs grossly reduced commercial waste generation. Over all, the lock down due to COVID-19 pandemic has led to 20% reduction in waste (fig 1).
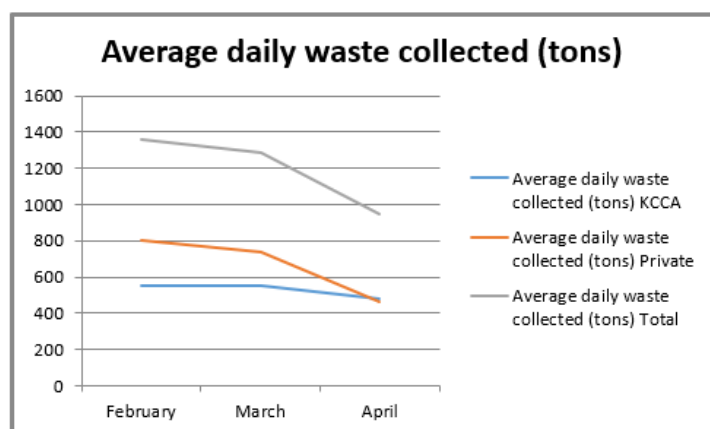

Figure 3: Trend in waste collection in Kampala shows a 20% drop over the last two months (March and April 2020)

2.   Increased domestic waste
The generation of waste is directly accompanied by the land use pattern. The stay-home policies established in the country, have led consumers to increase demand for online shopping for home delivery. Consequently, organic and inorganic waste generated by households has increased. With limited waste segregation at source, mixed non-homogenous waste with low quality for recycling is collected for disposal at the landfill.

3.   Reduction in waste
recycling Waste resource recovery from collection trucks and landfills has always been a major source of inputs for the recycling industry. As a result of the COVID-19 pandemic lockdown, recycling activities were stopped, as authorities have been concerned about the risk of COVID-19 infested waste material spreading among waste handlers (including recyclers).

Figure 4: These landfill waste pickers' smiles didn't last long as their work could not continue amidst the COVID-19 public health guidelines

Conclusion
There has generally been a reduction in solid waste generation during the COVID-19 lockdown in Kampala. Much as this reduction in waste generation is temporary, it could have an impact on the total concentrations of greenhouse gases in Kampala's atmosphere. On the other hand, the increase in medical waste generated during the COVID-19 pandemic control such as contaminated masks and gloves, used or expired medications can easily be mixed with domestic non-hazardous municipal solid waste. However, safe management of these should ensure these critical waste materials are segregated, collected, treated and disposed of separately by competent specialized operators.

The Impact of COVID-19 Prevention Measures on Markets in Kampala city

Authors: *Emilian Ahimbisibwe[1], Jeffrey Drani[1] Peter Ssetenda[1], Alex Ndyabakira[1,2], Najib L. Bateganya[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda.

*Correspondence:eahimbisibwe@kcca.go.ug

Introduction
The coronavirus disease (COVID-19) was first announced in Wuhan city, China and was subsequently imported across the globe. By early May, there were 3.9 million cases with 270,720 fatalities (7%). Having declared the first COVID-19 case on March 21 2020, Uganda had 121 cases by May 11th. Ministry of health in Uganda instituted several measures to prevent the spread of the virus.

One of the major key measures was to decongest crowded areas, such as schools, markets, places of worship, bars and public transport. In fact, a lockdown was finally effected to further restrict movement of people. However, due to the anticipated socioeconomic and welfare issues associated with the lockdown, food markets were included among essential services and allowed to continue operating, albeit with strict measures guided by the Ministry of Health. These standard operating procedures (SOPs) included strict observance of social distancing, hand washing and practicing of safe sanitation. Just like other markets in the countrywide, the markets in Kampala mainly deal in agro-based food products from farms and nonfood items. The markets are comprised of temporary wooden structures and some items are sold on bare ground exposing them to potential contamination. The markets tend to attract many people from within and outside Kampala city hence the characteristic overcrowding. Besides the numerous vendors and customers, other categories of people who routinely transact in the markets include suppliers, loaders and off loaders of produce/ goods, cleaners and members of the market committees. This has led to an overwhelming market population that strains the existing but inadequate space and sanitary facilities (figure 1).

Figure 1

Figure 1. Top & Bottom: A section of Kalerwe Market in Kawempe Division before the Covid-19 outbreak. This puts the market population at risk of various forms of infections such as, water and food borne diseases.

In this article we present some of the approaches KCCA has taken to reorganize the markets and enforce COVID 19 measures to reduce risks of transmission and food contamination. Crowded food stalls were reorganized to two-meter distance a part, hand washing facilities were placed at all market entry points and all markets in Kampala were fumigated against mosquitoes and other crawling insects. It is envisaged the transformation of these essential work spaces can be a benchmark for making them safer for the vulnerable high population groups that operate therein.

Methods

We disseminated SOPs on COVID-19 prevention from MOH widely within Kampala city through community radios, speakers mounted on media vans, mass and social media and using posters in all markets. Risk communication was done by a trained team from KCCA headquarters. We issued directives on mandatory social distancing between traders and customers. The City Authority also installed hand washing facilities with soap to the markets and ensured constant water supply to all points at all times. The markets were routinely fumigated and vendors who sleep in the markets were supplied with insecticide-treated bed nets. We used photo voice to document the process. The markets were closely moinitored and nuisance notices served to the management committees to ensure compliance with the SOPs.

Results

Overcrowding has been extensively reduced. Spacing between the vendors has increased to four (4) meters. Easy access and movement within the market setting has been achieved. The market management committees have also been empowered to enforce hygiene measures related to reducing risk of COVID-19 transmission. Roadside market/vending around Kalerwe market was eliminated. Improvement in the market sanitation following erection of makeshift stalls especially in Kalerwe market has greatly reduced the risk of food contamination (figure 2).

Figure 2.Top & Botttom Improved spacing between the established Kalerwe Market stalls Vendors in Nakasero market, Newly

Conclusion

The COVID-19 pandemic prevention measures have positively impacted on the sanitation and hygiene of markets in Kampala city thereby reducing the risk of COVID-19 transmission coupled with other WASH related diseases. However, there is need to design innovative strategies to sustainably maintain the gains achieved such as foot operated hand washing containers, effective management of long ques or crowds, improved access to masks, etc.

Leveraging Geographic Information Systems (GIS) to Effectively Respond to COVID-19 Pandemic in Kampala city.

Authors: *Ivan Bamweyana[1,3], Elizabeth Katana[1,2], Patrick Ojirot[3], Moses K. Atwine[3], Daniel A. Okello[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda
[3]Directorate of Physical Planning, Kampala Capital City Authority, Kampala, Uganda

*Correspondence: ibamweyana@kcca.go.ug

Both the 'who' and the 'when' of disease patterns are relative to and often dependent on the 'where'. Geographic Information Science, Software, Systems (collectively known as GIS) and technologies are one of the response tools epidemiologists use in defining and evaluating the 'where '. In essence, making the location a holy grail in combating the outbreak. The spread of COVID-19 like any other disease is inherently spatial. GIS synthesizes sophisticated algorithms, spatial analysis, geo-statistics and modelling, making its technology a powerful tool for the prediction of disease patterns and parasite ecology associations. Its ability to access, share and utilize satellite and remote-sensing data has made possible even wider understanding of health processes, population and of their links to the environment. This has consequently enabled public health professionals to evaluate and quantify the relationships between health-related variables and enviro-nmental risk factors at different geo-graphical scales. To support the public health response to COVID-19 pandemic , GIS provides a set of tools for surveillance, situational awareness, logistics, and communication. The resultant maps and location intelligence provide deeper understa-nding and insights needed to address rapidly changing conditions around the impacted areas making the invisible visible. In this case, GIS is used to observe, understand and guide response to the pandemic (as shown in figures 1 and 2).

Figure 1: The KCCA Based country monitoring GIS Dashboard

Figure 2: The KCCA City wide COVID-19 infections monitoring dashboard by division

In a recent vulnerability study by the KCCA GIS Section, Institution of Surveyors Uganda (ISU) and Department of Geomatics and land management Makerere University, the vulnerability to COVID-19 in the Greater Kampala Metropolitan Area (GKMPA) was scaled to the parish level as shown in figure 3.

This was useful for COVID-19 related policy decisions such as distribution of food and relief items during lock down.
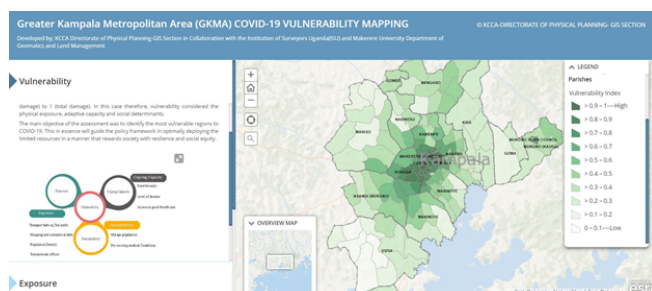

Figure 3: Greater Kampala Metropolitan Area COVID-19 Vulnerability Mapping

Emphatically, for a GIS to effectively be used for response, there is need to; i) Map the cases -Map confirmed and active cases, deaths, and recoveries to identify where the infections exist and have occurred. ii) Map the spread-Time enabled maps can reveal how infections spread over time and where you may want to target interventions. iii) Map vulnerable populations- COVID-19 disproportionally impacts certain demographics such as the elderly and those with underlying health conditions. Mapping social vulnerability, age, and other factors help you monitor at-risk groups and regions you serve. iv) Map your capacity- Map facilities, employees or citizens, medical resources, equipment, goods, and services to understand and respond to current and potential impacts of the epidemic. v) Communicate with maps-Use interactive web maps, dashboard apps, and story maps to help rapidly communicate your situation to enhance situational awareness. Effective GIS response surveillance systems are therefore pivotal in; providing early warning systems for public health emergencies, assess the impact of interventions or evaluate progress towards specified goals, and monitor trends in the development and proliferation of health threats, informing the prioritization of issues, allocation of resources, public health policy and strategies. The leveraging of GIS in supporting and closely monitoring the COVID-19 response at KCCA can be explored through this link, https://coronavirus-response-19-ctf-kcca-gisservices.hub.arcgis.com/

The Contribution of the 21st Century Communication Technology in Uganda's Response to COVID-19

Authors: *Elizabeth Katana[1,2], Alex Ndyabakira[1,2], Geoffrey Amanya[2], Richard Migisha[2], Daniel A. Okello[1]

[1]Directorate of Public Health and Environment, Kampala Capital City Authority, Kampala, Uganda
[2]Uganda Public Health Fellowship Program, Ministry of Health, Kampala, Uganda

*Correspondence: ekatana@kcca.go.ug

Communication is an essential and indispensable component of preparedness and response to public health emergencies. Given many previous public health emergencies over the years, Uganda is now far more prepared than in the past, even when we are more interconnected as a global village with evolved, efficient and better communication systems of the 21st century dubbed as "Cambrian explosion of communications technology" (BNPP Australia, 2017). Communication systems of this era including social media platforms, televisions, radio, mobile phones etc. are by far fast evolving with improved efficiency, creativity, innovation, multi-sectoral collaborations, artistry, curiosity, imagin-nation, personal expression, adaptability, reliability and accessibility compared with the 20th century technology of the 1900's.

20th century systems were majorly analog and nearly inaccessible by many Africans including post mails, radio, analog TVs, among others. The inefficiency of these analog communication systems of the 1900s, coupled with inadequate accessibility in Africa, have been somehow associated with the poor documentation and investigation of large influenza pandemics in the past including the devastating "Spanish' influenza of 1918-1919 that is speculated to have wiped out nearly 2 percent of Africa's population in just six months (Okeke, 2012; Phillips, Howard, 2014). The presence of improved and efficient communication systems has been recently appreciated and credited with improving the public health attention, concern and change in Africa's HIV/AIDS pandemic of the early 1990's.

In Uganda's COVID-19 response, the state leaders, public health authorities, public and stake holders have engaged in variety of information generation and communication efforts to continuously inform the general population, encourage them, built trust and also monitor the progress of events. Soon as China notified the World Health Organization of an outbreak of a pneumonia of unknown origin, risk communication efforts were upscaled for several weeks to ensure the public could access and use all the important information before Uganda confirmed her first case of COVID-19 on March 21, 2020. The COVID-19 lockdown has required many Ugandans to adjust their routines remarkably regardless of social inequalities, economic status, physical and mental incapability, etc. hence the need for rapid generation and routine dissemination of information. However, we cannot ignore the undeniable positive contribution of the 21st century communication systems in Uganda's COVID-19 response and preparedness.

Lately if Ugandans want to freely air out their opinions or consume information, they are presented with a wide range of possibilities such as, social media platforms, mobile phones, landline phones, TV, radio, electronic mail, post mail, etc. The online connected world has presented us with possibilities for growth and instant delivery of communication during the COVID-19 lockdown. The Ministry of Health (MoH) and government officials frequently and freely distribute official and crucial information through social media platforms such as Twitter and Facebook. The public keeps track of the lockdown and presidential directives at the comfort of their homes mainly through Television, radios, web searches and social media platforms. Digital systems have allowed the continuity of essential services during the lockdown including electronic banking services and payment of utilities, some people are able to work from home using their personal laptops, online shopping and deliveries, electronic distribution of school packages through newspapers and web pages, and many public health surveys and researches have been conducted through online and web platforms. Improved communication systems have also contributed positively to the access to quality health care by Ugandans and epidemic response by MoH over the years, with the ability to communicate risks, diagnose and pick up early warning signals and symptoms of many epidemic prone diseases. The COVID-19 Task Force at KCCA has been able to track contacts of confirmed cases and high risk travelers using GPS locators, utilized Mobile apps like the Go App for data collection and management, coordinated ambulance dispatches and referrals using online platforms such as WhatsApp, used technology and mobile devices to link health facilities, trainings for health workers and meetings have been conducted successfully on online platforms and also logistics have been managed electronically.

Whilst being able to positively contribute on the COVID-19 response, this evolution of communication systems and complexity of some can also bring forth some negative unintended effects. The spread of rumors, myths, gossip, conspiracies unreliable and false information pauses a challenge on public health efforts that can potentially pull down the positive contribution of some of these platforms. The increased access to health information on several communication platforms has been linked with the recent rise in poor use of medicines such as antibiotics to treat infections leading to antimicrobial resistance which has been a turning point for public health and communications in the 21st century.

Moving forward, public health authorities should consider upscale of legal channels that can effectively verify information and address the possible negative contribution of these communication systems as we expect communication technology to probably evolve more in the coming decades. Some the COVID-19 response strategies that were not easy to execute such as institutional quarantine, self-isolation, contact listing and tracing, etc. can be evaluated to cater for the public's expectations and opinions, to allow better risk commu- nication in a future similar epidemic. For successful prevention and management of future outbreaks, it will be wise and important to invest in primary and community healthcare systems formally linked with adoption of some of the 21st communication technologies such as Whats-App, Facebook, Twitter, Email, etc., with deep insight into local public health communication needs, and trainings for community health care providers.
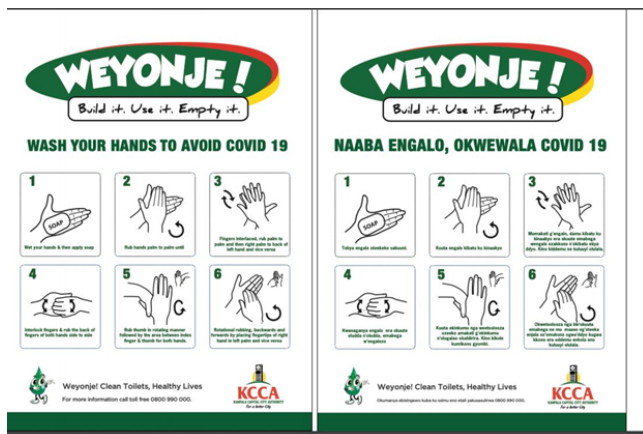
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Acknowledgements

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KCCA COVID - 19 Response Hub

This COVID-19 Response Hub is designed to aid real-time monitoring, to catalogue GIS data that supports mapping and analysis, and to increase overall community preparedness with general public health resources and media stories related to COVID-19 outbreak in Uganda.

Uganda`s COVID-19 Statistics

Confirmed Cases	Active Cases	Deaths	Recovered
457	385	0	72
Source: Ministry of Health Uganda	Source: Ministry of Health Uganda	Source: Ministry of Health Uganda	Source: Ministry of Health Uganda

GIS COVID-19 Coronavirus Response Applications

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Please visit the KCCA COVID-19 Response Hub

https://coronavirus-response-19-ctf-kcca-gisservices.hub.arcgis.com/