International

CPHIA | 2021

Conference on Public Health in Africa

ABSTRACT BOOK

1ST INTERNATIONAL
CONFERENCE ON PUBLIC HEALTH IN AFRICA

CPHIA 2021 | 14–16 DECEMBER 2021

African Union

AFRICA CDC
Centres for Disease Control and Prevention
Safeguarding Africa's Health

FOREWORD

The first international Conference on Public Health in Africa (CPHIA 2021) was hosted virtually by the African Union (AU) and Africa Centres for Disease Control and Prevention (Africa CDC) from 14-16 December 2021. This historic three-day conference focused on the need to address long-standing health challenges on the continent, including vaccine inequity and manufacturing capacity, the ongoing COVID-19 pandemic, and the need to build resilient health systems.

Support and political commitment to CPHIA 2021 and the AU New Public Order was evident in the opening and closing ceremonies, which included African Heads of State and leaders of Government, as well as key leaders of international health agencies.

Across seven scientific plenaries, nine parallel sessions, two special sessions, and eight abstract driven sessions, CPHIA 2021 had 232 African policymakers, scientists, public health experts, data experts, and civil society representatives who presented the latest learnings and research from the COVID-19 pandemic, as well as the actions needed to better guard against current and future health crises. In addition, 40 parallel side events were hosted by various health institutions and agencies.

Throughout the pandemic, many African countries have demonstrated tremendous leadership, acting quickly to limit the impact of the virus. However, Africa's dependence on international sources for vaccines, drugs, diagnostics, and health supplies has made it difficult for governments to mount a fully localized response.

There was an overwhelming consensus that it is time for change – Africa must stand up, Africa must unite, and Africa must put in place the necessary systems for it to safeguard the health of its people. Despite the immeasurable human cost and unintended economic implications, COVID-19 has created a historic opportunity for the African continent to build a new public health order – one that can secure Africa's future and guarantee its continued development.

We are grateful to the Africa CDC for all of their efforts to improve public health in Africa, including spearheading CPHIA; and to the members of the Organizing Committee for their constant support and contributions in planning this conference.

We are excited to announce Rwanda as the host for CPHIA 2022, from 13-15 December 2022. We hope to see you there in person!

Professor Agnes Binagwaho, MD, M(Ped), PhD
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Vice Chancellor and Professor of Pediatrics
University of Global Health Equity
Kigali, Rwanda

Professor Senait Fisseha, MD, JD
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70. **Yenew Kebede Tebeje, MD, MSc, MPH** – Africa CDC, Ethiopia

71. **Yvonne Mburu, PhD** – Nexakli, Kenya

OPENING AND CLOSING CEREMONIES

CPHIA 2021 received strong political support with several Heads of State and Government and key leaders of regional and international agencies endorsing the inaugural conference, and fully supporting the call for a New Public Health Order for Africa.

Opening Ceremony
- **H.E Félix Antoine Tshisekedi Tshilombo,** President, Democratic Republic of Congo; Chairperson of the African Union
- **H.E. Paul Kagame,** President, Rwanda; AU Champion for Domestic Health Financing
- **H.E. Moussa Faki Mahamat**, Chairperson, Commission of the African Union
- **Dr. Matshidiso Moeti**, Director, WHO Regional Office for Africa
- **Prof. Agnes Binagwaho**, Co-Chair, CPHIA 2021; Vice Chancellor and Professor of Pediatrics, University of Global Health Equity
- **Prof. Senait Fisseha,** Co-Chair, CPHIA 2021; Director of Global Programs, The Susan Thompson Buffett Foundation
- **Dr. John Nkengasong**, Director, Africa Centers for Disease Control and Prevention (Africa CDC)

Closing Ceremony
- **Shingai Machingaidze**, Senior Science Officer, Africa CDC
- **Dr. John Nkengasong**, Director, Africa CDC
- **Dr. Tedros Adhanom Ghebreyesus**, Director General, World Health Organization (WHO)
- **Dr. Olive Shisana**, Special Policy Advisor to the President of South Africa
- **Dr. Daniel Ngamije**, Minister of Health, Rwanda

Master of Ceremonies: *Zain Verjee, Zain Verjee Group*

PLENARY AND PARALLEL SESSION SUMMARIES

As part of the seven scientific tracks for CPHIA 2021, we had the privilege of hearing from 232 African policymakers, scientists, public health experts, researchers, data experts, and civil society representatives.

Plenary Session 1: Epidemiology of SARS-COV-2, Virology, Prevention and Clinical Management

While the African continent was predicted to be particularly vulnerable to COVID-19, African populations appear to have thus far evaded widespread morbidity and mortality due to the virus. This track assessed how the pandemic has unfolded on the African continent, discussed possible biologic mechanisms that may have mitigated the impact of the disease, identified areas of particular need for future research in the African setting, and discussed the future of COVID-19 in Africa.

Plenary Session 2: Vaccination in Africa: Research Capacity, Advocacy, Manufacturing and Distribution

As the world looks toward preparing for future health threats, African countries need to strengthen their vaccine manufacturing capacities by bolstering regulatory agencies, developing the necessary human resource potential and attracting financial and technical investment. This track explored the current state of COVID-19 vaccine distribution in Africa and the way forward, as well as the future of vaccine manufacturing on the continent.

Plenary Session 3: COVID-19 and Equitable Health System Strengthening in Africa

African countries and continental public health institutions have had to develop innovative approaches to meet the challenges presented by the COVID-19 pandemic – from a rapid expansion of diagnostic capacity and genomics, to pooling resources between nations and across the public-private sector. This track explored case studies that can inform innovative approaches to building strong health systems in Africa.

Plenary Session 4: The Case for a New Public Health Order for Africa

The proposed New Public Health Order is an urgent call for Africa to strengthen public health institutions, decentralize public health engagements for more efficient implementation, bolster capacity for local production of vaccines, therapeutics and diagnostics, while creating significant investments in the health workforce and leadership programs, and building respectful public-private partnerships. This track will focus on two tenets of the New Public Health Order: building the capacity of the Africa CDC and National Public Health Institutes and investing in the public health workforce.

Plenary Session 5: Assessing the Response to COVID-19 in Africa to Prepare for Future Health Threats

While African countries have responded relatively well to the pandemic, the continent has faced a variety of challenges, including in some instances weak leadership; restrictions in the global supply chain with insufficient test kits, personal protective equipment and vaccines; and misinformation. This track examined the effectiveness of Africa's response to the COVID-19 pandemic and highlight key successes, challenges and lessons learned to prepare for future health threats. It will also explore ways to prevent the severe unintended economic and social consequences that often follow health crises such as COVID-19.

Plenary Session 6: Digitisation, Modeling and Analytics to Support an Effective Public Health Response to the COVID-19 Pandemic

The COVID-19 pandemic has accelerated the advent of digital tools and technologies for public health messaging, epidemiologic surveillance, screening and diagnosis for rapid case identification, interruption of community transmission and clinical care delivery. This track explored how digitisation, modelling and analytics can be fruitfully employed to sustain the public health goals of quality, accessibility, efficiency and equity in health care.

Plenary Session 7: Agenda 2063: Whole-of-society – Private Sector, Community and Leadership, Approach in Combating COVID-19 and Other Emerging Diseases

Effective partnerships and collaborations across all sectors will be critical to winning the fight against COVID-19. This track focused on what can be done to create and harmonize more effective platforms for public-private dialogue to strengthen health systems; the innovations and investments that should be prioritized to better prepare for and respond to future pandemics and outbreaks; how leveraging private sector supply chain best practices can improve health supply chains in low- and middle-income countries; the role of local leadership in effective testing and diagnostics; and community engagement best practices.

Special CPHIA Session: Developing, Producing and Delivering Oral Therapeutics for COVID-19

This session discussed the recent, exciting advances in the development of oral drugs for COVID-19. It was pointed out that we can leverage existing infrastructure and country resources to deliver new oral therapies, building on lessons from other health challenges – like HIV; and that it is essential that we drive attention, political will, and resources to ensure rapid, global access to these and other oral drugs for COVID-19.

Special CPHIA Session: COVID GAP - Joint Convening to accelerate Global COVID-19 Vaccinations

COVID Global Accountability Platform (COVID GAP) is led by Duke University and COVID Collaborative, together with the World Health Organization, UNICEF, Africa CDC, The Rockefeller Foundation, and the Bill & Melinda Gates Foundation

ABSTRACTS

CPHIA 2021 supported a closed call for abstracts on a specific set of pressing topics impacting health on the continent.

Abstracts were accepted for three of the conference tracks:

- Track 1: Epidemiology of SARS-COV-2, Virology, Prevention and Clinical Management
- Track 4: Assessing the Response to COVID-19 in Africa to Prepare for Future Health Threats
- Track 6: Digitisation, Modelling and Analytics to Support an Effective Public Health Response to the COVID-19 Pandemic

Across all three tracks, 152 abstracts were submitted and underwent a blind review process by at least three members of the CPHIA Organizing Committee. Of those, 40 were selected for oral presentations, while a further 58 were selected for CPHIA's virtual poster hall. Eight parallel sessions were organized for oral abstract presentations – Track 1 hosted four sessions, while Tracks 4 and 6 each hosted two. All presenters were allocated 10-minutes to share their findings.

Track 1: Epidemiology of SARS-COV-2, Virology, Prevention and Clinical Management

Track 1 included 20 abstract-driven oral presentations and 30 poster presentations. Oral presentation sessions for this track were held on Tuesday 14 December 2021 from 5:30 – 7:00PM EAT.

Oral Presentations – Session 1

The following abstracts were presented in Track 1 Parallel Session 1. The session was co-moderated by Dr. Dawit Wolday (Mekelle University) and Ms. Lolem Ngong (Amref Health Africa).

Long COVID in South Africa: Persistent symptoms in patients hospitalized with SARS-CoV-2

Dr. Murray Dryden, Medical Officer/ Principal Investigator, National Institute for Communicable Diseases

Introduction/ Background:
Despite a greater understanding of acute COVID-19 risk factors for severity and mortality, less is known about the long-term complications may arise after acute illness. Long COVID refers to a wide range of new, returning, or ongoing health problems experienced by COVID-19 survivors ≥4 weeks after initial infection with SARS-CoV-2.

Methods:
The aim of this study was to characterize physical and psychosocial sequelae in patients one month after hospital discharge, estimate the prevalence of and risk factors associated with Long COVID. In this prospective cohort study using the International Severe Acute Respiratory and emerging Infection Consortium multi-country protocol, patients ≥18 years who had been hospitalised with confirmed SARS-CoV-2 between December 2020 & August 2021 were interviewed at one month from hospital discharge with a standardised questionnaire for the evaluation of symptoms, health-related quality of life, functional and occupational status. Multivariable logistic regression models were used to determine factors associated with persistent outcomes.

Results:
In total, 2,410 previously hospitalised COVID-19 survivors were enrolled. Patients had a median age of 52 (IQR 41-61) and 1,280 (53.1%) were women. At one-month follow-up, 1,978 (82.1%) patients reported one or more persistent symptom(s). The most common symptoms reported were fatigue (64.9%), shortness of breath (34.8%), headaches (20.0%), weakness in arms or legs (18.8%) and confusion or lack of concentration (16.0%). Factors associated with new or persistent symptoms following acute COVID-19 illness were white (aOR 1.48; 95% CI [1.11-1.97]) and mixed race (1.90 [1.17-3.10]); ICU admission (2.53 [1.78- 3.62]); ≥3 comorbidities (1.90 [1.18-3.03]); and ≥4 acute symptoms (5.25 [3.82-7.21]).

Impact:
Hospitalised patients with confirmed SARS-CoV-2 infection are at a significant risk for persistent COVID-related symptoms after 1 month from hospitalisation which may necessitate additional post discharge follow up that is not typically necessary following acute viral infections. This may have additional impacts on the individual and collective economic output.

Conclusion:
The majority of patients reported persistent symptoms at one month from hospital discharge and that there is a significant impact of Long COVID on functional and occupational status. Significant risk factors included white & mixed race; ICU admission; ≥3 comorbidities and ≥4 acute COVID-19 symptoms.

All-cause and cause-specific mortality in Kilifi Health and Demographic Surveillance System, in Kenya in the period of the COVID-19 pandemic

Mr. Mark Otiende, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
COVID-19 impact on all-cause mortality in tropical Africa remains unknown. In Kenya, there were 3,000 COVID-19-attributabledeaths by May 2021. We used the Kilifi Health and Demographic Surveillance System (KHDSS) to monitor mortality among 300,000 residents in rural Kenya during the pandemic and investigated excess mortality.

Methods:
Using a negative binomial model, accounting for seasonality and trend, we fitted mortality data from 2010-2019 and predicted mortality in April 2020-May 2021. Excess mortality was calculated as [(observed-expected mortality)/expected mortality]-1. We examined the impact of the pandemic on 8 leading causes of death using Verbal Autopsy (VA). Finally, we calculated the anticipated number of COVID-19 deaths in KHDSS, in 10 age strata, as the product of the number of KHDSS residents, KHDSS seroprevalence of SARS-CoV-2 (see impact) and infection fatality ratios (IFR) from a meta-analysis of 28 populations, largely in Europe and America.

Results:
We observed 1424 deaths between April 2020-May 2021. Based on 2010-19 mortality, we predicted 1510 deaths (excess mortality -5.7%, 95% CI -9.8%, 1.9%). Mortality was significantly lower among children <5 years old (-26.2% 95% CI -33.5, -14.9%). By VA, there were fewer deaths attributable to acute respiratory infections in 2020, compared to 2010-19, in all age groups. External IFRs predicted 327 (95% CI 265-403) COVID-19-attributable deaths, which would represent an excess mortality of 22%.

Impact:
The impact of COVID-19 on all-cause mortality cannot be assessed without simultaneous evidence of COVID-19 transmission in the same population. A random sample survey of 850 KHDSS residents during December 2020-May 2021 has already reported seroprevalence of anti-SARS-CoV-2 IgG as 12% in children and 26% in adults, suggesting widespread transmission.

Conclusion:
The lack of mortality impact in Kilifi could be explained either by a compensatory reduction in all non-COVID-19 causes of death or by a substantially lower age-specific risk of death among individuals infected with SARS-CoV-2 in Kenya compared to Europe or America.

COVID-19 clinical presentation and SARS-CoV-2 viral kinetics in people living with HIV

Dr. Aida Sivro, Senior Scientist, Centre for the AIDS Programme of Research in South Africa

Introduction/ Background:
By August 2021, 6.2 million cases of COVID-19 have been reported in Africa, which has about 70% of the global burden of HIV. The purpose of this study was to assess SARS-CoV-2 viral load in people living with and without HIV.

Methods:
We screened 2174 ambulatory patients presenting at three primary healthcare facilities and enrolled 106 consenting individuals who tested positive for SARS-CoV-2 primarily during the second wave in Durban, South Africa. Participants were enrolled within three days of SARS-CoV-2 screening and were then followed up at day 7, 14 and 28, and at month 3 and 6 post screening visit. Data on SARS-CoV-2 Ct number, as well as laboratory parameters were collected blinded to HIV status.

Results:
All 106 participants presented with mild to moderate COVID-19. Thirty of 106 participants were HIV positive; 26 (86.5%) were on ART, of which 21 (77.8%) were virally supressed. Their CD4+ T-cell count ranged from 286 to 843 with the median 500 cells/mm3. In the HIV infected cohort, longer viral shedding was associated with having a CD4+ T cell count <500 at enrolment (adjusted hazards ratio: 0.31, 95% confidence interval: 0.12-0.80, p=0.015). We observed no significant differences in the clinical presentation and disease outcomes of HIV infected and HIV uninfected COVID-19 patients.

Impact:
Considering the implications that prolonged viral shedding could have on emergence of new viral variants and global vaccination efforts, HIV patients failing therapy should be prioritized for current prevention measures.

Conclusion:
Presence of HIV co-infection did not result in worsened clinical presentation in this cohort. Of note, we identified HIV infection with CD4 counts <500 as a potential driver of prolonged SARS-CoV-2 viral shedding.

[Estimation of Shedding Time in Laboratory-confirmed COVID-19 Cases in South Africa, 2020](#)

Ms. Carroll Tshabane, South African Field Epidemiology Training Programme

Introduction/ Background:
South Africa recorded its first COVID-19 case on 5 March 2020 and continues to report the largest number of cases in Africa. Determining viral shedding time is crucial in understanding COVID-19 transmission dynamics in South Africa. We aimed to estimate viral shedding time among laboratory-confirmed COVID-19 cases in South Africa.

Methods:
We performed a cross-sectional analytic study using COVID-19 data collected in 2020, obtained from the NMCList and DATCOV systems. These platforms report laboratory-confirmed and hospitalized COVID-19 patients, respectively. The study consisted of laboratory-confirmed COVID-19 patients with repeat positive PCR tests (at least two positive PCR test results) and who subsequently tested negative. We defined shedding time as the period from the first positive PCR test to the last positive test prior to a first negative PCR test result. To determine the association between shedding time and predictor variables, multivariate analysis was conducted and a p-value <0.05 was considered statistically significant.

Results:
We included 2752 cases. About 39.9% (1099/2752) of participants were inpatients and 60.1% (1653/2752) outpatients. The median shedding time was 17 days (range: 1–128). There was no significant difference in shedding time between males (median: 16 days, range: 1-128) and females (median: 17 days, range: 1–94) and between inpatients (median: 16 days, range 1–108) and outpatients (median: 17 days, range: 1–128). Individuals aged 0-4 years had the lowest shedding time (median: 14 days, range: 1–72). After adjusting for age, sex and province, shedding time was shorter for admitted cases compared to outpatients (coefficient: -0.14, CI: -0.24 — -0.03, P-value: 0.014).

Impact:
Our results will assist in refining COVID-19 infection control strategies and assist in the interpretation of repeat positive COVID-19 PCR tests over time. These results may also be used in facilitating early treatment and intervention, leading to a decrease in the incidence and mortality due to coronavirus disease.

Conclusion:
The duration of viral shedding within the population of South Africa varies from 1 to 128 days. Admission status is associated with SARS-CoV-2 shedding time. Our findings indicate that infection control strategies should take into account factors affecting shedding time such as disease severity.

[Temporal dynamics of SARS-COV-2 viral load and related antibodies in West African patients: the COVADIS cohort](#)

Ms. Sona Jabang, Laboratory Scientist, Medical Research Council Unit, The Gambia, London School of Hygiene and Tropical Medicine

Introduction/ Background:
The COVID-19 pandemic continues to challenge the world's population though morbidity and mortality seems to be lower in West Africa than in other parts of the world. We set up a cohort of COVID-19 patients to

determine the dynamics of SARS-CoV-2 viral load and related antibodies in West Africa.

Methods:
The study was carried out in Burkina Faso and The Gambia between Sep2020 and Sep 2021. Symptomatic patients confirmed by RT-PCR were invited into a 6-month follow-up with weekly up to day 28, then months 3 and 6. A 4-plex qRT-PCR was used to detect the N and E genes of SARS-CoV-2, and a multiplex serological assay for the detection of antibodies against SARS-CoV-2 Spike (S) and Nucleocapsid (NC) protein as well as other seasonal corona viruses. Analysis used mixed models allowing for a random intercept on subject and considering non-linear pattern of antibodies overtime adjusting for confounders.

Results:
114 COVID-19 patients were recruited (88 in Burkina Faso and 26 in The Gambia). Preliminary results show rapidly decreasing viral loads while the S & NC antibodies increased overtime peaking around day 21 since diagnosis. Though antibodies gradually decline after day 21, the relative gains in antibodies from day 0 were sustained even at day 90, particularly for the S protein. The estimated mean antibody titer (log10) rose from 3.66 (95% CI: 3.58 - 3.73) at admission to 4.11 (95% CI: 4.03 – 4.19) at day 21, then declined to 3.83 (95% CI: 3.75 – 3.91) at day 90.

Impact:
The COVID Luminex platform constitutes a powerful tool to accurately measure exposure to SARS-CoV-2 at population level, and to explore the relationship between SARS-CoV-2 antibody response and antibodies against other human seasonal coronaviruses viruses and/or other tropical pathogens.

Conclusion:
Our preliminary data suggest a rapid decline in viral load among SARS-CoV-2 patients while their serological response is sustained for weeks. The COVID Luminex platform constitutes a powerful tool measuring exposure to SARS-CoV-2, explore the

relationship between SARS-CoV-2 antibody response and antibodies against other seasonal coronaviruses viruses and tropical pathogens.

Oral Presentations – Session 2

The following abstracts were presented in Track 1 Parallel Session 2. The session was co-moderated by Professor Pauline Byakika-Kibwika (Makerere University/IDI) and Dr. Sofonias Tessema (Africa CDC).

[Establishing a national SARS-CoV-2 surveillance network across South Africa to support wastewater-based genomic and epidemiological monitoring of the COVID pandemic, 2020-2021](#)

Dr. Kerrigan McCarthy, Pathologist, National Institute for Communicable Diseases

Introduction/ Background:
Findings from wastewater-based epidemiology (WBE) surveillance of SARS-CoV-2 are increasingly used to monitor the epidemiology of SARS-CoV-2. We report on the findings from the South African Collaboration COVID-19 Environmental Surveillance System (SACCESS) laboratories and compare these with clinically obtained data.

Methods:
Wastewater grab or passive samples and underwent concentration, RNA extraction, reverse-transcriptase-polymerase chain reaction (RT-PCR) detection and quantification of SARS-CoV-2. Following whole genome amplicon-based sequencing, nonsynonymous mutations in the spike protein specific to variants of concern (VOCs) were identified. Quantitative RNA concentrations in genome copies/mL and the read-frequencies of lineage-specific single nucleotide polymorphisms (SNPs) in the spike protein of SARS-CoV-2 were plotted alongside official case load and SARS-Cov-2 lineage distribution by epidemiological week (provided by NICD SARS-CoV-2 epidemiology team and the Centre for Respiratory Diseases and Meningitis of the NICD).

Results:

Results from 95 wastewater treatment plants (WWTPs) across 9 provinces and all eight metropolitan areas of South Africa were collected weekly, biweekly or monthly from June 2020-October 2021 illustrate that increases and decreases in SARS-CoV-2 concentrations at all sites corresponded to metro-specific timing of the peak and post-peak decline in clinical cases.

Increases in SARS-CoV-2 concentrations consistently preceded increases in clinical cases. In 18 WWTPs genomic analysis detected SNPs corresponding to prevalent VOCs and documented the change from beta to delta variant over the third SARS-CoV-2 wave.

Impact:
Without sufficient evidence that WBE findings correspond with clinical epidemiology and genomic results, public health authorities are often reluctant to use these data to guide decision making. Our findings illustrated that WBE monitoring of SARS-CoV-2 and detection of SNPs specific to SARS-CoV-2 variants correspond with clinical epidemiology and genomic findings.

Conclusion:
Wastewater based epidemiology including genotyping should be integrated into SARS-CoV-2 surveillance networks to support decision-making regarding public health interventions to contain SARS-CoV-2. Additional analyses to support interpretation of quantitative and genomic results should be done.

Prevalence of anti-SARS-CoV-2 IgG antibodies among Kenyan blood donors between June and August 2021.

Dr. Sophie Uyoga, Research Scientist, KEMRI-Wellcome Trust Research Programme

Introduction/ Background:
Previous reports have estimated national seroprevalence of anti-SARS-CoV-2 IgG antibodies among blood donors in Kenya at 4.3% (April-June 2020), 9.1% (August-September 2020), and 48.5% (January-March 2021). Here we describe seroprevalence in the period June-August 2021 when COVID-19 vaccine coverage was 2.5% in the adult population in Kenya.

Methods:
We undertook a cross-sectional descriptive study to estimate prevalence of anti-SARS-CoV-2 IgG antibodies using residual plasma from the 6 regional transfusion centres in Kenya. Samples with complete donor demographic data were included and analysed using an anti-spike IgG enzyme- linked immunosorbent assay with validated specificity of 99.0% and sensitivity of 92.7%.

Bayesian multilevel regression with poststratification was used to obtain seroprevalence estimates and 95% credible intervals (CrI) adjusted for age, sex, and region of residence referenced against national 2019 census data for individuals aged 16-64 years. Results were also adjusted for test performance.

Results:
Of 7601 available plasma samples donated between 2nd June 2021 and 7th August 2021, 7139 (93.1%) were included in the analysis. Males comprised 5555 (78.8%) of the study population, while 4304 (60.3%) samples were from individuals aged 16-24 years. Crude seroprevalence was 67.2% (95% CrI, 66.1%-68.3%).

Overall Bayesian population-weighted, test-adjusted seroprevalence was 73.2% (95%CrI, 69.8-77.2%). Seroprevalence ranged from 69.9% among donors aged 35-44 years to 76.3% in the 16–24-year age group. We found no difference in seroprevalence by sex. Regional seroprevalence ranged from 58.9% in the coastal region (excluding Mombasa) to 82.5% in Nairobi.

Impact:
Local governments are making efforts to improve vaccine coverage while faced with limited access to the vaccines. These findings may guide targeted vaccine deployment through prioritization of vulnerable populations with lower seropositivity.

Conclusion:

SARS-CoV-2 has continued to spread rapidly across Kenya, infecting three-quarters of the adult population sampled through blood donation. The high seroprevalence observed is consistent with reports from other regions in sub-Saharan Africa and implies substantial infection-induced immunity that may mitigate the impact of low vaccine coverage.

SARS-CoV-2 antibody prevalence in Sierra Leone, March 2021: a cross-sectional, nationally representative, age-stratified serosurvey

Dr. Mohamed Bailor Barrie, Executive Director, Partners in Health, Sierra Leone
Dr. Sulaiman Lakoh, Lecturer, University of Sierra Leone

Introduction/ Background:

As of March 2021, the Africa CDC had reported 4,159,055 cases of COVID-19 and 111,357 deaths among the 55 African Union Member States; however, no country has published a nationally representative serosurvey. Such data are vital for understanding the pandemic's progression on the continent, evaluating containment measures, and policy planning.

Methods:

We conducted a cross-sectional, nationally representative, age-stratified serosurvey in Sierra Leone in March 2021 by randomly selecting 120 Enumeration Areas throughout the country and 10 randomly selected households in each of these.

One to two persons per selected household were interviewed to collect information on socio-demographics, symptoms suggestive of COVID-19, exposure history to laboratory-confirmed COVID-19 cases, and history of COVID-19 illness. Capillary blood was collected by fingerstick, and blood samples were tested using the Hangzhou Biotest Biotech RightSign COVID-19 IgG/IgM Rapid Test Cassette. Total seroprevalence was estimated after applying sampling weights.

Results:

The overall weighted seroprevalence was 2.6% (95% CI 1.9-3.4). This was 43 times higher than the reported number of cases.

Rural seropositivity was 1.8% (95% CI 1.0-2.5), and urban seropositivity was 4.2% (95% CI 2.6-5.7). Stratifying by age group and weighting, 1.7% (95% CI 0.2-3.2) of participants age 5-9 tested positive for anti-SARS-CoV-2 antibodies, as did 2.6% (95% CI 0.8-4.2) of those 10-19, 1.2% (95% 0.2-2.3) of those 20-39, 4.4% (95% CI 2.4-6.4) of those 40-59, and 3.6% (95% CI 1.6-5.6) of those 60 and above. There was a significant difference in seropositivity between rural/urban populations (Rao-Scott Chi-square p=0.002).

Impact:

This has ramifications for the country's third wave, where the average number of daily reported cases was 87 by the end of the Jone 2021—this could potentially be on the order of 3,700 actual infections, calling for stronger containment measures in a country with only 0.2% of people fully vaccinated.

Conclusion:

Overall seroprevalence was low compared to countries in Europe and the Americas (suggesting relatively successful containment in Sierra Leone). The results may reflect significant underreporting of incidence and mortality across the continent.

First national household seroprevalence survey of SARS-CoV 2 antibodies in Tunisia, April 2021

Dr. Hajer Letaief, Epidemiologist, National Observatory of New and Emerging Diseases

Introduction/ Background:

Population-based serosurveys measuring anti-SARS-CoV-2 antibodies are indicated for monitoring and estimating the real extent of the epidemic. This study aims to estimate the seroprevalence of SARS-CoV-2 antibodies among the Tunisian population.

Methods:

A national household cross sectional study was conducted in Tunisia on April 2021 among adults aged ≥18 years regardless gender, geographical distribution, and vaccination status using a random stratified two stage sampling. A sample size of 10000 subjects was calculated using Openepi Software. Trained interviewers collected data using a standardized electronic questionnaire (CSPAmong software) on sociodemographic characteristics, symptom history, and exposure factors. Blood samples were collected to identify IgG Antibodies, using ELISA test. Data analysis was performed using SPSS 26 and R. Estimations were adjusted to sample design and non-response rate.

Results:

A total of 9833 individuals from 5039 households were enrolled in the study. The weighted national seroprevalence was 29.5% (95%CI [28.2-30.8%]). It varied between governorates, ranging from 19.9% (95%CI [15.3%-25.5%]) in Kasserine to 41.9 % (95%CI [39.2%-49%]) in Kebili.

The highest seroprevalence was among female 30.7%(95%CI [29.1%-32.3%]) Vs 28.2%(95%CI [26.3-30.1%]) among male and age group 55-64 years 33.8% (95%CI [31.2%- 36.5%]). The lowest seroprevalence was among group age 18-24 25.9% (95%CI [22.4%-29.8%].

Impact:

Our study provides estimates on national SARS-CoV-2 seroprevalence showing significant variations between affected area. Highest seroprevalence where recorded in regions were circulation of SARS-CoV-2 occurred intensively and earlier during the first wave.

Conclusion:

This is the first national household seroprevalence survey of SARS-CoV-2 antibodies in Tunisia. Findings from this study are useful for adjusting vaccine-prioritization decisions and guiding preventive measures especially for susceptible population with lower seropositivity rates.

SARS-CoV-2 seroprevalence across six states of Nigeria, October 2020 and June 2021

Dr. Kristen Stafford, Associate Professor, University of Maryland School of Medicine

Introduction/ Background:

There have been low reported cases per population of SARS-CoV-2 in sub-Saharan Africa. Population-based studies are needed to estimate the true cumulative incidence of SARS-CoV-2 to inform public health interventions. This study estimated SARS-CoV-2 seroprevalence in four states in Nigeria in October 2020, and two states in June 2021.

Methods:

We conducted a two-stage cluster sample household survey in Enugu, Gombe, Lagos, and Nasarawa September–October 2020 and Kano and Federal Capital Territory (FCT) in June 2021. Thirty-four enumeration areas (EAs) were randomly sampled per state (30 in Lagos), and 20 households randomly selected per EA. All household members were eligible. Oral and nasopharyngeal swabs were taken for molecular testing and blood collected for antibody testing. Samples were tested on the multi-antigen target Luminex xMAP assay.

Results:

A total of 3,546 households (>83% of households) and 14,835 individuals (>94% of individuals) participated. In October 2020, SARS-CoV-2 seroprevalence was 25.2% (95% CI:21.8-28.6) in Enugu, 9.3% (95% CI:7.0-11.5) in Gombe, 23.3% (95% CI:20.5, 26.4) in Lagos, and 18.0% (95% CI:14.4-21.6) in Nasarawa. In June 2021, seroprevalence was 42.6% (95% CI:39.4-45.8) in Kano and 40.3% (95% CI:34.7-45.9) in FCT. By July 2021, <3% of the populations of Kano and FCT had received at least one vaccine dose.

Among the 38.9% and 53.1% respectively who indicated they would not take the vaccine, safety concern was the main reason (84.9%, 83.7% respectively).

Impact:
Population based surveys are important tools to estimate the true seroprevalence of novel pathogens more accurately with predominantly asymptomatic presentation. These surveys provide seroprevalence provide estimates that are not subject to bias from unequal distribution or uptake of testing services during outbreaks for development of accurate public health mitigation measures.

Conclusion:
Sixteen months in, approximately 60% of the populations of FCT and Kano had no antibodies to SARS-CoV-2, indicating a significant proportion of the population remained vulnerable to infection. Rapid scale-up of vaccine distribution and efforts to encourage vaccine uptake are needed to prevent the emergence of SARS-CoV-2 variants of concern.

Oral Presentations – Session 3

The following abstracts were presented in Track 1 Parallel Session 3. The session was co-moderated by Ms. Akhona Tshangela (Africa CDC) and Professor Peter Olupot Olupot (Mbale Regional Referral Hospital).

Evolution of variants of concern of SARS-CoV-2 during three waves in Senegal.

Dr. Abdou Padane, Pharmacist, L'Institut de Recherche en Santé, de Surveillance Épidémiologique et de Formations

Introduction/ Background:
In Senegal, SARS-CoV-2 incidence evolved with three successive epidemic waves. The first wave started on March 2020 with low virus variability whilst the second outbreak started in December was dominated by the Alpha variant. With the third taking place in June 2021, we investigated the involvement of other variants.

Methods:
During three waves of the pandemic, 163,788 nasopharyngeal swabs have been analysed at the Institut de Recherche en Santé, de Surveillance

Epidémiologique et de Formations (IRESSEF). From those, 10,189 positive samples were screened with Seegene Real-time reverse-transcription polymerase chain reaction RT-PCR new variant. From the screened samples, 972 positives were sequenced and 10% of the negatives for detection of new variants. The ARTIC Network methodology with Oxford Nanopore Technologies (ONT) has been used for sequencing.

Results:
Our data have overall shown that the Senegalese strains are very similar to each other or closely related to other. During the first wave, the most common clade found was 19A (70.27%) and majority of the samples were of the B.1 (54.05) lineage.

We noted more diversity during the second wave where clade 20B (40.82%) was more frequent, followed by clade 20A (28.91%), 20I (10.54%). At the level of lineages, we identified variants of interest as B.1.1.7 (10.54%), B.1.525 (6.12%), and B.1.617.2 (0.68%).

In the third wave, we observed at the clade level with mainly 21D (47.69%) and 21A (20%).

Impact:
SARS-CoV-2 diversity may affect the virus's properties, such as it spreads, disease severity, performance of vaccines, tools, or other public health and social measures. Therefore, such tracking of SARS-CoV-2 variants highlight the role some African institutes like IRESSEF surveillance capabilities through real-time sequencing of SARS-CoV-2 genomes in the local context.

Conclusion:
In Senegal, the SARS-CoV-2 pandemic has disrupted the organization of the health system. IRESSEF contributed to put in place strategies to respond effectively to the expectations of medical authorities by providing them with data on the strains circulating in Senegal at each moment of the epidemic.

Genomic surveillance of SARS-CoV-2 variants circulating in the Brazzaville, Republic of Congo, December 2020–July 2021

Mr. Claujens Chastel Mfoutou Mapanguy, Biologist, Fondation Congolaise pour la Recherche Médicale

Introduction/ Background:
The COVID-19 pandemic has caused significant mortality and multiple variants of SARS-CoV-2 have been documented. Delta is the predominant variant around the world. Genomic surveillance can help country to overcome the pandemic by informing/prevention strategies.

We aim to determine the dynamic of SARS-CoV-2 in Brazzaville, ROC, between December 2020-July 2021.

Methods:
Between December 2020 and July 2021, oropharyngeal swabs from symptomatic individuals (n=600) were screened for COVID-19 from different districts of Brazzaville, ROC.

RNA was extracted from swabs using the QIAamp Viral RNA Mini Kit (Qiagen, Hilden, Germany) and subjected to RealStar® SARS-CoV-2 real-time PCR targeting the S gene of SARS-CoV-2 (Altona Diagnostics, Hamburg, Germany) was performed in LightCycler® 480 Instrument II (Roche diagnostics, Mannheim, Germany).

Found 317 individuals tested positive for COVID-19 and 182 samples that were having Ct <30 were subjected to Next- Generation Sequencing (NGS).

Results:
The characteristics of the study population from 171 genomes sequenced are as following, the median age of the subjects was 34 years (IQR: 25 to 47) and 67% (115/171) were males. The genomes were assigned to different pangolin lineages.

A total of 15 variants were found circulating during the study period. For phylogenetic analysis, variants B.1.544 and B.1 were clustered into a single, and four sister lineages, B.1.214, B.1.214.1, B.214.2 and B.1.214.3, were clustered into a single clade.

The B.1.214.2 was the predominant lineage. The VOC lineages B.1.1.7 and B.1.627.2 now have been finding in circulation in the ROC.

Impact:
The results from the present study indicate that many SARS-COV-2 variants are circulating in the ROC, and the detection of B.1.1.7 and B.1.617.2 variants for the first time in the country is the raised alarm to the health authorities.

Conclusion:
Many SARS-COV-2 variants are circulating in the ROC, and the detection of B.1.1.7 and B.1.617.2 variants for the first time in the country is the raised alarm to the health authorities. Thus, the spatiotemporal genomic surveillance of SARS-CoV-2 variants contributes to our understanding of viral dynamics.

[Genomic surveillance of SARS-CoV-2 in Uganda shows rapid replacement of variants, 2021](#)

Dr. Nicholas Bbosa, Scientist, School of Hygiene and Tropical Medicine Uganda Research Unit

Introduction/ Background:
In this cross-sectional study, we conducted genomic surveillance of SARS-CoV-2 with the aim of identifying emerging variants and tracking the genomic evolution of the virus. Furthermore, we analyzed the trends of SARS-CoV-2 lineages over time in Uganda.

Methods:
We performed SARS-CoV-2 whole-genome deep sequencing on samples collected between June-August 2021 from 107 patients (RT-PCR Ct values < 26) from 10 Districts in central (Kampala, Wakiso, Mpigi, Kalungu, Kalangala, Kassanda and Mityana) and northern (Dokolo, Amudat, Moroto) Uganda.

Sequencing was done using the Illumina Miseq and Oxford Nanopore MinION next generation sequencing platforms. Deep sequence reads were assembled using Genome Detective and Nanopolish/Medaka (ARTIC). Quality control of the sequences was done using Nextclade and Geneious followed by lineage

analysis using PANGOLIN (Phylogenetic Assignment of Named Global Outbreak LINeages).

Results:
102 (95.3%) of 107 genomes were of the Delta variant (B.1.617.2). Delta AY sub-lineages detected at low prevalence included AY.1, AY.4, AY.16, AY.33 and AY.39. One AY.1 (delta plus) and 2 AY.16 sub-lineages were identified. Additionally, 1 Kappa B.1.617.1 variant was detected.

Other minority lineages included A, B and Eta (B.1.525). By 20th September 2021, 712 SARS-CoV-2 sequences from Uganda had been deposited in GISAID (https://www.gisaid.org) and between December 2020 to January 2021, the A.23.1 variant dominated. The first Delta variant (B.1.617.1) sample was collected in March 2021 and by June 2021, Delta accounted for >90% of all detected variants.

Impact:
This study provides valuable information on the circulating variants and lineages in Uganda and contributes towards the national SARS-CoV-2 genomic surveillance. However, a major limitation of the study is the suboptimal sampling as a result of funding challenges.

Conclusion:
In Uganda, Delta has largely replaced other variants and is the dominant circulating SARS-CoV-2 variant. Study findings suggest that continued SARS-CoV-2 genomic surveillance from recently collected samples is critical to keep track of the circulating and emerging variants.

Genomic surveillance of SARS-CoV-2 in Kenya: March 2020-October 2021

Dr. George Githinji, Bioinformatician, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
By end of October 2021, the Ministry of Health had confirmed over 250 thousand SARS-CoV-2 cases in Kenya following identification of the initial cases in March 2020. We setup a genome surveillance platform in Kenya to track introductions, local evolution and transmission of SARS-CoV-2 within the country and the region.

Methods:
Samples were collected from designated diagnostic centres across 47 Kenyan counties. Viral RNA was extracted from the Nasal and oropharyngeal swabs from RT-PCR confirmed cases followed by viral amplification of recovered cDNA using the ARTIC nCoV-2019 primer set and thereafter library preparation and sequencing using the Oxford Nanopore MinION platform.

The raw signal files were base-called and processed to obtain consensus sequences followed by SARS-CoV-2 lineage assignment and phylogenetics analysis.

Results:
Phylogenetics and epidemiological analysis of 4,200 sequences provided insight on introduction of SARS-CoV-2 in Kenya. The first (March-September 2020), second (October 2020-February 2021) waves of infections were dominated by B-like lineages.

The third wave (March-June 2021) coincided with introduction of Alpha and Beta variants (December 2020), merging into the fourth wave (June-October 2021), the Delta variant in April 2021. Ancestral reconstruction identified multiple introductions of the basal lineages (37<n<69) and Variants of Concern (Beta (n=14), Alpha (n=83), Delta (n=92)). We observed rapid replacement of ancestral lineages leading to dominance of the Delta variant that comprised the fourth wave of infections.

Impact:
Our genomic surveillance platform has improved monitoring of the diversity of circulating variants of concern (VOCs) and revealed transitions across the country in the dominance VOCs detected between late 2020 to October 2021. This output had fed into national decision-making through regular policy briefs.

Conclusion:

The Delta variant is the dominant variant of concern across the country. Genomic surveillance of SARS-CoV-2 should focus on identifying the emergence of local mutations with the potential to confer additional transmissibility and antigenic drift, particularly in the background of inadequate vaccine coverage and waning natural immunity.

Tracking SARS-CoV2 variants and strains: an overview of Nigeria Centre for Disease Control's first 596 sequences, November,2021

Dr. Nnaemeka Ndodo, Chief Molecular Bioengineer, Nigeria Centre for Disease Control

Introduction/ Background:

There are 249,851,155 cases of COVID-19 globally as of 6th November 2021. SARS-CoV-2, accounts for 5,053,813 deaths worldwide. In Nigeria 212,511 cases and 2,902 deaths were recorded at the same time point. his report describes the first 596 SARS-CoV-2 genomes sequenced at the National Reference Laboratory (NRL) of NCDC.

Methods:

Samples sequenced include positive samples from baseline surveillance and in-bound travellers from several states in-country. Isolates were obtained from nasopharyngeal and oropharyngeal swabs and Library preparation was done using ARTIC NEB SARS-CoV-2 or the NEBNext FS Library preparation kits and sequencing on Oxford Nanopore MinION or Illumina MiSeq. Sequence analysis was done using ARTIC bioinformatics pipeline for MinION and Illumina Basespace DRAGEN COVID Lineage app for MiSeq sequence data respectively.

Results:

Of the 596 sequences, 51.8% were Delta variants, 17.4% Eta variants, and 1.0% Alpha variants. The sequences represented mostly the second and third waves of the COVID-19 pandemic in Nigeria, mostly driven by the Eta and Delta variants respectively. The first wave was driven by D614G, L452R and Y1155F spike mutations, while the second wave was characterized by the Eta variant and the Third wave was driven by Delta variants.

Impact:

Genomic surveillance has been recognised as a major element for pandemic response and has become a necessity for public health. To monitor local transmission and importation of SARS-CoV-2 variants in Nigeria, whole genome sequencing of SARS-CoV-2 was carried out as part of the response to the ongoing COVID-19 pandemic.

Conclusion:

There were multiple introductions of SARS-CoV-2 variants into Nigeria despite all the measures in place at various points of entry. The importance of timely detection of circulating variants of SARS-CoV-2 for effective preparedness and response activities cannot be overemphasised. Sequencing helped inform rational public health advisory and response.

Oral Presentations – Session 4

The following abstracts were presented in Track 1 Parallel Session 4. The session was co-moderated by Professor Catherine Orrell (Desmond Tutu HIV Foundation) and Mr. Jean Marie Habarugira (EDCTP).

Covid-19 vaccination uptake in uMkhanyakude district South Africa, April-November 2021

Dr. Guy Harling, Africa Health Research Institute

Introduction/ Background:

Vaccination is fundamental to COVID-19 epidemic control, however, hesitancy and other barriers may undermine high vaccine uptake in Africa as elsewhere. We measured vaccine hesitancy and its correlates over a six-month period as national rollout took place, in a continuous surveillance programme in rural KwaZulu-Natal, South Africa.

Methods:

From April-September 2021 we conducted rolling COVID-19 surveys (telephonic and in-person) with

adult members (age 18+) of households in the SAPRIN network demographic & health node in rural KwaZulu-Natal, South Africa. Proxy respondents were asked to report vaccine uptake by household members every four months (n=26,934), and their own vaccine willingness (n=8,359) and reasons to accept/decline a vaccine (n=10,936). We measured how vaccine uptake and willingness differed by age, sex and time. We conducted adjusted multivariable regressions to see how vaccine hesitancy was associated with COVID-related: knowledge; past experience; perceived risk; and government trust.

Results:
By September, vaccine update was 52.4% among over-60s (eligible 17 May), 35.6% in 50-59 year-olds (1 July), 16.8% in 35-59 year-olds (1 August) and 3.3% in 18-34 year-olds (1 September). Only 52.1% of unvaccinated individuals said they definitely would get a free vaccine today. Vaccine hesitancy was associated with less trust in government (aOR:0.79; 95%CI:0.74-0.84), lower perceived risk of getting COVID-19 (aOR:1.58; 95%CI:1.32-1.88) and not knowing someone who has had COVID-19 (aOR:0.70; 95%CI:0.55-0.90), but not concern about COVID-19 outcomes or COVID-19 knowledge. Common hesitancy reasons included were generic concerns (fear of needles) and COVID-19-specific ones (vaccine does not work; side-effects).

Impact:
Published evidence on COVID-19 vaccine willingness in Africa is mostly limited to knowledge and intentions, often from convenience samples. We have presented this work, linking intentions, vaccine uptake and hesitancy reasons, to national government to help guide their COVID-19 policymaking and intervention to maximize vaccine coverage, thus protecting against COVID-19.

Conclusion:
Despite cost-free availability and high self-reported willingness, many rural South Africans remain unvaccinated. Reported barriers to uptake most often relate to concerns about vaccines, rather than practical issues, e.g., cost or transport. Addressing

perceived negative aspects of vaccines may be central in maximizing COVID-19 vaccine uptake in Africa as elsewhere.

Evaluation of vaccine effectiveness against COVID-19: a case-control study on a Tunisian national sample, August 2021

Dr. Emna Mziou, Resident in Preventive and Community medicine, National Observatory of New and Emerging Diseases Tunisia

Introduction/ Background:
In response to the pandemic, multiple vaccines to protect against COVID-19 disease have been unrivalled in the history of public health. Precise estimates of vaccine effectiveness (VE) vary according to studies design, outcomes measured and circulating variants. The aim of this study is to evaluate the anti-covid-19 vaccine effectiveness in Tunisia.

Methods:
We conducted a matched case-control study from 02 to 15 August 2021. Cases and controls were subjects older than 60 years, selected from the database of testing at the National Observatory of New and Emerging Diseases, regardless vaccine status. A sample of 977 matched peers for age and gender were included. A standardized questionnaire was administered for cases and controls to collect information about vaccination status. The odds-ratio was calculated using simple conditional logistic regression. The VE (95% confidence intervals) was calculated as (1 – odds ratio for vaccination) × 100%.

Results:
The vaccine effectiveness was 84.2% (95%CI [70.3%-97.2%]). In our sample, 68.1% of the male population and 56.4% of the female population were vaccinated with a vaccine effectiveness of 84.2% (95%CI [63.2%–96.3%]) for men and 86.3% (95%CI [68.1%-95.7%]) for women.

Vaccine Effectiveness was the highest among age group [60-70[years 88.0% (95%CI [68.9%-91.5%]).

Vaccine effectiveness in prevention from severe forms (treated with oxygen-therapy or necessity of Intensive-care-unit) was 94.5% IC [72.2%-96.3%].

Impact:
Our study aims to strengthen anti-covid-19 vaccination efforts as it reduces the spread of the disease (including infection without symptoms) and helps protect from severe forms including hospitalization and death. Difference estimates (depending on the unvaccinated group absolute incidence) provide further evidence of the possible public health value of vaccines.

Conclusion:
The results of our study imply that the anti-Covid-19 vaccines used in Tunisia are effective in preventing SARS-COV-2 infections and severe forms of COVID-19. This study provided important data on the 'real-world' performance of vaccines that guide decisions about vaccine sustained use.

mRNA Vaccine Technology Transfer and Training Hub in South Africa: A partnership model for sustainable vaccine production.

Professor Petro Terblanche, Managing Director, Afrigen Biologics

Introduction/ Background:
While over 6 billion doses of Covid19 vaccines have been administered globally, only 2% of people in Africa have been vaccinated. This uncomfortable reality lead to the establishment of a mRNA vaccine technology transfer and training Hub in South Africa under the COVAX initiative lead by WHO and MPP.

Methods:
Afrigen Biologics is establishing a technology transfer and training hub for COVID-19 mRNA-based vaccines. In the absence of a technology transfer agreement with the holders of mRNA vaccine technology, Afrigen and its University partners are developing a first-generation vaccine, a fast follow-on of mRNA-1273 (Moderna vaccine).

The Afrigen-based vaccine technology transfer program will provide sufficient transfer of know-how to allow a competent tech transfer recipient manufacturer in Africa and other LIMCs to successfully manufacture and release mRNA vaccines at scale to support clinical development, national/regional marketing authorization and WHO prequalification, and sustainable supply to meet local and regional vaccine demand.

Results:
The mRNA Hub at Afrigen has reached key milestones in terms of completion of the facility and start up phase of equipment supply, training of Afrigen core staff in drug substance and drug product production at lab scale. The development of a stable genetic construct that allows transcription of an mRNA molecule at bench scale as well as the encapsulation in a lipid nano particle is underway. This presentation will provide an overview of the progress of the mRNA Hub, its workplan as well as the long-term research and development program and the partnerships supporting the Hub.

Impact:
The mRNA vaccine technology transfer Hub has created a public private partnership model for sustainable vaccine manufacturing on the African continent. Supported and enabled by the African Union and the African CDC, the mRNA Hub is well positioned to become one of the pillars of the African vaccine manufacturing strategy.

Conclusion:
The Covid19 pandemic has unleashed significant energy to ensure that Africa implement programs that will ensure sustainable supply of vaccines and preparedness for future pandemics. The Hub and Spoke model is one of the interventions that has the potential to create local innovation and contribute to the supply of vaccines.

AEFI collected during COVID-19 vaccine campaign in Tunisia

Dr. Imen Aouinti, Associate Professor, Tunisian Pharmacovigilance Centre

Introduction/ Background:
As part of the surveillance of Covid-19 vaccines, a specific and reinforced surveillance strategy for adverse events following immunization (AEFI) of Covid-19 vaccines was set up since the vaccination campaign has been started in Tunisia in order to monitor the safety profile of available vaccines in real time.

Methods:
We conducted a descriptive study on Covid-19 vaccines AEFI collected by the National Chalbi Belkahia Center for Pharmacovigilance (CNPV) from March 13th to November 3rd, 2021.

The notifications were collected via the CNPV website / email, the eVAX platform, or at the CNPV external consultation. Activedata collection by phone was carried out during the 6 open days for vaccination.

Data for the study were extracted from the national, WHO-dependent VigiBase database.

Results:
We collected 2773 AEFI on 9 264 263 administered doses (0.03%).
Mean age=50.4 years. Sex ratio M/F = 0.62.
Pfizer BioNTech® vaccine was used in 54.1% of cases, Vaxzevria® in 14%.

AEFI SOCs: general and administration site disorders (48.6%), nervous disorders (29.3%), musculoskeletal disorders (18%), gastrointestinal disorders (13.7%).

Main MedDRA terms were fever (23.2%), asthenia (19%), headache (15.8%), and injection site pain (10.4%). Serious adverse events were noted in 146 cases (5.3% of AEFI).
SOCs: Nervous disorders (42.5%), General and administration site disorders (15.8%), Cardiac disorders (13.7%).

In serious adverse events, Pfizer BioNTech® was used in 51.4%, and Vaxzevria® in 19.2%.

Impact:
Monitoring of any new medicinal product and the detection of adverse events is necessary, in particular, at the start of its use in order to ensure the safety of the population.

Conclusion:
This study confirms phase III clinical trials data in which the most frequent AEFIs were general and injection site disorders. Serious adverse event were rare. These results show that the benefit of vaccination outweighs the risk and encourage vaccination.

Reactogenicity following first dose of COVID-19 vaccine in Nigeria 2021

Dr. Emem Iwara, Senior Surveillance Lead, University of Maryland Baltimore- Nigeria Program

Introduction/ Background:
Following rollout of COVID-19 vaccination, Nigeria established an adverse event monitoring surveillance system to monitor reactogenicity and safety profiles of vaccines. We assessed reactions reported after the first dose of Oxford AstraZaneca or mRNA-1273 (Moderna) vaccines.

Methods:
We conducted prospective surveillance of a cohort of over 12,000 participants, 18 years of age and older, who received the first dose of any COVID-19 vaccine with active follow-up on days 0, 3, and 7. Descriptive statistics describe local and systemic reactogenicity.

Local reactogenicity was defined as inflammatory changes around the injection site and systemic reactogenicity was defined as fever, chills, headache, etc. Poisson regression was used to examine associations between reactogenicity and select variables.

Results:

Of 11,046 participants, 6,167 (56%) received AstraZeneca. No adverse reaction was reported by 3,810 (34%) participants. Local reactogenicity was reported by 6,214 (56%) participants and systemic reactogenicity (SR) by 4,535 (41%). SR was higher among those age 20-29 years (IRR:1.3, 95% CI:1.1-1.4) and 30-39 (IRR:1.2, 95% CI:1.0-1.3) compared ≤19.

Lower rates of reactogenicity occurred among those >50 years of age (IRR:0.7, 95% CI:0.6-0.8). SR was lower (IRR:0.8, 95% CI:0.8-0.9) among males compared to females and higher (IRR:1.2, 95% CI:1.2-1.3) among those with any related symptom 3 days before vaccination. Reactogenicity was higher (IRR:1.2, 95% CI:1.1-1.3) among those with chronic disease.

Impact:
It is important to effectively monitor reactogenicity among all populations receiving COVID-19 vaccines to continue to inform the costs and benefits of specific vaccinations among specific populations receiving vaccines. Our data indicates local reactogenicity is more common than systemic.

Conclusion:
Most participants reported local reactogenicity within 7 days of COVID-19 vaccination; however, vaccination was well tolerated. Systemic reactogenicity was more common among women, those with pre-vaccination symptoms, or history of chronic disease.

Track 1 Accepted Posters

A cross-sectional study on social demographic determinants affecting uptake of COVID-19 vaccine in Nigeria, August 2021

Mr. Adebisi Adenipekun, Africa Centres for Disease Control and Prevention

Introduction/ Background:
Nigeria rolled out the first phase of COVID-19 vaccination in March 2021. However, according to the National Primary Health Care Agency (NPHCDA) daily calling-in data, the uptake of the vaccine has been sub-optimal. The aim of this study was to assess the socio-demographic determinants of COVID-19 vaccine uptake.

Methods:
A total of 3,493 adults were sampled using stratified random sampling across 8 states spread across all the geopolitical zones in Nigeria. The data collection was interviewer-administered to healthcare workers and non-healthcare workers using SurveyCTO mobile application from 26th July to 12th August 2021. The study was conducted in adherence to principles of research and ethical approval was obtained from the National Health Research and Ethics Committee (NHREC). Security sensitive communities were excluded from the sampling frame for this study. The data were managed using Microsoft Excel and SPSS version 25.

Results:
About 44% (1,548 of 3,494) of the total study population had taken the COVID-19 vaccine at the time of the study. Out of the 56% of the people that are yet to take the COVID-19 vaccine, only 10% reported some level of willingness to take the vaccine.

Higher uptake of the vaccine was reported among healthcare workers and the relationship between vaccine uptake and occupation of the respondent was found to be statistically significant (p=0.001). The relationship between willingness to take the vaccine and demographic factors such as age, religion, gender, and education were not found to be statistically significant.

Impact:
This study has helped to inform effective strategies for subsequent deployment of the COVID-19 vaccine in Nigeria and has guided the institution and restructuring of COVID-19 vaccine Crisis Communication Centre (CRICC).

Conclusion:
Mass COVID-19 vaccine campaigns and strategies should be tailored to improve non-healthcare workers' confidence and uptake of the vaccine. Demand generation activities should be intensified

across the country leveraging both social and traditional media.

An APOL1 genotype associated with adverse Covid-19 outcomes: UK-Biobank data, September 2021

Dr. Walt Adamson, University of Glasgow

Introduction/ Background:
The risk of hospitalisation/death from Covid-19 in the UK is disproportionately high in black populations. In people of African ancestry, variants of the APOL1 gene (G1 and G2) are associated with risk of non-communicable diseases, and sleeping sickness. We hypothesise that adverse Covid-19 outcomes are also associated with these variants.

Methods:
The UK Biobank contains genetic, lifestyle, and health information from 7,643 individuals who self-report as being of black ethnicity. Within this cohort there had been 142 hospitalisations and 36 deaths attributed to Covid-19 as of September 2021. Taking risk factors previously associated with poor Covid-19 outcomes (age, sex, chronic kidney disease, atrial fibrillation, hypertension, depression, chronic obstructive pulmonary disease, dementia, type 2 diabetes, obesity, and Townsend deprivation index) as covariates, we used Firth's Bias Reduced Logistic Regression in R to identify APOL1 genotypes that were associated with hospitalisation and death.

Results:
Individuals who are heterozygous for variants at both the G1 and the G2 loci are termed G1/G2 compound heterozygotes.

G1/G2 compound heterozygosity was associated with hospitalisation (odds ratio = 2.4, 95% confidence interval: 1.2-4.5, p = 0.010) and death (odds ratio = 5.4, 95% confidence interval: 1.8-15.4, p = 0.004). This association has not previously been detected in genome wide association studies, as they usually examine individual loci separately rather than considering combinations of loci.

Impact:
This has implications at the individual and population level by identifying those at higher risk of severe Covid-19 who would benefit from early vaccination and treatment. This is especially relevant to geographical regions where APOL1 G1 and G2 variants are common, such as West and Central Africa and their diaspora.

Conclusion:
This data supports hypotheses proposing APOL1 genotype (and specifically G1/G2 compound heterozygosity) as a significant contributory factor in the increased rates of poor Covid-19 outcomes observed in people of African ancestry.

Comparative Epidemiologic Analysis of COVID-19 Patients in the First and Second Waves—Uganda, 2020-2021

Ms. Sarah Elayeete, Makerere University

Introduction/ Background:
Uganda has had two major waves of COVID-19, the first in late 2020 and the second in mid-2021. In March 2021, Uganda began COVID-19 vaccination. Shortly, the country entered a larger, second wave caused by SARS-CoV-2 Delta variant. We compared epidemiologic characteristics of Uganda's COVID-19 patients in the two waves.

Methods:
"Wave 1" was data abstracted for confirmed COVID-19 patients in Nov-Dec 2020, and "Wave 2" was data abstracted for confirmed COVID-19 patients in April-June 2021, at Mulago and Entebbe Grade B Hospitals.

We randomly collected medical records data for 200 patients from Wave 1 and 200 patients in wave 2, based on a sample size calculation to identify a difference of 5 years in mean age between patients in different Waves. We also retrieved contact information for randomly-selected, PCR-confirmed non-hospitalized patients (200 from each wave) and

interviewed them by phone. We compared between- and within-wave statistics using a two-sample t-test.

Results:
A higher proportion of hospitalized-patients in Wave 2 than Wave 1 were female (46% vs. 27%, p=0.0001), more hospitalized- patients in Wave 2 than Wave 1 had severe disease or died (65% vs. 31%, p<0.0001).

Non-hospitalized patients in Wave 2 were younger than those in Wave 1 (median age 27 vs. 35 years, p=0.08).

Median age of hospitalized-patients was significantly older than non-hospitalized patients in Wave 2 (median age 47 vs. 27 years, p<0.0001) but not Wave 1 (median age 42 vs. 35 years, p=0.15). Increasing age was associated with hospitalization in both waves (p<0.0001).

Impact:
The body of data included in this study adds to the limited data available on the Delta variant of COVID-19. Additional data in larger studies are critical to supplement the data from this study

Conclusion:
Epidemiologic characteristics of hospitalized and non-hospitalized COVID-19 patients between and within Waves 1 and 2 of the pandemic in Uganda differed. For resistance, hospitalized patients were older in Wave 2 than in Wave 1, disease severity was significant in Wave 2, than Wave 1. Different variants of COVID-19 should be studied independently

Comparing Wantai ELISA and an in-house ELISA in detecting SARS-CoV-2 antibodies in Kenyan populations

Dr. James Nyagwange, KEMRI-Wellcome Turst

Introduction/ Background:
Many SARS-CoV-2 antibody detection assays have been developed but their differential performance is not well described. The KEMRI-Wellcome Trust Research Programme (KWTRP) developed in-house anti-spike-IgG ELISA which has been used extensively to estimate SARS-CoV-2 seroprevalence in Kenya. Here we examined performance and concordance between KWTRP and WHO-approved Wantai total-immunoglobulin ELISAs.

Methods:
We used a diverse sample set from the Kenyan population to compare performance characteristics of the Wantai ELISA to the spike receptor binding domain measuring total immunoglobulin and the full length spike anti-IgG KWTRP ELISA . These included 189 pre pandemic coastal Kenya samples collected in 2018 from adults investigated in the annual malaria cross- sectional survey and 327 adult blood donor samples from 2018 (negative gold standard). A total of 149 SARS-CoV-2 PCR positive samples from Nairobi (positive gold standard) and 1028 COVID-19 testing and blood donor samples collected from coastal Kenya and countrywide from different periods during the pandemic (unknowns).

Results:
Sensitivity was 0.95 (95% CI 0.90-0.98) for Wantai and 0.93 (95% CI 0.87-0.96) for KWTRP using the 149 SARS-CoV-2 PCR positive gold standard samples.

Using the 327 pre-pandemic blood donors and 189 pre-pandemic malaria cross-sectional survey samples, specificity for Wantai was 0.98 (95% CI, 0.96-0.99) and 0.99 (95% CI 0.96-1.00), while KWTRP specificity was 0.99 (95% CI, 0.98-1.00) and 1.00.

The overall concordance between Wantai and KWTRP was 0.97 (95% CI, 0.95-0.98).

Impact:
These findings allow for the wider comparison of results based on the KWTRP in-house assay with others generated across multiple settings where seroprevalence has been studied using the Wantai assay.

Conclusion:
Both assays showed very high sensitivity and specificity for detection of detection of anti

SARS-CoV-2 antibodies. The KTWRP in-house assay measuring IgG showed high concordance with the WHO-recommended Wantai assay measuring total immunoglobulins.

COVID-19 vaccination errors Collected during Tunisian vaccination campaign

Dr. Widd Kaabi, National Observatory of New and Emerging Diseases

Introduction/ Background:
The National Centre of Pharmacovigilance, in collaboration with the Primary Health Care Direction, is charged with monitoring and managing adverse events following immunization (AEFI) that included vaccination errors. Our work aims to describe the type and the frequency of these errors in order to prevent their occurrence.

Methods:
We conducted an observational study from the onset of the vaccination campaign on March 13, 2021, to September 29, 2021. We collected vaccine errors through the different sources of notification used by the National Centre of Pharmacovigilance in Tunisia. We have listed vaccine errors through Vigibase national reports. We categorized the error reports on the basis of the vaccine error type described by the Centres for Disease Control and Prevention (CDC).

Results:
During this period, a total of 8,031297 doses were administrated. We counted 153 (5,86%) COVID-19 vaccine errors out of 2609 AEFI.

One hundred thirty-eight (90%) of these vaccination errors were reported during the mass vaccination days. The errors were classified into three main categories:

180 cases (70%) with wrong doses, either dilution or dose volume issues,
50 cases (28,8%) with a wrong indication, and
5 cases (3,2%) with wrong intervals between the two vaccine shots.

Impact:
Errors reported to the Tunisian Pharmacovigilance Centre do not reflect all COVID-19 vaccine errors that might be occurring nationally and thus are probably underestimated. Thus, a pharmacovigilance reporting system is important for the early detection and management of these errors to prevent their recurrence.

Conclusion:
Health care providers involved in the COVID-19 vaccine supply chain should anticipate, report, and mitigate COVID-19 vaccine-related errors to promote shared learning opportunities and make every dose of vaccine count.

Diagnosis and genomic characterization of SARS-COV-2 in a Senegalese laboratory of public sector

Professor Halimatou Diop Ndiaye

Introduction/ Background:
In Senegal, several labs are involved in COVID-19 diagnosis but only a few have the capacity of genomic sequencing, especially in the public sector. The aim of this study was to describe the contribution of a public health laboratory in COVID-19 diagnosis and molecular epidemiology of SARS-COV-2 in Senegal.

Methods:
From nasopharyngeal swabs collected from COVID-19 patients, viral RNA was extracted and an RT-PCR was carried out to detect SARS-COV-2 genes using different kits targeting ORF1ab and N genes using Dan-An Gene Co (LTD of Sun-Yat-Sen University) and Sansure Bio Tech Inc or RdRp and N gene with Abbot Real-Time RT-PCR kit. Genomic characterization of SARS-COV-2 strains were carried out on a subset of positive samples collected from the 3 waves by sequenced using MinIon Oxford Nanopore technology.

Results:

From July 2020 to Sept 2021, 7988 COVID-19 suspected patients or travelers were tested at Laboratoire de Bacteriologie- Virologie (LBV) of Aristide Le Dantec hospital, an University Teaching Hospital. Among them, 964 patients were positive to SARS-COV-2 giving a positivity rate of 12%.

Thereafter, 115 (11.9%) were sequenced including 32, 40, and 43 from the first, second, and third waves, respectively. The most detected variants of the first wave were B.1.1.420 (23%). For the second wave, B.1.1.420 (27.5%) and B.1.1.7 (35%) were the most detected. For the third wave, 42 sequences were Delta variant (B.1.617), and one from 19A clade.

Impact:
The results of this study highlight the need to enlarge the sequencing capacity to laboratories from the public sector in Senegal, especially university teaching hospitals as they may contribute efficiently to COVID -19 response.

Conclusion:
Despite the low number of positive samples, the LBV through this experience has proven its capacity to contribute to the national response of the COVID-19 pandemic and in genomic characterization of SARS-COV-2 in the country. It was also a very good opportunity for a technology transfer from IRESSEF and MCR-Gambia.

Diagnosis of tuberculosis amongst COVID-19 Patients in Ghana

Dr. Isaac Darko Otchere, Noguchi Memorial Institute for Medical Research

Introduction/ Background:
Tuberculosis(TB) and COVID-19 pandemics are air-bone diseases of public health threat globally. They also share some clinical signs and symptoms. We, therefore, took advantage of collected sputum samples at the early stage of COVID-19 outbreak in Ghana to conduct differential diagnoses of long-standing endemic respiratory illness, particularly tuberculosis.

Methods:
Sputum samples collected through the enhanced national surveys from suspected COVID-19 patients and contact tracing cases were analyzed for TB. The sputum samples were processed using Cepheid's GeneXpert-MTB/RIF assay in pools of 4 samples to determine the presence of Mycobacterium tuberculosis complex.

Positive pools were then decoupled and analyzed individually. Details of positive TB samples were forwarded to the NTP for appropriate case management.

Chi-square-test, Fischer's exact test, or logistic regression where appropriate was used to test for statistical significance. P=values <0.05 were regarded as statistically significant at a 95% confidence level. All statistical analyses were carried out in Stata.

Results:
Seven-hundred and seventy-four sputum samples were analyzed for Mycobacterium tuberculosis in both suspected COVID-19 cases (679/774, 87.7%) and their contacts (95/774,12.3%).

A total of 111(14.3%) were diagnosed with SARS CoV2 infection and six (0.8%) out of the 774 individuals tested positive for pulmonary tuberculosis: five(83.3%) males and one(16.7%) female.

Drug susceptibility analysis identified 1(16.7%) rifampicin-resistant tuberculosis case. Out of the six TB positive cases, 2 (33.3%) tested positive for COVID-19 indicating a coinfection.

Stratifying by demography, three out of the six (50%) were from the Ayawaso-West-District. All positive cases received appropriate treatment at the respective sub district according to the national guidelines.

Impact:
Misdiagnosis of respiratory infections potentially leads to mismanagement with its concomitant

clinical and public health implications. There is need for differential diagnosis of respiratory infections to advice proper clinical management.

Conclusion:
The discovery of TB positive patients among suspected COVID-19 patients harbingers the untold stories of undiagnosed TB in our communities. Our findings therefore highlight the need for differential diagnosis among COVID-19 suspected cases and regular active TB surveillance in TB endemic settings.

Epidemiological, Virological and Clinical Features of SARS-CoV-2 Among Individuals During the First Wave in Cameroon: Baseline Analysis for the EDCTP PERFECT-Study RIA2020EF-3000

Dr. Joseph Fokam , International Reference Centre Chantal Biya

Introduction/ Background:
In Cameroon, the first case of SARS-CoV-2 was identified ion March 6, 2020. Since then, the pandemic has spread nationwide, which henceforth requires local knowledge to optimize the national strategy. Our study objective was to ascertain the epidemiological, virological and clinical features of COVID-19 in the Cameroonian context.

Methods:
As a baseline analysis for the EDCTP PERFECT-Study RIA2020EF-3000, an observational study was conducted in a population of 14,119 individuals (59.8% male) living in the city of Yaounde, Cameroon from April through December 2020. The eligibility criteria for the study was the individual acceptance for COVID-19 molecular tesing and the availability of a conclusive result.

COVID-19 testing was performed on nasopharyngeal samples using by SARS-CoV-2 real-time PCR systems (Abbott m2000RT and Da An Gen nucleic acid amplification/detection kits). SARS-CoV-2 posivity was evaluated, and factors associated to a positive SARS-CoV-2 result were evaluated using logistic regression, with $p < 0.05$ considered statistically significant.

Results:
Overall SARS-CoV-2 positivity was 12.7% (from 7.9% in <10 years to 17.3% in >60 years, P<0.001). Positivity rate among symptomatics was 36.1% versus 9.8% among asymptomatics, P<0.001. Age group ≤10 (aOR [95%CI]: 0.515 [0.338-0.784], P=0.002) and being symptomatic (aOR [95% CI]: 5.108 [4.521-5.771], P<0.001) were predictors of SARS-CoV-2 positivity.

Regarding PCR cycle threshold (CT), 53.8% of positive individuals had a CT <30. According to age, those aged 21-40 years showed a higher proportion with high viraemia (CT <20) (21.3% versus 12.5% among older individuals, P=0.003). Similarly, symptomatics showed a higher proportion with high viraemia (13.9%), compared to asymptomatics (22.4%), P<0.001.

Impact:
Our findings contributed in predicting the COVID-19 trends in Cameroon and in identifying the target populations for specific preventive measures. Of note, the elderly should be preferentially protected as the most vulnerable to infection, while those aged 21-40 years and symptomatics should be treated as the greatest transmitters at community-level.

Conclusion:
During this first wave of the pandemic, overall SARS-CoV-2 positivity remained high (>10%), and was associated with the presence of symptoms and older age. The majority of infection is among young and asymptomatic individuals, suggesting the "track-and-test" strategy should target these potential transmitters.

Epidemiology and related hospitalization of COVID-19 before and during the period of SARS-CoV-2 B.1.617.2 predominance in Tunisia (April-September 2021)

Ms. Mouna Safer, National Observatory of New and Emerging Diseases

Introduction/ Background:
By July 202, the SARS-CoV-2 B.1.617.2 variant became the predominant circulating strain, isolated in more than 80%. This study compared indicators of morbidity, mortality and related hospitalization of COVID -19 in two periods: April to June 2021, (predominance of B.1.1.7 variant) and July to September 2021 (predominance of B.1.617.2 variant).

Methods:
National surveillance COVID-19 data concerning morbidity, mortality and related hospitalisation collected by the National Observatory of New and Emerging Diseases from April to September 2021 was analyzed.

The following indicators were calculated: incidence rate (Crude mortality rate per 100,000 inhabitants was calculated), mortality rate (Crude mortality rate per 100,000 inhabitants was calculated), total hospitalisation rate and intesive care unit hospitalisation rate (hospitalizations per 100,000 persons). These indicators were compared during the period of of B.1.1.7 variant predominance and the period of B.1.617.2 variant predominance.

Results:
Based on 488054 confirmed cases of COVID-19 during April 1–September 30, 2021, incidence rate increased significantly during the delta predominance period from 1670,5 per 100000 persons to 2515,8 per 100000 persons (p<10-4).

We noted a mortality rate of 18,2 per 100000 persons during period before delta variant predominance and 27,3 per 100000 persons during period of Delta variant predominance (p<10-4) whereas we did not find significantly higher rate of related hospitalizations and proportion of Intensive care unit admissions during this period.

Impact:
The results of this study highlighted the impact of the delta variant in the resurgence of COVID -19 in Tunisia during the second phase of the epidemic and the importance of rigorous prevention and control

measures to reduce transmission, particularly ongoing vaccination program, and preparedness plans for hospital capacity.

Conclusion:
The results of this study that took place during the predominance period of B.1.617.2 variant in Tunisia showed significant increase in the incidence and mortality rate . This was probably related to low COVID-19 vaccination coverage, proved effective in reducing the incidence of infection and severe disease.

Epidemiology of SARS-CoV-2 in Tunisia, February 2020-October 2021

Dr. Aicha Lahchaichi, National Observatory of New and Emerging Diseases

Introduction/ Background:
The COVID-19 pandemic has overwhelmed health systems worldwide. The ability of SARS-CoV-2 to mutate will likely expose countries to further concerns in the future. The aim of this study is to describe the epidemiology of SARS-CoV-2 in Tunisia to inform prevention and public health control policies.

Methods:
A prospective national study based on the outbreak epidemiological monitoring and investigation system was conducted, 24 February 2020 - 31 October 2021. Data was collected via EPICOV platform and SARS-COV-2 database implemented by the National Observatory of New and Emerging Diseases. Data collected allowed the calculation and monitoring of the five key surveillance indicators: 14-day cumulative incidences (CI), mortality rates (MR), case fatality rates (CFR), test positive ratios (TPR), and testing rates (TR).

Results:
During the study period, Tunisia has reported 721078 cases and 25248 deaths corresponding to a CI of 6158.7 per 100000 inhabitants, a MR of 216.6 per 100000 inhabitants and a CFR of 3.5%.

Tunisia average 14-day CI was 140.5 per 100000 inhabitants, TPR and TR were 17.5% and 579.13 tests per 100000 inhabitants, respectively. The average 14-day MR were 4.90 per 100000 inhabitants.

The intensity and severity of transmission varied by region and time, with four outbreaks. The highest peak was observed during July-August 2021 after Variant Delta dissemination and have leading to increased incidence and deaths and strained health-care-system.

Impact:
The ongoing assessment of the epidemiological situation has allowed for early and rapid detection of cases, limitation of transmission and adjustment of control measures implemented. Therefore, the description of the outbreak suggested a phenotypic change in the epidemic, probably caused by the emergence of new variants, leading to an alert

Conclusion:
The temporo-spatial monitoring of the pandemic offered decision-makers key indicators to early detection of outbreaks and clusters and guide prevention control measures implementation. The intensity of non-pharmaceutical interventions was dynamically calibrated based on the risk evaluation.

Evaluation of assays for antibodies against SARS-CoV-2 in Uganda

Mr. Matthew Odongo, Uganda Virus Research Institute

Introduction/ Background:
Serological detection of specific antibodies to SARS-CoV-2 can be utilised to define the true burden of disease which is important given high rates of asymptomatic infection and the unknown implications on neurodevelopment in exposed infants. Assessing specificities of immunoassays in serum could identify best combinations of assays in periCOVID studies.

Methods:

We assessed the specificities of four commercially available SARS-CoV-2 immunoassays and one in-house assay in serum from Maternal samples. 20 pre-2019 samples and 20 PCR positive samples were utilised as per FIND criteria for assay validation.

These were identified as the MOLOGIC, WANTAI total antibody, Euroimmune S AND LUMINEX ELISAs test kits. The Sheffield assay was also used as a comparator. The FIND consortium criteria were reviewed for assessing diagnostic accuracy. Commercially available assays of possible use were identified in agreement with EACR / UVRI and FIND

Results:
Four commercially available serological tests assays were employed in this exercise. additionally, an in-house assay was used for caparison. sensitivity and specificities where calculated and reported as indicated below:

WANTAI total Antibody assay : sensitivity 90% specificity 95%
Luminex (N and S IgG) Sensitivity 100% specificity 95%
MOLOGIC assay (IgG) sensitivity 70% specificity 60%
EUROIMMUNE S and N (IgG) sensitivity 95% (for both) specificity 95% (for both)
Sheffield N and S (IgG) sensitivity N=100% S=90% specificity N=87% S=95%

Impact:
A well characterised algorithm for serological testing of SARS-CoV-2 antibodies in human serum will enable early screening for infection and quantify resultant antibody responses. standardised quantification of antibody levels will aid measurement of protective immunity which is of great public health importance.

Conclusion:
We advise using the Wantai as a screening test for maternal sera, followed by a second independent serological test employing different antigens – S and N (Euroimmune or Sheffield). This will also enable differentiation between natural immune sera and vaccination.

Field performance of rapid antigen test for SARS-CoV-2 in western Kenya

Dr. Simon Onsongo, PharmAccess Foundation

Introduction/ Background:
Testing for SARS-CoV-2 is a key pillar in combating COVID-19. Whilst testing using real-time polymerase chain reaction is the current gold standard, rapid antigen tests are an attractive alternative. This study assessed the field performance of the NowCheck COVID-19 antigen kit in selected healthcare facilities in Kisumu County - western Kenya.

Methods:
This was a prospective multi-facility field evaluation study using the NowCheck COVID-19 antigen test (Ag-RDT) compared to standard SARS-CoV-2 real-time polymerase chain reaction (RT-PCR). Paired oropharyngeal and nasopharyngeal swabs were collected from 997 all persons suspected to have COVID-19 and subjected to both antigen and RT-PCR testing. The testing algorithm followed the Ministry of Health, Kenya COVID-19 testing protocol. The results of both methods were captured using an electronic digital application and analyzed.

Results:
A total of 997 suspected COVID-19 cases were recruited. The median age of study participants was 39 years and 54% were male. T

he NowCheck COVID-19 Antigen test (BioNote, Hwaseong-si, South Korea) had a sensitivity of 84.8% (95% CI: 75.8-91.4) and specificity of 94.4% (95% CI: 92.7-95.8) and overall accuracy of 93.5% (95%CI: 91.8-94.9) when a cycle threshold (Ct value) of ≤35 was used.

When a Ct value <40 kit sensitivity was 71.5% (63.2-78.6) with a specificity of 97.5% (96.2-98.5). The highest sensitivity of 87.7% (77.2-94.5) was observed in samples with Ct values ≤30, corresponding with samples with higher viral loads.

Impact:
N/A *[This abstract was submitted before the CPHIA organizing committee added an "Impact" section.]*

Conclusion:
The NowCheck COVID-19 antigen test showed good field performance in this evaluation. Operational specificity and sensitivity were close to WHO-recommended thresholds. Faster turnaround time to results, lower cost, simple analytical steps requiring no equipment or infrastructure make antigen testing an attractive screening method in the fight against the SARS-CoV-2 pandemic.

Genomic surveillance of SARS-CoV-2 in Ghana: Leveraging a national influenza platform

Dr. Michael Marks, London School of Hygiene and Tropical Medicine

Introduction/ Background:
Genomic surveillance of SARS-CoV-2 is crucial for monitoring the spread of the disease and guiding public health decisions but the capacity for SARS-CoV-2 sequencing in Africa remains low. This research aims to increase the genomic contribution from the Africa and gain insights of the SARS-CoV-2 infections in Ghana and Africa.

Methods:
We utilised samples from two sources; firstly, community surveillance undertaken using the Ghana Influenza Surveillance Network and secondly imported cases of SARS-CoV-2 detected in travellers. A total of 457 patients from Ghana, collected from 1st April 2020 to 31st August 2021, were sequenced using Oxford Nanopore Technology sequencing and the ARTIC tiled amplicon method. The sequence lineages were typed using Pangolin and the phylogenetic analysis was carried out using IQtree and TreeTime.

Results:
We detected three waves of SARS-CoV-2 infections in Ghana. The first wave of infection was mainly contained in the Greater Accra, later spreading to other regions in the second and third wave. B.1 and

B.1.1. were the most prevalent lineages in wave one, while the B.1.1.7/alpha variant is responsible for the second wave.

An investigation into the lineages detected in Ghana led us to discover that B.1.1.318 (which contains the E484K mutation shown to impact antibody recognition) has a high cumulative prevalence rate in a number of neighbouring West African countries, suggesting that there might be a regional circulation.

Impact:
The high-quality sequences produced from this study were submitted to the largest open-access SARS-CoV-2 sequence database, increasing the genomic contribution from Africa. By sequencing both community samples and imported cases in Ghana, the study revealed an insight into the SARS-CoV-2 epidemiology in Ghana and West Africa.

Conclusion:
This study not only informed us of the epidemiological characteristics of the SARS-CoV-2 outbreaks in Ghana, but also shed light on the epidemiological trends of neighbouring countries that may have less sequencing capacity, highlighting the important role of pathogen genomic sequencing in cross-border and regional disease surveillance.

[Global burden of COVID-19 in Tunisia during the first year, February 2020 to February 2021](#)

Dr. Hind Bouguerra, National Observatory of New and Emerging Diseases

Introduction/ Background:
The effects of COVID-19 on public health can be expressed through the burden of disease indicators. The objective of this study was to estimate the burden of COVID-19 disease in Tunisia during the first year of the outbreak to provide clear information for stakeholders and decision-makers.

Methods:
We conducted a national prospective study between February 2020 and February 2021. The source of data

(daily cases and deaths) was based on the national surveillance system of COVID-19 notified to the National Observatory of New and Emerging Diseases.

The disability-adjusted life years (DALYs) due to COVID-19 were measured using an incidence-based approach in according to the European Burden of Disease Network consensus model: DALYs=YLDs (years of life lived with disability or morbidity indicator) +YLLs (years of life lost or mortality indicator).

Results:
During the study period, the DALY's number was 120644 in Tunisia. The proportion of DALYs lost by persons under 65 was 47.3%: 49.8% in men and 43.0% in women.

The majority (99.7%) of the COVID-19 disease burden was accounted for death (YLL). Each patient infected by SARS-Cov-2 lost 24.7 years of life : women suffered greater YLD than men (14.0 vs. 10.7 years).

In addition, each patient who died lost 15.5 years of life; women lost slightly greater years of life than men due to COVID-19 (15.3 vs. 14.9 years).

Impact:
These results are important to guide decision-makers to reduce the economic burden of the impact of COVID-19 in Tunisia and prioritize healthcare resources to control the pandemic especially with the limited available resources.

Conclusion:
Effective prevention and control strategies which include early quarantine and testing of suspected patients, isolation and managing of confirmed cases, contact tracing, and national vaccine program should be maintained. Further studies are needed for DALYs estimations in 2021 to assess the impact of vaccine strategies and the emergence of variants.

[High anti-SARS-CoV-2 IgG antibody seroprevalence among long-distance trucking crews in Kenya within one year of the COVID-19 pandemic](#)

Dr. Wangeci Kagucia, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
The first case of COVID-19 in Kenya was confirmed in March 2020. Given their key role, long-distance trucking crews (drivers, assistants and others) were exempted from local COVID-19 travel restrictions. Long-distance trucking crews also interact with many contacts over large geographical areas, placing them at increased risk of SARS-CoV-2 infection.

Methods:
We conducted two cross-sectional serosurveys to estimate cumulative SARS-CoV-2 incidence among trucking crews in Kenya. The surveys were conducted in Kilifi County and Busia County, the first in September – October 2020 and the second in January – April 2021.

Up to 5mL of blood was collected from participants and plasma extracted. Plasma samples were tested using a validated in-house anti-spike IgG ELISA with 93% sensitivity and 99% specificity. Overall crude and test performance adjusted seroprevalence were estimated.

Results:
A total of 830 and 527 participants were sampled in the first and second cross-sectional serosurveys, respectively. Overall crude SARS-CoV-2 IgG antibody seroprevalence was 39.6% (95% CI 36.3-43.1) and 61.9% (57.6-66.0) in the September-October 2020 survey and the January-April 2021 survey, respectively.

Overall SARS-CoV-2 IgG antibody seroprevalence adjusted for test performance was 42.3% (95% credible interval 38.4–46.3) in the September–October 2020 survey and 66.6% (61.7–72.2) in the January–April 2021 survey.

Impact:
This research generates empirical evidence on the risk of SARS-CoV-2 infection among long-distance trucking crews. The findings demonstrate the challenge of infection prevention within a group at increased occupational risk during pandemics yet exempt from stringent pandemic control measures given a critical role in sustaining supply chains during pandemics.

Conclusion:
Two-thirds of trucking crews were infected with SARS-CoV-2 within one year of the pandemic. Seroprevalence was higher compared to Kenyan healthcare workers (20.8% [17.5–24.4], July–December 2020) and blood donors (48.5% [45.2–52.1], January–March 2021), indicating higher infection risk. Preparedness planning for the safe continuation of haulage remains important for future pandemics.

Household genomic epidemiology of SARS-CoV-2 in rural coastal Kenya

Dr. Charles N. Agoti, Kenya Medical Research Institute

Introduction/ Background:
Household environments are characterized by frequent person-to-person contacts and potential transmission of respiratory infections. We used whole genome sequencing to describe the molecular epidemiology of SARS-CoV-2 in households in rural coastal Kenya.

Methods:
We collected 1,802 nasopharyngeal/ oropharyngeal swabs from 137 households (502 participants) in Kilifi County between 10th December 2020 and 14th September 2021. These households were selected because a member had been confirmed to have SAR-CoV-2 infection by routine health service testing, or because a member was a close contact of a confirmed case.

RT- PCR positive samples with a cycle threshold of < 30.0 were targeted for genome sequencing. Phylogenetic relationships were inferred using maximum likelihood methods and the number of independent introductions into the households

inferred using both pairwise nucleotide differences and ancestral state reconstruction approaches.

Results:
A total of 332 samples from 155 participants in 71 households tested SARS-CoV-2 positive, 132 (39.7%) of which yielded genomes with >80% coverage (73 participants in 41 households).

All recovered genomes were classified within lineages of known variants of concern: Alpha (n=60), Beta (n=18) and Delta (n=54). Of the 41 households with sequence data recovered, 26 (63%) had one distinct introduction, 10 (24%) had two introductions, 4 (10%) had three introductions and 1 (3%) had four introductions.

Among these sequenced households 31 within household transmission events and 16 interhousehold transmission events were identified from the genomic data.

Impact:
Transmission of SARS-CoV-2 infection within and between households is common in rural Kenya, is often asymptomatic, and realistic measures to mitigate infection spread within households are needed to reduce the disease burden.

Conclusion:
We found both frequent SARS-CoV-2 transmission within households and its multiple introductions into households. Genomic data adds value in estimating household attack rates by distinguishing single from multiple introductions to households.

Impact of the SARS-CoV-2 pandemic on health-care workers (HCWs) in Tunisia from 22 February 2020 to 31 October 2021

Dr. Souha Bougatef, National Observatory of New and Emerging Diseases

Introduction/ Background:
COVID-19 has rapidly spread throughout worldwide. HCW being at the frontline, are presumed to be a high-risk population. The objective of this study is to assess the impact of the SARS-CoV-2 infection on HCWs.

Methods:
We conducted a prospective nationwide cohort study from 22 February 2020 to 31 October 2021, on COVID-19 among HCWs diagnosed by RT-PCR and Rapid Antigen Test, and reported to the National Observatory of New and Emerging Diseases (ONMNE) and followed by regional unit. The following indicators were calculated: cumulative incidence rate (CI), case fatality ratio and relative risk (RR). Descriptive statistics were performed using frequencies, means and proportions. And a Chi-square test were used to determine the association between SARS-CoV-2 infection and different exposures.

Results:
13876 cases and 125 deaths of COVID-19 among HCWs were reported representing 1.9% and 0.5% of total infection and deaths respectively, giving a CI of 12300/100000 and a specific case fatality ratio of 1.3%.

The mean age was 41y, most cases were females (70.6%), nurses (55.1%), from university hospitals (42.9%) and working at COVID-19 units (32.6%).

The epidemic curve showed: The lowest CI was noted during the first phase of the pandemic (41/100000). The RR was 160 time greater during the early stages of the second phase (6694/100000). Most fatal cases occurred in males (3.4%) and within physicians.

Impact:
The study allowed to determine the occupation category and the working area most at risk for the SARS-CoV-2 infection in Tunisia, which will permit to refine the response against COVID-19.

Conclusion:
The widespread use of PPE helped control the infection rate among HCWs. The late decrease of the incidence rate can be attributed to the massive vaccination campaign implemented since week 12, 2021 privileging HCWs. Strategies to protect HCWs

should prioritize providing adequate PPE as well as testing, surveillance and vaccination.

Investigation of a Cluster of COVID-19 among Factory X Workers, Buikwe District, Uganda, 2020

Mr. Aggrey Byaruhanga, Makerere University

Introduction/ Background:
In September 2020, a cluster of SARS-COV-2 infections was reported among workers at a factory in Uganda. The factory had already introduced COVID-19 risk reduction measures for all employees, including face mask use. We investigated the cluster to determine exposures associated with transmission and inform evidence-based control measures.

Methods:
We defined a case as positive RT-PCR test for SARS-COV-2 in a Factory X worker during August-September 2020. We conducted a case-control study using a randomly selected subset of case patients.

A control was a Factory X worker with a negative RT-PCR test for COVID-19 during August-September 2020, selected randomly from Factory X departments with cases. Case-patients and controls were interviewed using a standardized questionnaire, asked about possible exposures.

We analysed data using logistic regression to obtain an adjusted odds ratio (AOR) with confidence interval (CI). We interviewed facility staff on preventive measures and conducted an observational assessment for ventilation and crowding.

Results:
Among 163 case-patients (factory attack rate=11%), none died. The index case-patient was a 27-year-old employee with infection confirmation on August 10.

In the case-control study with 75 cases and 75 controls, lack of self-reported mask use (AOR=14, 95% CI 2.4-76), and working in the engineering (AOR=5.9,

95% CI 2.3-16) or old garments (AOR=2.4. 95% CI 1.1-5.5) departments were associated with infection.

Engineering and old garments departments lacked windows, while other departments all had open windows. We observed workers on production lines spaced closely together.

Impact:
Based on the findings, Integration of tracking mechanisms for local infections at workplaces and enhanced focus on preventive measures, including periodic worker monitoring to ensure adherence to preventive measures, may be warranted during higher-risk times to prevent such outbreaks in the future.

Conclusion:
This SARS-COV-2 cluster was associated with inadequate mask use and poor ventilation, likely exacerbated by congestion. We recommended enforcement of factory risk reduction measures including mask use, increased spacing on production lines and provision of adequate windows and doors in all departments.

Knowledge, Attitude and Practice towards COVID-19 in Tanzania, April 2020 – June 2021.

Dr. Esther Ngadaya, National Institute for Medical Research – Tanzania

Introduction/ Background:
Public must routinely practice precautionary behaviors to control the spread of COVID-19. This paper measured changes in the public's knowledge, attitudes, and practices (KAP) related to COVID-19 at different intervals to provide recommendations for behavioral interventions and policies in the country.

Methods:
We conducted three cross-sectional surveys between May 2020 to February 2021 involving 5231 Tanzanians (KAP1-1822; KAP2-1813 & KAP3-1596) residing in all 8 zones, where one region/zone was selected

randomly. KAP-1 and 2 were conducted between May and August 2020, and KAP-3 in February 2021. Both qualitative and quantitative methods were employed. We determined the level of comprehensive Knowledge, Attitude and Practice. Descriptive statistics, chi-square and t- tests were used in data analysis.
Results:
Among 5231 respondents, 53.6% were males. Mean age ranged between 31.6 to 37.0 years.

Majority (35.9%) completed primary school. COVID-19 awareness in all KAPs was very high (over 98%). Comprehensive knowledge increased from 37.3% in KAP-1 to 44.9% in KAP-3; p=0.001.

Strongly positive attitude towards different Covid-19 preventive measures declined from 68.4% in KAP-1 to 59.5% in KAP-3. The need for COVID-19 vaccines has significantly dropped from 93.3% in KAP-1 to 68.5% in KAP-3.

Lowest recorded mean practices scores were in KAP-2 (28.2 (SD=12.9)) compared to 71.6 (SD=15.9) in KAP-1. Radio and TV were the most preferred source of information.

Impact:
The findings are expected to generate a better understanding of the drivers and barriers for COVID-19 spread, prevention and possible control measures to inform Risk Communication and Community Engagement in the country.

Conclusion:
Results highlight the importance of consistent messaging from health authorities using preferred channels, as well as the need for tailored health education programs. Furthermore, reinforcing /supporting beliefs of self-efficacy and effectiveness of the recommended COVID-19 prevention and control measures is important.

Multisystem Inflammatory Syndrome in Children: A Diagnostic Conundrum in a Young Kenyan Boy, October 2021.

Dr. Derrick Nyaga, University of Nairobi

Introduction/ Background:
Multisystem inflammatory syndrome in children is a severe manifestation of COVID-19 infection in children and adolescents. It causes a significant hyper inflammatory response in children and is related to SARS-CoV-2 infection. There is paucity of data on this subject, especially in Sub-Saharan Africa, leading to challenges and delays in diagnosis.

Methods:
A case of a 17-year Kenyan boy who presented to a tertiary-level facility in Nairobi with abdominal pain and diarrhea for five days, difficulty in breathing and conjunctival injection for 1 day. Three weeks prior to this he had a dry cough and associated sore throat. He hadn't received Covid-19 vaccination. There had been a COVID-19 outbreak at school. Examination at admission revealed he was hypotensive, tachycardic, tachypnoeic, afebrile with normal oxygen saturations. He had distended neck veins with hyperactive precordium and elevated jugular venous pressure, a distended abdomen, tender in the right upper quadrant and a hepatomegaly of 16cm.

Results:
Investigations revealed multiple organ dysfunction (MOD) including heart failure with reduced ejection fraction (LVEF-30%), acute kidney injury, acute congestive hepatopathy, coagulopathy, elevated inflammation markers and positive SARS-CoV-2 IgG and IgM and a negative COVID 19 PCR test. He received IV antibiotics, daily hemodialysis sessions, inotropic support, high dose steroid therapy and Tocilizumab. He succumbed 8 days after admission. A postmortem revealed necrosis of the glomeruli and tubules, acute hemorrhagic necrosis of hepatocytes with fatty change, hyaline covering alveoli sac in-keeping with acute respiratory distress syndrome.

Impact:
MIS-C presents a diagnostic challenge and is often mistaken for other medical conditions. This often leads to inappropriate or delayed treatment, hence poor outcomes. A high index of suspicion is

warranted. This may present a wakeup call for consideration of extending vaccination to the pediatric age group.

Conclusion:
Multi-system inflammatory syndrome is a rare COVID 19 complication affecting children and adolescents. It presents difficulty in diagnosis in Kenya considering most adolescents are managed as adults. This case hopes to increase vigilance among health care workers and that more preventive interventions can be implemented to reduce infection in children.

SARS-CoV-2 cases reported from long-term residential facilities (care homes) in South Africa: A retrospective cohort study

Tracy Arendse, National Institute for Communicable Diseases

Introduction/ Background:
Long-term care facilities (LTCFs) experienced a large burden of SARS-CoV-2 due the COVID-19 pandemic. The purpose of this study was to describe the temporal trends as well as the characteristics and risk factors for mortality among residents and staff testing positive for SARS-CoV-2 in LTCFs across South Africa.

Methods:
We implemented a retrospective cohort analysis of SARS-CoV-2 positive cases in LTCFs across South Africa from 5 March 2020– 31 July 2021. We analysed 45 LTCFs from the DATCOV sentinel surveillance system in South Africa. Outbreaks in LTCFs were defined as large if more than one third of residents and staff had been infected or there were more than 20 cases that were epidemiologically linked. Multivariable logistic regression was used to assess risk factors for mortality amongst LTCF residents.

Results:
Total of 2,324 SARS-CoV-2 cases were reported; 1,504 (65%) were residents and 820 (35%) staff. Ten (26%) reported one outbreak and 29 (74%) reported more than one outbreak, while 15 (38%) reported small outbreaks and 24 (62%) large outbreaks.

There were 1,259 cases during the first COVID-19 wave, 362 during wave two, and 299 during wave three. Among residents, 9% died and among staff 0.5% died.

Factors associated with mortality among residents were age 40-59 years, 60-79 years and ≥80 years compared to <40 years. Compared to pre-wave 1, there was a lower risk of mortality across waves.

Impact:
There is currently very little literature on the impact of COVID-19 in LTCFs in low- and middle-income countries (LMIC). This study will impact by adding knowledge to SARS-CoV-2 in LTCFs in a LMIC.

Conclusion:
Sentinel LTCFs in South Africa shows an encouraging trend of decreasing numbers of outbreaks, cases, and risk for mortality since the first wave. LTCFs have likely learnt from international experience and adopted national protocols, including improved measures to limit transmission and early and appropriate clinical care.

SARS-CoV-2 large-scale population testing using LumiraDx SARS-CoV-2 Antigen Test

Dr. Aminata Mboup, L'Institut de Recherche en Santé, de Surveillance Épidémiologique et de Formations

Introduction/ Background:
RT-PCR testing remains the gold standard for the diagnosis of infections. There are limited resources for SARS-CoV-2 RT-PCR, which affects capacity for screening large populations. To meet such demands and reduce transmission, antigen-based methods are being considered. We assess antigen tests performance for large population screening compared to RT-PCR.

Methods:
The evaluation was conducted on 4146 participants in Senegal and tested at IRESSEF (Institut de Recherche en Sante de Surveillance Epidemiologique et de

Formations. Oropharyngeal and nasopharyngeal swaps were collected from each participant into 2 mL of viral transport medium (VTM). We used 400ul of VTM to assess the performance of LumiraDx SARS-CoV-2 antigen assay compared to RT-PCR. Sensibilities and specificities LumiraxDx were computed and compared to those of RT-PCR.

Results:
Prevalence of SARS-CoV-2 was 4.5% with RT-PCR and 4.1% with LumiraDx. Compared to the RT-PCR, the specificity and specificity of the LumiraDx test in large-scale population were 82.7% [95% CI 74,1-89,7] and 99.9% [95% CI 99,6-99,9] respectively.

Based on the threshold cycle range, sensitivity and specificity were 92,1% [95% CI 84,6-96,3] and 99.9 % [95% CI 99,6-99,9], respectively when Ct value was below or equal 33 cycles, and 38.1% [95% CI 18,9-61,3] and 100% [95%CI 99,7-100] respectively when it was above 33. The kappa coefficient was 0.88 when considering all the patients and 0.94 for Ct values below 30 cycles.

Impact:
The results confirm that antigen-based tests could be used instead of PCR-based test in resource limited settings. Indeed, RT- PCR may not be feasible for large populations screening in resource limited countries and antigen-based testing could be an alternative to quickly diagnose, isolate and treat positive cases.

Conclusion:
Our data have shown that the LumiraDx SARS-CoV-2 antigen test using oropharyngeal and nasopharyngeal swap samples collected in viral transport elicited comparable prevalence, high sensitivity and good agreement in large scale screening of SARS-CoV-2, when compared to the RT-PCR.

[Seroprevalence of SARS-Cov-2 from July to September 2020 in Senegal](#)

Dr. Moustapha Mbow , L'Institut de Recherche en Santé, de Surveillance Épidémiologique et de

Formations

Introduction/ Background:
Because of limitations of the RT-PCR for the diagnosis of SARS-CoV-2 for large-scale testing, data based on such a molecular method may not reflect the actual exposure to the virus. In this study, we assessed the seroprevalence of SARS-CoV-2 during the first wave of the SARS-CoV-2 pandemic in Senegal.

Methods:
A total of 3,978 samples were collected from nine regions of Senegal between July and September 2020. Participants were recruited from the Dakar, Thiès, Diourbel, Louga, Saint Louis, Kaolack, Ziguinchor, Saint-Louis, and Tambacounda which are the main regions of Senegal.

From each participant, EDTA blood was collected and approximately 2ml of plasma were stored at 80ºC for the subsequent anti-IgG and anti-IgM qualitative test using the lateral flow Healgen IgG/IgM SARS-CoV-2 test, which has previously been successfully evaluated.

Results:
Our data have shown a national SARS-CoV-2 prevalence of 28% during the first wave. The highest exposure to the virus was found in Ziguinchor with a prevalence of nearly 60% while the Thiès, Louga and Kaolack regions elicited the lowest prevalence. Considering the age groups [0-18], [19-40], [41-60] and > 60 years, there was no significant difference in the seroprevalence despite a slight predominance among [19- 40] years. In Dakar, no significant difference in prevalence between the four departments. No significant difference in exposure to SARS-CoV-2 between males and females was found despite a slight predominance in males.

Impact:
The seroprevalence eliciting the exposure of a given population to SARS-CoV-2 could provide important information that can serve not only for prevention guidances for control programmes but also SARS-CoV-2 vaccine strategies.

Conclusion:
In the light of these results, it appears that the circulation of the SARS-CoV-2 in Senegal during the first pandemic wave was much higher than what was reported at the national level based on RT-PCR testing.

Sero-surveillance for IgG to SARS-CoV-2 at antenatal care clinics in three Kenyan referral hospitals

Dr. Katherine Gallagher, KEMRI-Wellcome Trust

Introduction/ Background:
The high proportion of SARS-CoV-2 infections that remain undetected presents a challenge to tracking the progress of the pandemic and implementing control measures in Kenya. Pregnant women represent a sentinel sero-surveillance population as they routinely supply blood samples at their first antenatal care visit.

Methods:
We determined the prevalence of IgG to SARS-CoV-2 in residual blood samples from mothers attending antenatal care services at 3 referral hospitals in Kenya (Kilifi County Hospital, Kenyatta National Hospital and Busia County Referral Hospital). We used a validated IgG ELISA for SARS-Cov-2 spike protein and adjusted the results for assay sensitivity and specificity. We then used mixture models to estimate true cumulative exposure in the context of waning IgG titres over time.

Results:
In Kenyatta National Hospital, Nairobi, adjusted seroprevalence in August 2020 was 50% (95% CI 42.7-58.0) but had decreased to 32% (26.2-38.4) in February 2021.

In Kilifi County Hospital, seroprevalence increased from 1% (95% CI 0.04-4.7) in September 2020 to 23% in March 2021. Only 7% of women reported past symptoms.

Further results from Nairobi, Busia and Kilifi up until October 2021 and the results of the mixture modelling will be available by the 30th November 2021.

Impact:
Residual blood samples from antenatal care visits represent an efficient sentinel surveillance population for sero-surveillance activities. The sero-surveillance estimates from this group can be compared with those from blood donors and other sentinel populations to identify high-risk groups.

Conclusion:
There has been substantial, unobserved transmission of SARS-CoV-2 in parts of Nairobi, Busia and Kilifi Counties. Due to the length of time since the beginning of the pandemic, repeated cross-sectional surveys are now difficult to interpret without the use of models to account for sero-reversion.

Serosurveillance for SARS-CoV-2 Antibodies in a cohort of Health Care Workers in Kenya

Dr. Anthony Etyang, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
Health care workers (HCWs) have a critical role in responding to the COVID-19 pandemic in Africa, while also providing other health services. We are conducting a longitudinal cohort study to estimate the incidence and severity of SARS-CoV-2 infection among HCWs in Kenya.

Methods:
We report preliminary results from the first two serosurveillance rounds. We recruited HCWs of all cadres from Kilifi, Nairobi, and Busia in Kenya. Serum samples were collected from June to December 2020 (round 1), and from February to May 2021 (round 2).

The median interval between sample collections was 174 days (IQR 100-217). We tested for immunoglobulin G antibodies to SARS-CoV-2 spike protein using a locally validated enzyme-linked immunosorbent assay with a sensitivity of 93% and specificity of 99%.

Complete data for both rounds were available for 550 (80%) of 684 HCWs.

Results:
The mean (sd) age of study participants was 37(14) years, 295 (54%) were female, and 69 (13%) had received one dose of COVID-19 vaccine.

SARS-CoV-2 seropositivity rose from 19% (95% CI 15-22) in round 1 to 45% (95% CI 41-50) in round 2. Seroreversion occurred in 42(41%) of 102 HCWs that were initially seropositive.

Seroconversion occurred in 190(42%) of 448 HCWs that were initially seronegative. Log mean (sd) antibody levels (arbitrary units) in seropositive unvaccinated HCWs (N=97) reduced from 1.5(0.7) in round 1 to 1.1(1.1) in round 2, mean (sd) reduction 0.47(0.99), p<0.001.

Impact:
Seroprevalence of anti-SARS-CoV-2 IgG was high among HCWs in Kenya and rose steeply in early 2021. There was significant waning of antibody levels in those with evidence of previous infection. These results will be useful in informing public health policy to control the pandemic.

Conclusion:
During this high incidence period, there was equal probability of seroreversion and seroconversion among HCWs in Kenya. This suggests that seroprevalence of anti-SARS-CoV-2 IgG is likely to plateau soon, despite ongoing transmission.

The burden of SARS-CoV-2 infection among children in Lagos, Nigeria

Dr. Oluwatosin Odubela, Nigerian Institute of Medical Research

Introduction/ Background:
Most reports are silent on the burden of COVID-19 in paediatric population. Is the incidence and severity of COVID-19 truly low as reported? The objective of this study was to describe the prevalence and clinical features of coronavirus disease among children at a COVID-19 testing centre in Lagos, Nigeria.

Methods:
This is a retrospective study describing the prevalence and pattern of symptoms of COVID-19 among children at a testing centre in Lagos, Nigeria. Data was collected from the electronic records of individuals (< 18 years) visiting the SARS-CoV-2 testing centre from March 1, 2020, to June 30, 2020. The sociodemographic data, travel history, preexisting comorbidities, clinical symptoms, and outcomes of the qualitative (SARS-CoV-2) RT-PCR results were extracted and analyzed using SPSS software, version 22.0.

Results:
Three hundred and seven children were screened for SARS-CoV-2 infection and fifty children were found to be positive, giving a prevalence of 16.3%.

The median age (interquartile range (IQR)) was 9 (4–14) years. Seventeen (34.0%) of the SARS-CoV-2-positive children presented with symptoms while the rest were asymptomatic. The common presenting symptoms among those positive for SARS-CoV-2 infection were fever (40.0%), cough (32.9%), sore throat (17.1%), and runny nose (15.7%).

Fever and sore throat occurring together was the symptom combination most predictive of SARS-CoV-2 infection among the population (OR 0.49,95% CI: 0.12-1.98 and OR 4.59 95% CI 0.93-22.73).

Impact:
This is the first study to describe the epidemiological and clinical characteristics of children screened for SARS-CoV-2 infection in sub-Saharan Africa. The pattern of symptoms seen in SARS-CoV-2 infections among children is similar to common childhood infections (malaria, acute diarrhea diseases, and respiratory tract infection).

Conclusion:
Prevalence of paediatric SARS-CoV-2 infection was 16.3%, but majorly of mild disease and was commonly

predicated by fever and sore throat symptom combination. There is a need for a high level of suspicion in the management of common febrile diseases in paediatric settings especially in presence of sore throat.

The Three waves of the Coronavirus disease-19 pandemic: epidemiology and response strategies from March 2020 to September 2021 in Senegal

Dr. Mbouna Ndiaye, Institut National de Santé Publique

Introduction/ Background:
In response SRAS-Cov2 that hit Senegal in March 2020, the country has implemented several strategies to contain its spread. To date, apart from official situation reports, no publication has been made on the development of the different waves in Senegal. Our objective was to describe the epidemiology and strategies adopted.

Methods:
We conducted a descriptive cross-sectional study of confirmed COVID-19 cases from March 2, 2020 to September 30, 2021 in Senegal. A confirmed case was defined as a person with a positive Reverse Transcriptase Polymerase Chain Reaction (RT-PCR-SRAS-Cov 2) or antigenic (rapid diagnostic) test, regardless of clinical signs and symptoms. We used surveillance data collected by Ministry of Health and extracted the variables of interest: socio-demographic characteristics, mode of transmission and biological confirmation. Data quality control was performed with investigation forms. Data was cleaned and analyzed with the software R. We computed the following parameters: proportions, mean and standard deviation.

Results:
Senegal recorded a total of 73 782 confirmed cases and 1 859 deaths due to SARS-Cov-2. The temporal evolution was marked by three epidemic waves.

Epidemic was concentrated in high-density areas such as Dakar (48,656 cases or 66%), among males

(sex ratio 1.13) and in the 25-34 age group (16,527 cases or 22.4%).

The national incidence was 428 per 100,000 inhabitants and the overall case fatality rate was 2.5% (1,859/73,782). Strategies were implemented according to the waves: training for healthworkers, restrictive measures, home-based case management and vaccination.

Thus far, 9.2% (840,154/9,128,453) of the target population have been fully vaccinated.

Impact:
Our study has allowed to know the evolution of the epidemic over time, map the areas at risk and identify the categories of people most affected. Our work provides an inventory of all the strategies implemented. Our recommendations will allow a better targeting of interventions and a readjustment of strategies.

Conclusion:
The epidemic has affected specific groups. The disease was most prevalent in densely populated areas, in the 25-34 age group and in males. We recommended to: reinforce preventive measures in high-density cities, mobilize community health networks to encourage vaccination and assess the impact of COVID-19 on priority public health programs.

Title Epidemiology of COVID-19 among population under 18 years-old: The Tunisian experience. March 2020-July 2021

Dr. Molka Osman, National Observatory of New and Emerging Diseases

Introduction/ Background:
Children have a lower susceptibility to SARS-CoV-2 infection than adults and experience less severe illness with 0.08% mortality. Since the emergence of new variants of concern, there are increased rates of infection across all age groups. This study aims to

characterize COVID-19 among people under 18 years old in Tunisia.

Methods:
We conducted a national prospective study from March 02, 2020 to July 10, 2021. Data were collected by the National Observatory of New and Emerging Diseases via EPICOV and SARS-COV-2 database and concerned COVID-19 RT-PCR confirmed cases under 18 years. Viral mutations and variants in Tunisia, routinely monitored through a sequence-based surveillance using a representative sample of COVID-19 patients in Tunisia, were also assessed. We did a descriptive analysis by gender, age group, region, outcome, and infecting sequence. We also calculated the cumulative incidence.

Results:
Out of 497,613 COVID-19 confirmed cases, 4.1% (n=20,434) were under 18.

The average age was 12.5 +/- 5.1 years. Female were more affected than male (52.5% vs 47.5%). The cumulative incidence was 606,4/100,000 people under 18.

The highest incidence rates occurred in weeks 1, 14 and 26 of 2021. Fifty-one children died from COVID-19, of which 67% were boys and 47% were under one year. Highest numbers were recorded during week 25 of 2021 (12%).

Out of 208 samples sequenced, 41% (n=85) were VOC (84% Alpha, 15% Delta and 1% Beta). The Delta variant was mostly detected in Kairouan (62%).

Impact:
Our research describes COVID-19 among population under 18 years old since the beginning of the pandemic in Tunisia, which is important to know in order to orient preventive measures and adapt them according to the results.

Conclusion:
Our findings highlight that child COVID-19 is not uncommon, a majority being adolescents and with a high case-fatality rate. With the Delta variant, the control of cluster infections and preventive measures such as social distancing, hand wash, wearing mask and vaccination should be enhanced especially in family and school environment.

Validation of Commercial SARS-CoV-2 Immunoassays in a Nigerian Population

Ms. Fehintola Ige, Nigerian Institute of Medical Research

Introduction/ Background:
The World Health Organization reports that approximately 80% of COVID-19 infections seen in Africans were asymptomatic compared to 40% - 50% seen globally. Validated serological assays are thus critical in conducting reliable serosurveys; however most SARS-CoV-2 immunoassays were validated using specimens from China, Europe, or United States populations.

Methods:
The study evaluated performance of five commercial SARS-CoV-2 immunoassays to inform use in serosurveys in Nigeria. Four semi-quantitative ELISAs (Euroimmun Anti-SARS-CoV-2 NCP IgG, Euroimmun spike SARS-CoV-2 IgG, Omega Mologic COVID-19 IgG, Bio-Rad Platelia SARS-COV-2 Total Ab) and one chemiluminescent microparticle immunoassay (Abbott Architect SARS-COV-2 IgG) were assessed.

The analytical performance characteristics was evaluated using plasma from 100 SARS-CoV-2 polymerase chain reaction (PCR)-positive patients from varied time points post-PCR confirmation and 100 pre-pandemic samples (50 HIV-positive and 50 hepatitis B-positive).

Results:
The Bio-Rad assay was evaluated, but failed manufacturer-specified validation steps. The Euroimmun NCP, Euroimmun spike, and Mologic assays had sensitivities of 73.7%, 74.4% and 76.9%, respectively, on samples taken 15-58 days after PCR confirmation, and specificities of 97%, 100%, and 83.8%,

respectively. The Abbott assay had 71.3% sensitivity and 100% specificity on the same panel. Parallel or serial algorithms combining two of the above immunoassays did not substantially improve sensitivity or specificity.

Impact:
Validated assays are necessary in conducting reliable seroepidemiology surveys and in tracking asymptomatic infections. These findings highlight the importance of in-country validations of SARS-CoV-2 serological assays prior to use to ensure accurate results are available for public health decision making to control the COVID-19 pandemic in Africa.

Conclusion:
The study results showed lower sensitivity and, for one immunoassay, lower specificity, compared to manufacturers' results and other reported validations. Seroprevalence results using these assays might need to be interpreted with caution in Nigeria and similar settings.

Willingness to participate in COVID-19 vaccine trials; a survey among a population of healthcare workers in Uganda

Dr. Jonathan Kitonsa, Uganda Virus Research Institute

Introduction/ Background:
Healthcare workers (HCWs) are at high risk of acquiring SARS-CoV-2 and COVID-19 and may therefore be a suitable population for COVID-19 vaccine trials. We conducted a survey to evaluate willingness-to-participate in COVID-19 vaccine trials in a population of HCWs at three hospitals in Uganda.

Methods:
This cross-sectional survey was conducted between September and November 2020. Using a standardised face-to-face administered questionnaire loaded on encrypted electronic tablets, data were collected on socio-demographics, willingness-to-participate in COVID-19 vaccine trials, and motivators and barriers to participation. Data were analysed descriptively and a binomial

generalised linear model with a log link function used to investigate factors associated with unwillingness to participate. A p-value cut off of 0.05 was used to determine statistical significance.

Results:
657 HCWs (female, 63%) were enrolled (Mean age 33 years, SD 10). Overall willingness-to-participate was 70.2%. Key motivators for participation were expectation of protection against COVID-19 (81.1%) and altruism (73.3%).

Selected hypothetical trial attributes reduced willingness-to-participate weekly-quarterly study visits across 12 months (70.2%-63.2%); risk of mild-moderate local adverse reactions (70.2%-60.3%, P<0.001); and delay of pregnancy: Female, 62.8%-48.4% (P=0.002); Male, 82.5%-71.5% (P=0.003)].

Among individuals that were unwilling to participate, the commonest barrier was concern over vaccine safety (54.6%). Unwillingness to-participate was associated with being female (aRR 1.97, CI 1.46-2.67, P<0.001) and having university or other higher-level education (aRR 1.52, CI 1.05-2.2, P=0.026).

Impact:
Some of the findings from this study may inform uptake of approved vaccines, e.g., concerns about safety. In addition, in preparation for COVID-19 vaccine trials, extensive education for potential participants is needed. The reluctance of females to participate and the impact of the need to delay pregnancy need farther exploration.

Conclusion:
Willingness-to-participate in COVID-19 vaccine trials among HCWs in Uganda is high but may be affected by vaccine trial requirements and concerns about the safety of candidate vaccines. Preparation for COVID-19 vaccine trials should include extensive education about vaccine research and vaccine research requirements for potential participants.

Track 4: Assessing the Response to COVID-19 in Africa to Prepare for Future Health Threats

This session examined the effectiveness of Africa's response to the COVID-19 pandemic and highlighted key successes, challenges and lessons learned to prepare for future health threats. It also explored ways to prevent the severe unintended economic and social consequences that often follow health crises such as COVID-19.

Following the emergence of COVID-19 in December 2019 and introduction into Africa in February 2020, the continent was predicted to be the next epicentre of the disease because of the weak healthcare systems and limited capacities for surveillance, diagnostics, and treatment in many African countries. Nevertheless, African countries responded relatively well to the pandemic. The successful response to COVID-19 in Africa has been attributed in some cases to government leadership, to effective regional leadership by the African Union and WHO, and collective efforts to enforce public health measures across most countries. However, the continent has faced a variety of challenges including in some instances weak leadership, restrictions in the global supply chain with insufficient test kits, personal protective equipment and lack of vaccine access, and misinformation.

Track 4 included 10 abstract-driven oral presentations and 19 posters. Oral presentation sessions for this track were held on Thursday 16 December 2021 from 1:00PM – 2:30PM EAT.

Oral Presentations – Session 1

The following abstracts were presented in Track 4 Parallel Session 1. The session was co-moderated by Professor Ehimario Igumbor (Senior Epidemiology Advisor to the Director General, Nigeria CDC) and Professor Moses Bockarie (Director, EDCTP).

Strengthening public mental health in Africa in response to COVID-19

Dr. Mohammed Abdulaziz, Head of Division, Africa Centres for Disease Control and Prevention
Dr. Muhammad Alkasaby, Research Fellow in Mental Health, London School of Hygiene and Tropical Medicine

Introduction/ Background:
The COVID-19 crisis has disrupted health systems all over the world. 93% of countries worldwide reported disruption in mental health services. In a survey conducted by the WHO, about 75% of the responding countries reported the lack of funding

to implement their COVID-19 mental health response plans.

Methods:
This research was designed and implemented with the mental health leads from African public health institutions (Africa CDC, WHO AFRO and EMRO, WAHO, ECSA-HC). It assessed the mental health response to the COVID-19 pandemic in African countries.

A web-based survey was sent to mental health focal points in 55 African countries. The survey assessed the perceived degree of implementation of the Inter-Agency Standing Committee (IASC) "14 Globally Recommended Activities" for mental health response to COVID-19. In-depth interviews with 17 respondents followed the survey to explore barriers and enablers to mental health integration into the current pandemic response.

Results:
Responses were received from 28 countries. The degree of implementation of the recommended

mental health activities was less than half in about 70 % of the respondent countries. Lack of political will, poor funding, limited human resources, and weak pre-existing mental health systems were key challenges faced in addressing mental health needs during the COVID-19 crisis. Participants highlighted the need to capitalize on the increased attention to mental health and strengthen new partnerships initiated through the COVID-19 pandemic response.

Impact:
Extracting lessons from the current pandemic response will help to improve the preparedness and response to future disease outbreaks. This is a formative research that will be used in the second phase of the project which aims to improve mental health response to disease outbreaks in Africa.

Conclusion:
National mental health should be strengthened in advance of potential future outbreaks. International agencies and local NGOs have significant roles in encouraging national uptake of mental health in health systems by developing agendas and recommendations, organizing stakeholder meetings, and drawing political attention towards the importance of mental health.

The Unsung Heroes in the COVID-19 Response: Lessons Learnt from the Partnership for Accelerated COVID 19 Testing Initiative in Africa, August 2020 - October 2021.

Dr. Herilinda Temba, Community Health Workers Initiative Coordinator, Africa Centres for Disease Control and Prevention

Introduction/ Background:
This paper describes the role of Community Health Workers (CHWs) in COVID 19 Response based on the lesson learned from the Partnership for Accelerated COVID-19 Testing (PACT) Initiative implemented by the African Centers for Disease Control and Prevention.

Methods:
The study is based on field experience and lesson learned from PACT initiative implementation. We analyzed 15 months field reports from PACT supported CHWs who were locally recruited, trained and deployed to support COVID 19 response across 28 African Countries for the period of August 2020 to October 2021. Bi-weekly field reports were received from 28 African countries implementing PACT Initiative and all the countries implementing the initiative were included in the analysis. Over 50 field reports were analyzed using excel.

Results:
Over 20500 CHWs were trained, deployed and supported with working tools. The deployed CHWs visited over 2.7 million households for community engagement activities, active case search, and contact tracing.

They identified over 1.6 million contacts, 941,031 suspect cases and facilitated testing referrals for 571,197 (61%) of suspect cases. The deployed CHWs were also key in Community engagement activities to promote COVID 19 vaccine uptake. Challenges includes low recognition of CHWs, inadequate coordination, insufficient financing and sustainability.

Impact:
The deployed CHWs were critical in supporting surveillance activities in COVID 19 response including Contact tracing, active case search, Risk communication and community engagement activities to create awareness and promote vaccine uptake.

Conclusion:
Community health workers represent a crucial asset of African States health system and offers a critical part of human resource for health, when capacitated can offer a range of preventive, promotive and curative health services. There is urgent need for further action to support country-led community health strategies.

Readiness of Health Facilities to Manage COVID-19 in Uganda, June 2021

Dr. Patience Mwine, Fellow, Uganda National Institute of Public Health

Introduction/ Background:
The COVID-19 pandemic has overwhelmed the capacity of health facilities globally, emphasizing the need for readiness. The first wave of COVID-19 in Uganda peaked in late 2020, uncovering challenges with facility readiness. In mid-2021, we assessed the readiness of health facilities in Uganda to manage the second wave of COVID-19.

Methods:
We assessed 17 RRH and 71 lower-level health facilities from all subregions of Uganda during June 2021. In each of the facilities, we interviewed the director about challenges faced during the first COVID-19 wave. We inspected COVID-19 treatment units (CTUs) and other facility service delivery points using a WHO observational checklist with infection prevention, equipment, medicines, personal protective equipment (PPE) and CTU surge capacity.

We used the "ReadyScore" criteria to classify level of preparedness as >80% ('better prepared'), 40–80% ('work to do'), and <40% ('not ready'). Readiness was assessed at levels tailored to the specific facility level.

Results:
All 17 RRH assessed were managing COVID-19 patients at the time of the visit. Of these, 15 (88%) were in "work to do" category, and two (12%) were "better prepared". Most had an inadequate supply of 13 (82%) essential medicines, 12 (71%) oxygen and 11 (65%) lacked space to expand CTUs.

None of the 71 lower-level facilities had COVID-19 patients admitted when we visited. Fifty-five (77%) of these were "not ready", and 16 (23%) were in the "work to do" category. The majority, 70 (99%), lacked medicines, 64 (90%) lacked PPE, and 53 (75%) lacked an emergency plan for COVID-19.

Impact:
The Ministry of health utilized our findings and supported health facilities; the national medical stores made an emergency supply of medicines and personal protective equipment to the under-equipped CTUs. We provide feedback to health facilities and sensitized them on infection prevention and control to prevent COVID-19 infections in health facilities.

Conclusion:
Few health facilities were ready to manage a second wave of COVID-19 in Uganda during June 2021. The largest gaps were in essential medicines, PPE, oxygen, and space for CTU expansion. Adequate preparedness for future waves of COVID-19 requires additional support and action in Uganda.

COVID-19 Vaccination intentions and related factors in South Africa: results from a large-scale public survey

Ms. Ronel Sewpaul, Research Manager, Human Sciences Research Council of South Africa

Introduction/ Background:
Despite COVID-19 vaccines being ubiquitous in South Africa, 30% of the population are vaccinated. Understanding socio-behavioural determinants of vaccination intention can inform interventions to improve vaccination uptake. We assessed the intentions and attitudes regarding the COVID-19 vaccinations and the socio-behavioural factors associated with intention to vaccinate among South African adults.

Methods:
Data was analysed from a large-scale public survey conducted in South Africa from 25 June-15 September 2021. The survey was administered online using a data-free platform and telephonically. Invitations to participate were widely distributed on social media platforms. Vaccination

intention was based on the question "When available, would you take the COVID 19 vaccine?"

Data were benchmarked using the general population demographics. Bivariate analyses examined the association between vaccination intentions and explanatory variables that included attitudinal, behavioural, and sociodemographic variables.

Results:
73.8% reported they would definitely/probably take the vaccine, 16.4% were uncertain and 9.9% reported they probably or definitely would not (N=14,419).

63.4% thought vaccines are useful to protect communities from disease; over 60% were concerned about vaccination-related side-effects; 72.9% heard conflicting information about COVID-19 vaccinations and 18.7% felt their religion/culture would discourage them or their families from being vaccinated.

Vaccination intentions were significantly lower for 18-29-year-olds, women; those concerned about side-effects; who felt their religion/culture discouraged them, who thought there was inadequate safety information about the vaccines, and who questioned their effectiveness due to fast development.

Impact:
The study identifies subgroups of individuals for whom targeted public health interventions and health communication should be prioritised and tailored in order to improve intentions to vaccinate. Behavioural interventions can be tailored to address the identified determinants of vaccination intentions.

Conclusion:
Young age, gender; concerns about side-effects, safety information and effectiveness due to the rapid development of the COVID-19 vaccines, and

cultural or religious concerns were determinants of the intentions to receive a vaccine among South African adults.

Establishing an Africa-wide rumour tracking system for COVID-19

Dr. Hana Rohan, Assistant Professor, London School of Hygiene and Tropical Medicine

Introduction/ Background:
Risk communication and community engagement (RCCE) are critical aspects of robust public health responses during infectious disease events like the COVID-19 pandemic. One aspect of RCCE is tracking 'rumours' to allow responders to appropriately develop interventions focused on community perceptions, misinformation and dominant narratives around the event or associated response.

Methods:
In March 2020, Africa CDC established an Africa-wide rumour tracking system (RTS), based on a human curated COVID-19 taxonomy with a rules-based machine learning platform. That platform uses an enrichment process to compile, categorise, and geolocate monitored open-source media.

The RTS' rule-based machine learning sorts content to facilitate rumor identification and classification by severity level. Content is also categorized by theme (e.g., perceptions of: vaccines, public authorities, public health and social measures (PHSM)) and sentiment (e.g., positivity or negativity towards governments, vaccine manufacturers, agencies). The RTS allows for near real-time detection of COVID-19 narratives and sentiments across African media environments.

Results:
The RTS has identified over 200,000 iterations of misinformation and critical public concern relating to COVID-19 and public health responses through filtering millions of posts and comments from

geolocated African Twitter and Facebook spaces, and from 564 African news outlets.

The RTS labeled 5.4% of the total volume of monitored African media posts and articles concerning COVID-19 as reflecting misinformation and notable public concern. Of identified rumors, 55% were classified as major, 6% as moderate, and 39% as minor in their potential severity and impact. Levels of identified misinformation were higher in social media spaces than in comparable news environments.

Impact:
The RTS facilitated the evidence-based development of several RCCE interventions, including Africa CDC's social media messages around IPC, mask-wearing, adherence to PHSM, and ways to safely celebrate the 2020 end-of-year holidays. Data from the RTS also contributed to the development of a large vaccine hesitancy campaign led by MC Saatchi.

Conclusion:
The RTS has enabled Africa CDC to assess public perceptions of COVID-19 quickly and consistently, and to combat misinformation and rumours. In its next iteration, the system will be expanded to include other major diseases and public health initiatives, enabling an appropriate RCCE response across Africa CDC's public health programmes.

Oral Presentations – Session 2

The following abstracts were presented in Track 4 Parallel Session 2. The session was co-moderated by Professor Charles Wiysonge (Director of Cochrane South Africa, South African Medical Research Council) and Professor Alain Tehindrazanarivelo, (Professor, University of Antananarivo).

Impact of SARS-CoV-2 pandemic on health care of people living with HIV at a large treatment centre in Lagos, Nigeria

Dr. Salako Abideen, Research Fellow/Consultant Pediatrician, Nigerian Institute of Medical Research

Introduction/ Background:
Nigeria, like the rest of the world, introduced public health measures to control SARS-CoV-2 infection. These measures especially movement restrictions impacted all aspects of citizens' life including health services. This study was conducted to determine the impact of COVID-19 movement restriction on treatment outcomes among individuals living with HIV/AIDS.

Methods:
This was a retrospective review of the electronic database at the HIV clinic of the Nigerian Institute of Medical Research over a 5-month period (three months before, during, and after the COVID-19 movement restriction). The study population were people living with HIV attending the HIV clinic. Information on sociodemographic, and clinical (type of ARTs, duration on ART, laboratory evaluation) were extracted from database and analyzed using the SPSS version 22.0.

Results:
The data of 4145 individuals in the database were extracted and reviewed. The median age of PLWH was 45 years, with the majority within the age group being 25-49years (65.4%), married (59.5%), had at least secondary education (82.8%), and employed (81.5%).

The median duration on ARTs was 102 months (IQR: 67-138) with the most on non-Protease Inhibitor based regimen (77.7%). The drug pickup declined by 40% from the pre-movement restriction period levels. Three months post movements restriction, laboratory monitoring for treatment outcomes were mostly affected as none of the patients had their routine test performed during the locked down period.

Impact:
The COVID -19 movement restriction had a significant impact on the treatment access among

people living with HIV. This could portend untowards public health effect on the gains of HIV care.

Conclusion:
The COVID -19 movement restriction resulted in the decline of antiretroviral drug pick by 40% and almost no performance of laboratory monitoring HIV diseases. It is recommended that in future restriction of movement government and institutions should put in palace contingency plan to ensure that HIV services are not compromised.

How have health systems in Gambia, Senegal and Burkina Faso managed COVID-19 from May 2020 to September 2021?

Dr. Mareme Diallo, Medical Research Council Unit, The Gambia, London School of Hygiene and Tropical Medicine

Introduction/ Background:
Known for their weakness, health systems in West Africa have been the subject of pessimistic predictions. We were interested in understanding how the Senegalese, Gambian and Burkinabe health systems have coped with the shock of the pandemic.

Methods:
We conducted interviews with 75 doctors, nurses, midwives, and other medical personnel working in four selected healthcare institutions per country. We also interviewed six healthcare managers in charge of coordinating COVID-19 activities in each of the three countries, including a nation-wide COVID-19 decision-maker, a COVID-19 treatment centre coordinator and a COVID-19 testing laboratory manager.

We used the theory of resilient health systems (Fridell et al., 2020) to analyse our data.

Results:
Health professionals reported leadership support. Solidarity between colleagues improves the working environment although the working

conditions are difficult. To cope with the lack of training, health professionals go to colleagues or to the Internet.

The availability and quality of Personal protective equipments varies between countries and services. COVID-19 treatment centre and laboratory staff felt more protected within their department than outside it, whereas maternal health workers...

About delivery services, the first patients were taken care of with a lot of pressure because of providers lack's of experience. In addition, health professionals find themselves playing the role of carer in their absence.

Impact:
This study shows that health systems in West Africa, although weak and often under-resourced, have a workforce capable of using the resources available to deal with the shock of a pandemic.

Conclusion:
Human resources of health are strong and committed, despite difficult working conditions with insufficient preparation, providers have drawn on their own resources to train themselves to the point of taking over the role of the carer.

The contribution of legal determinants to strengthening health security in Africa

Mrs. Christie Tiwoda, Health Lawyer, Ministry of Public Health Cameroon

Introduction/ Background:
The proliferation of legal instruments in the management of Covid-19 in Africa reinforced the need of holistic health systems reforms based on compliance with the International Health Regulations (IHR 2005) that question the capacity and contribution of legal frameworks to support preparedness and response to public health emergencies in Africa.

Methods:

The study targets all the 55 countries of African Union from August to December 2021.We analysed the technical area related to legislation, policies and financing in the reports of the Joint External Evaluation of the International Health Regulation capacities as well as the Performance of Veterinary Services assessment reports in these countries. The annual reports on IHR implementation from 2018 to 2020 and the Covid-19 management evaluation reports in these countries were analysed.

Results:
47/55 African Union countries have completed the joint external evaluation of IHR capacity. In most of the African Union countries, capacities for health emergency preparedness and response regarding legislation and policies are weak , multi-sectoral assessment is recommended, as well as establishment of legal epidemiology and health security policies surveillance.

The 2020 annual report on IHR implementation in the WHO African Region show that the average score for legislation (47%) was lower than that of the WHO regions as a whole (68%). Few African Union countries have conducted partial evaluations of their legislation under the Animal Health Organisation's Veterinary Legislation Support Programme.

Impact:
The coherence and consistency of legal frameworks affect the performance of national public health emergency preparedness and response systems. The assessment and updating of national legal frameworks for public health emergency management is a major challenge for public health security in Africa.

Conclusion:
The provision of an effective legal frameworks for health security is lacking in most of the African Union state members , even though it is a crucial tool for public health.

Public Health and Social Measures: support and adherence in 19 AU MS

Ms. Alexandra Fehr, Research Fellow, London School of Hygiene and Tropical Medicine

Introduction/ Background:
To control the spread of COVID-19, Member States (MS) across the African Union (AU) have implemented Public Health and Social Measures (PHSMs), which will be more effective with greater population support and adherence. This study assesses factors influencing individual support for and adherence to PHSMs across 19 AU MS.

Methods:
This study uses data from the fourth cross-sectional, telephone-based survey conducted by the Partnership for Evidence- Based Response to COVID-19 (PERC). The survey took place in September 2021 across 19 AU MS; the total sample size was 24,983.

Bi- and multi-variable analyses were conducted to examine associations with support for and self-reported adherence to PHSMs, classified into three categories: 1. individual restrictions, 2. social gathering restrictions, and 3. movement/economic restrictions.

Among the assessed factors included in analysis were: demographic characteristics, COVID-19 beliefs and risk perceptions, institutional and government perceptions, economic conditions, and sources of COVID-19 information.

Results:
Support for and self-reported adherence to PHSMs varied by category. Across all MS, support for individual, social, and movement/economic PHSMs was 85%, 46%, and 46%, respectively; self-reported adherence was 55%, 32%, and 27%, respectively.

Additional factors significantly associated with increased adherence to all PHSMs were:
1. Demographic: females and those aged 56+;

2. COVID-19 perceptions: high personal risk perception;
3. Institutional perceptions: trust in the president and Ministry of Health, and satisfaction with the government's pandemic response;
4. Economic: loss of all income during the pandemic period;
5. Information: those who did not use Facebook for COVID-19 information.

Impact:
These results have important implications for risk communication and the implementation of PHSMs in multiple contexts. By understanding support and adherence patterns, policy-makers can employ targeted PHSM strategies that are more likely to succeed and therefore contribute to a reduction in COVID-19 infection and its secondary burdens.

Conclusion:
This study has identified trends in support for and adherence to a variety of PHSMs implemented across 19 AU MS. Importantly, individual PHSMs had the highest levels of support and adherence, but there was substantially lower support for and adherence to PHSMs that restricted movement and economic activities.

New networks in improving mortality surveillance beyond COVID-19, 2021

Mrs. Joy Ebonwu, Provincial Epidemiology Team Manager, National Institute for Communicable Diseases

Introduction/ Background:
Excess mortality reports suggest underreporting of COVID-19 related deaths, as routine surveillance utilizes mainly in-facility data. SARS-CoV-2 post-mortem testing (PMT) for home deaths from natural causes has been implemented in South Africa. We provide information to highlight the critical role of morticians in improving mortality surveillance in South Africa.

Methods:
Sentinel surveillance was implemented in three Districts to support SARS-CoV-2 PMT and reporting in two provinces of South Africa. A repository of out-of-facility natural deaths was compiled using mortuary registers from public and private sectors, with multiple stakeholder involvement. Deaths were linked to cumulative COVID-19 laboratory test data and case linelists. Data from August 2020 to October 2021 were analyzed to assess the contribution of community COVID-19 related deaths to the overall reported mortality.

Results:
A total of 8,254 COVID-19 related deaths were reported, comprising of 70% (n=5,751) hospital and 30% (n=2,503) community deaths.

Most of the deaths were females (57.5%; n=4,742) and 60 years and older (61.5%; n=5,079). Of the 2,503 community deaths, 47% (n=1,184) were tested prior to death and 53% (n=1,319) post-mortem.

Overall, reporting of COVID-19 related deaths markedly improved by 16% (1,319/8,254) with engagement and additional reporting of data from post-mortem testing.

Impact:
Morticians play a critical role in COVID-19 mortality surveillance, providing the much-needed socio-demographic information and vital to the handling and transport of corpses to health facilities for specimen collection.

Conclusion:
The number of reported COVID-19 related deaths was enhanced by linking mortuary registers with laboratory test data and case line lists. Expansion of this model to all mortuaries, across the districts in South Africa, could be a vital component of efforts to improve community-based surveillance.

Track 4 Accepted Poster Abstracts

A case study of research review systems during COVID-19 pandemic in Kenya, 2020-2021.

Dr. Alex Hinga, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
During COVID-19, research and ethics review systems have been under pressure to ensure the timely review of research to inform health emergency response efforts. While previous health emergencies have provided lessons for research review systems, COVID-19 presents unprecedented challenges. The study explored Kenyan research review systems' responses to COVID-19 pandemic.

Methods:
An exploratory case study design was used. Data were collected through individual in-depth interviews (n=15), document reviews and secondary analysis of administrative records. Respondents included researchers and reviewers at the KEMRI Wellcome Trust Research Programme (KWTRP) and the KEMRI Scientific and Ethics Review Unit (SERU). Qualitative data were managed using NVivo 12. The Framework Approach was used for analysing interviews and documents while descriptive statistics were generated from the administrative records.

Results:
Between April 1st 2020 and March 31st 2021, 30 COVID-19-related protocols by KWTRP researchers were reviewed and approved by institutional and national-level ethics review committees. The committees made structural and procedural changes to expedite review of protocols, including fast roll out of online submission of protocols. There was a 1.4-fold and 2.4- fold delay in providing review feedback for new COVID-19 protocols and amendments respectively compared to internally set targets. Reviewers raised COVID-19 specific ethics issues, including virtual informed consent; COVID-19 screening and testing procedures and mitigation measures; and the challenges of study design and undertaking community engagement during the pandemic.

Impact:
Understanding how research and ethics review systems have responded to COVID-19 can generate valuable knowledge to inform future responses to pandemics and other public health emergencies. Strengthening research and ethics review systems is likely to build public confidence in research outputs.

Conclusion:
Despite best intentions, the review process became more complex and there were bureaucratic delays in final approval of research protocols. Our findings highlight the need for strengthening coordination and communication between researchers, institutional and national research ethics committees, including by improving information and technology infrastructure.

ANTICOV: Initiating a platform adaptive trial for COVID outpatients in Africa

Dr. Junior Matangila, Drugs for Neglected Diseases initiative

Introduction/ Background:
Early evidence on mortality and ICU intervention rates for SARS-CoV-2 patients, and modelling of COVID in Africa, prompted calls for treatment to prevent progression of mild/moderate COVID. WHO's SOLIDARITY trial aimed to prevent death in hospitalized patients and others looked at prevention, but no trials assessed treatment for mild/moderate cases.

Methods:
The challenge was to rapidly launch a large and flexible study. A consortium of African research institutions already part of the COVID response and additional technical partners developed a Target-Product-Profile and a clinical protocol to allow per-country adaptation while maintaining key common features. ANTICOV is an adaptive platform trial in 13 African countries, testing two treatment arms (700 max./arm), nitazoxanide/inhaled

ciclesonide and ASAQ/ivermectin, in patients with mild/moderate SARS-CoV-2 infection and symptoms up to 7 days before randomisation. ANTICOV has submitted an amendment to test fluoxetine/inhaled budesonide. Ancillary studies are conducted in a subset of countries.

Results:
This unique, diverse, 26-partner consortium was established rapidly. The protocol was ready for submission by mid-June 2020, and funding was quickly granted, thanks to clear needs and the experience of consortium members. 9 of 13 countries have started recruitment. Despite support from AVAREF, approval processes per country took longer than hoped, and approved drug importation was also a bottleneck. Changes in diagnostic referral impacted recruitment, so active screening was established in some countries. An interim analysis was conducted after 300 patients were randomized with no treatment interruption resulting; the next is planned after 750 patients are randomized.

Impact:
ANTICOV is driven by a unique research alliance to respond to region/context-specific treatment and pandemic control, unlike much of global research to date. In a context of emerging variants and inequitable vaccine access, effective therapeutics to prevent disease progression globally but prioritized only by the African region until recently.

Conclusion:
ANTICOV was set up collaboratively, bringing experience and know-how from diverse African and European leaders to find treatment adapted to the needs of low-resource settings. It was rapidly developed and financially supported. Results will be shared quickly. Future pandemic preparedness will require similarly established networks and expedited funding.

Challenges of implementing non-pharmaceutical-interventions to prevent COVID-19 in an urban-slum in Lagos-Nigeria.

Dr. Sabdat Ekama, Nigerian Institute of Medical Research

Introduction/ Background:
Non-pharmaceutical interventions are important public health measures targeted at behavioral changes to interrupt the transmission of coronavirus in humans. This study evaluated the challenges of implementing non-pharmaceutical-interventions, assessed adherence, and identified requirements to the successful control of the spread of COVID-19 among individuals living in an urban-slum setting in Lagos-Nigeria.

Methods:
A cross-sectional study conducted among resident of an urban-slum in Makoko, Lagos-Nigeria. Adult members of households aged 18 years and above were selected via convenient sampling. An interviewer administered semi-structured questionnaire was used to obtain information on sociodemographic characteristics, living conditions and adherence to non-pharmaceutical interventions over a period of five-months from May to September 2020. Adherence to non-pharmaceutical intervention was determined by calculating an adherence index from 10 evidence based protective behaviors and a self-report of adhering to the measures. Descriptive-statistics and multiple-logistics regression model were used to determine challenges and factors associated with adherence to COVID-19 preventive measures.

Results:
A total of 357 participants with a mean-age of 45.8 ± 12.9 years were included in the analysis. Majority were males (62.2%) and married (83.8%).

Most participants (93.8%) had no space for self-isolation as majority lived in a one-room-apartment (72.8%), shared toilets/kitchen-space (63.6%) with other families and had no constant source of water-supply (61.9%).

About 98.8% are aware of the pandemic but only 33.9% adhered to the preventive-measures. The ability to afford facemasks/hand-sanitizers (aOR:6.7;95% CI:3.8-11.6), living-alone (aOR:3.7;95%CI:1.3-10.6), and ability to buy-water (aOR:0.3;95% CI:0.1-0.5) were found to be associated with adherence to the preventive-measures after adjusting for covariates in a multi-logistic-regression-model.

Impact:
This study gives insight on the realities/challenges of implementing non-pharmaceutical-intervention against COVID-19 disease in a setting of economically disadvantaged individuals who are at a great risk of being a hub for circulating the virus. This will aid the government in addressing cogent factors that might fuel re-occurrence of the pandemic waves.

Conclusion:
Implementation of non-pharmaceutical interventions for COVID-19 prevention was a challenge as only a quarter of residents adhered to national guidelines. Government should prioritize vaccinating these cohort of individuals and address factors like poor housing, overcrowding and lack of public water supply that affects adherence to public health measures in this setting.

COVID19 case detection in symptomatic and asymptomatic individuals in Zambia, May-October 2021

Dr. Kwame Shanaube, ZAMBART Project Limited

Introduction/ Background:
Rapid, scalable point-of-care COVID-19 testing at community-level may hold the key towards diagnosis and control in resource-limited settings. Our initial door-to-door symptom-based strategy yielded low COVID-19 cases. We therefore investigated COVID19 case detection using a strategy of community hubs in a peri-urban community (~27,000) with high TB/HIV prevalence in Zambia.

Methods:
COVID19 screening was delivered using "community hubs", walk-in testing locations staffed by 2 Community Health Workers serving 3000 to 4000 people. Between May-October 2021 4 hubs were operated in high-risk transmission hotspots changing location weekly. All persons attending the hubs were offered COVID-19 testing (Panbio_AgRDT and a PCR (Cepheid_Xpert_Xpress TM or VitaPCRTM RT-PCR assay (Credo Diagnostics Biomedical, Singapore), depending on availability) and symptoms screening; TB/HIV screening and testing; counselling and linkage to routine care. Qualitative methods included: mystery shoppers, focus group discussions with different groups and observations.

Results:
Over 6 months, 2956 people were screened at the hubs, 1724 (58%) males with median age 30 years. Prevalence of COVID19 suggestive symptoms was 18.3% (540/2956).
A total of 2938 antigen tests were done and 168 (5.7%) were positive. For PCR testing, by Xpert Xpress 370/1270 (29.1%) were positive and 113/951 (11.9%) by VitaPCR; 157 (5.3%) were positive on both.

Test positivity was strongly associated with being symptomatic (p<0.001). Antigen test positivity rate was 1.6% in asymptomatic versus 24.2% in symptomatic; for Xpert_Xpress 20.6% versus 46.5% and for Vita PCR 4.2% versus 30.4% respectively. Qualitative results are available.

Impact:
This study aims to generate and evaluate models of community-based COVID-19 services to improve the trace-screen-test- isolate cascade and management by overcoming barriers, reducing stigma, and enabling communities to access rapid-testing. Rapid dissemination of key findings will mitigate the impact of the SARS-CoV2 epidemic and to help increase the knowledge.

Conclusion:
Delivering COVID-19 case-finding using mobile community hubs is feasible and acceptable and contributed towards the district and national COVID19 response in Zambia. Symptomatic persons have a significant higher chance of being detected with SARS-COV-2.

COVID-19 Mass Testing and Sequencing: Experiences from a Laboratory in Western Kenya

Dr. John Waitumbi , Kenya Medical Research Institute

Introduction/ Background:
This report provides a narrative of how our laboratory addressed mass testing challenges posed by the emergent COVID-19 in an environment with global supply shortages. The lessons learned will help us to respond better to a "disease "X" that may emerge in future.

Methods:
The KEMRI/USAMRD-A lab in Kisumu, Western Kenya traditionally performed disease surveillance in diverse hospitals in Kenya. The lab was designated a COVID-19 testing center "overnight", following confirmation of the first case in March 2020. Standard procedures were quickly developed to guide PPE donning, decontamination, specimen receipt, testing, risk mitigation, quality assurance, test result interpretation, re-testing of all inconclusive results, and reporting of validated results to the Ministry of Health (MOH). Supplies for extractions and testing were provided through the MOH. Resources for whole genome sequencing (WGS) were provided by the Global Emerging Infectious Surveillance (GEIS) program.

Results:
Through May 2020, samples came from long distance truck drivers crossing into Kenya from neighboring countries. As the disease spread, the sample source diversified to include general communities and hospitals. Three waves of COVID-19 were discernible; each high infection rate was preceded by low rates. The first wave climaxed by mid-July at 13.2%. The second wave was higher at 32.8% and climaxed in late October. Fueled by alpha and delta variants, Christmas and New Year's festivities, wave 3 emerged suddenly in February 2021, climaxing in August 2021, making it the longest wave in Kenya.

Impact:
We provided the MOH with daily testing results that allowed tracking the spread and the evolution of SARS-CoV-2 lineages. As a silver lining, COVID-19 made us realize how much capability exists in us. At the height of the epidemic, we achieved turnaround time of 750 PCR tests in 24 hours.

Conclusion:
The lab was able to quickly adapt to increased testing demand dictated by an emergent novel disease. To date, the lab has tested 55,525 samples, of which 5,044 (9.1%) were positive. The lab has contributed over 1200 WGS sequences to the Global Initiative on Sharing Avian Influenza Data (GISAID).

COVID-19 outbreak at a quarantine prison, Central Uganda, September 2020

Dr. Alex Ndyabakira , Uganda National Institute of Public Health

Introduction/ Background:
During September-October 2020, an outbreak of COVID-19 occurred at Masaka Ssaza, a COVID-19 quarantine prison (holding center for newly-sentenced persons before transit to their host prison) in Central Uganda. We investigated to identify factors associated with introduction and spread of infection in Masaka Ssaza prison.

Methods:
We defined a case as PCR-confirmed SARS-CoV-2 infection in a prisoner/staff at Masaka Ssaza prison during September- October 2020. A control was defined as a prisoner or staff at Masaka Ssaza with a negative test during the same timeframe. We

reviewed prison medical records to identify case-patients and interviewed prison staff to understand possible avenues of introduction of infection and opportunities for spread. We conducted a case-control study interviewing prisoners and staff to determine factors associated with spread of the infection. Logistic regression was used to assess factors associated with infection.

Results:
The index case was Inmate A, a 33-year-old male who entered the prison on September 16, 2020. On September 23, Inmate A learned that a colleague with whom he had close contact before imprisonment had died of COVID-19 which he reported to the warden leading to mass testing.

The overall attack rate was 40/100. Ward-specific prisoner density ranged from 0.3-2.1 prisoners/square meter. Face mask ownership among case-patients was 35%. Using a face mask all the time was protective (aOR= 0.03: 95% CI 0.01-0.09). Residing in Ward 6 was associated with increased odds of infection (aOR=7.4; 95% CI 1.6-3.4).

Impact:
Consistent use of face masks was protective. Unrestricted access to handwashing facilities, facemask use, and strict adherence to 'do not enter another ward' rules could mitigate risk of future outbreaks.

Conclusion:
COVID-19 was likely introduced into Masaka Ssaza prison by an infected incoming prisoner. The outbreak may have been amplified by congestion in wards and at mealtimes and low use of preventive measures.

Experiences from the Kenyan coast of receiving and responding to public feedback in the early days (March-August 2020) of the COVID-19 Response

Ms. Nancy Kagwanja, KEMRI–Wellcome Trust Research Programme

Introduction/ Background:
Responsiveness to public feedback could lead to fairer and stronger health systems. However, responsiveness may be undermined during crises, with particular negative implications for marginalised populations. During the COVID-19 crisis, much attention has been paid globally to public health control interventions, but minimal consideration of public views about these interventions.

Methods:
We present findings on responsiveness to public feedback during early days of the COVID-19 response in a coastal county in Kenya. The study adopted a case study qualitative design. We defined health system responsiveness as how the health system reacts to input from the public and considered elements along the responsiveness pathway to be receiving, processing and generating responses to feedback. We collected in-depth qualitative data, between March and August 2020 through non-participant observations of health managers' meetings, interviews with county, sub-county and hospital managers (n=20), and document reviews (n = 9). We analysed data using a thematic approach.

Results:
Multiple feedback mechanisms were utilised to provide information and track public concerns, including public address systems, press briefings, county Facebook pages, Whatsapp groups, a newly introduced channel (hotlines) and meetings with community leaders. Overall, we observed significant information-giving, but little use of participatory methods. Sensitization efforts were generalised with little specific messaging strategies for marginalised groups (youth, people living with disabilities). Responding to public feedback was undermined by resource and co-ordination challenges. These contributed to public mistrust of health system actors, and of information being

shared. Several instances of the public's resistance to compliance with COVID-19 control measures were observed.

Impact:
During crises, health systems have an opportunity to leverage community ideas, needs and support through pre-existing public feedback mechanisms. In Kilifi, the use of multiple feedback mechanisms allowed a range of issues and concerns to be picked up and responded to in the early days of the COVID-19 outbreak response.

Conclusion:
One-sided information-giving may reach large audiences, however interactive mechanisms should be strengthened to maintain public support for health system actions and to feed into information-giving initiatives. Introduction of new feedback mechanisms during crises requires adequate support and close monitoring to ensure responsiveness to public feedback is strengthened, rather than undermined.

Field performance of a rapid antigen detection test for SARS-CoV-2 (COVID-19 Ag Respi-Strip) in two West African settings.

Dr. François Kiemdé, Institut de Recherche en Sciences de la Santé

Introduction/ Background:
The COVID pandemic continues to devastate the world population since January 2020. RDTs are a key tool for COVID-19 response. We evaluated the performance of a commercially available SARS-CoV-2 antigen RDT for the screening of suspect cases of COVID-19 in two West African countries, Burkina Faso and The Gambia.

Methods:
The study was implemented between September 2020 and September 2021 in Burkina Faso (Bobo-Dioulasso) and The Gambia (West Coast division). Patients presenting with COVID-19 symptoms (WHO case definition, August 2020) were systematically screened for COVID-19 by RDT and diagnostic PCR and enrolled in a 6-month prospective follow-up study. Oro- and nasopharyngeal (OP/NP) swabs were collected from suspected case and the RDT performed within <8h of collection. The sensitivity and specificity of the RDT- with and without universal transport medium (UTM), were analyzed against COVID-19 diagnostic PCR and the positive- and negative predictive values were also estimated.

Results:
Between September 2020 and March 2021, a total of 478 patients were screened with 263 from Burkina Faso and 215 from The Gambia. From these, 118 COVID-19 positive by PCR were enrolled in the cohort (Burkina Faso: 92; The Gambia: 26).

Specificity was 100% for samples from UTM, but sensitivity was 24%. When stratifying the analysis to patients with Ct values ≤ 30 and ≤ 25, the sensitivity was 44% and 65%, respectively. Sensitivity on samples with buffer only was 71% and specificity 100%. On samples with buffer only and Ct values ≤ 34, RDT sensitivity and specificity were 100%.

Impact:
The COVID-19 Ag Respi Strip represents a rapid, reliable, and affordable triage tool for clinically suspect COVID-19 cases in Africa allowing for the timely isolation and management of COVID-19 patients before PCR confirmation.

Conclusion:
The RDT performs much better as a point of care test without UTM using the direct swab method. A newer version of the RD (COVID-19 Ag K-Set) with improved sensitivity could be assessed in the future.

Follow-up of Covid-19 vaccinated pregnant women in Tunisia

Professor Fatma Zgolli, National Observatory of New and Emerging Diseases

Introduction/ Background:
IInitially, vaccination against Covid-19 was not recommended during pregnancy due to the lack of data. It has become recommended, following the publication of data from pregnant women who received Covid-19 vaccines. In Tunisia, pregnant women have been prioritized in the vaccination program with the recommendation of the messenger RNA platform.

Methods:
We have started in Tunsisian National Centre of Pharmacovigilance a pilot study for monitoring pregnant and/or breastfeeding women. Data collection was carried out via telephone calls. We excluded women who were unreachable after two phone calls. The data collected concerned the course as well as the outcome of the pregnancy and the health status of newborns. In addition, women were asked about the possible occurrence of adverse effects following immunization.

Results:
We included 523 women. Pfizer-BioNTech vaccine was used in 73% of cases and Moderna vaccine in 26%. Coronavac vaccine was used in 1% of cases. Vaccination was performed during pregnancy in 72% of cases and breastfeeding in 13% of cases.

15% of women received the first dose during pregnancy and the second dose after childbirth. 26% of women delivered at term without incident and newborns were in good health. AEFI were pain at the injection site in 52%, soreness in 21%, fever in 13%, asthenia in 7%, headache in 3%, hot flashes in 3% and chills in 1% of cases.

Impact:
To encourage vaccination in pregnant and/or breastfeeding women and increase the confidence of this population with higher of a severe course of COVID-19, particularly in cases of advanced age over 35 years and in the presence of comorbidities.

Conclusion:

Although primary results of this pilot study were reassuring, its continuation with a larger sample will allow a better knowledge about the safety of Covid-19 vaccines in pregnant and/or breastfeeding women.

Health System Resilience in the Covid-19 Response: A case study of four countries in sub-Saharan Africa

Dr. Suzanne Kiwanuka, Makerere University

Introduction/ Background:
Health systems in sub-Saharan Africa are strained by communicable diseases, non-communicable diseases, and emerging diseases of pandemic potential. COVID-19 illustrated how shocks disrupt healthcare delivery. To understand factors of health systems resilience, we assessed maintenance of essential health services (EHS) in Uganda, Nigeria, Senegal, and the Democratic Republic of Congo.

Methods:
Mixed methods were used, including literature review, analysis of routine service data and key informant interviews (KIIs). Indicators including DPT3 coverage, general adult outpatient (OPD) attendance, and diabetes were assessed in 2020 (during the pandemic) and 2019 (baseline) using data from the DHIS2. KIIs were conducted to document EHS maintenance strategies and lessons learned. Key informants included national level policy makers (national task forces and EHS maintenance committee members), regional-level health service directors, district health officers, health facility staff and community health workers.

Results:
Monthly vaccine disruption ratios for DPT3 remained stable in DRC, but dropped in Uganda (0.7) and Nigeria (0.78), reverting to normal after 1 and 5 months respectively. In Senegal DPT3 dropped (0.65) moderate recovery starting May 2020. In Uganda, OPD visits decreased 10%-22% in three of four geographical regions and increased in one region, diabetes visits decreased by 23% in two

regions. EHS maintenance strategies included telemedicine, multi-month drug dispensing, and expanded use of community health workers (CHW). Challenges to maintain EHS included poor dissemination of guidelines across health system levels, poor financing of interventions, and limited tracking of EHS.

Impact:
These findings highlight gaps in health system resilience with disruptions in essential health service delivery during the COVID-19 pandemic in Africa, and the strategies implemented by countries to mitigate the disruptions. These lessons are important for health systems strengthening and future pandemic preparedness and response.

Conclusion:
EHS maintenance can be improved through integration into pandemic preparedness and response policies and strengthened data analysis to detect service disruptions. Strategies to mitigate service disruptions such as telemedicine, multi-month drug refills, and community drug distribution via CHWs should be implemented and monitored at the national and subnational levels.

Health system response to COVID-19 and efforts to maintain essential health services in selected primary health care units in Ethiopia: A qualitative study

Professor Getnet Mitike, Africa Health Organization

Introduction/ Background:
The COVID-19 pandemic has brought multifaceted impact including on health systems. In Ethiopia limited data is available how the response to the pandemic is shaping at sub-national level. This study explored the response to COVID-19 at sub-national level and its impact on essential health services.

Methods:
We conducted a qualitative study using key informant interviews. A total of 59 health leaders across Ethiopia's 10 regions and 2 administrative cities were purposively selected. Data were collected using a semi-structured interview guide in October 2020. Transcripts were coded, categorized and thematic analysis was conducted. Twenty-four experts with graduate level training conducted the interviews and supervised the data collection. The respondents included regional and zonal managers, directors and health workers at primary health facilities.

Results:
Local government took the lead in responding to COVID-19 by organizing multisectoral committees. Health officials organized incident management teams. The management reassigned the health workforce to COVID-19 surveillance and case management and took other measures. Training was prioritized for members of rapid response teams, laboratory technicians, clinicians assigned to treatment centers and health extension workers. Personal protective equipment was difficult to obtain at the beginning of the pandemic. Rapid response teams conducted case investigation, contact tracing, and sample collection. Essential health services declined in the first few months of the pandemic, affecting maternal and child health, HIV/AIDS, and tuberculosis services.

Impact:
There is a need to learn from the multisectoral actions that were effective at beginning of the SARS-COV-2 pandemic. it also underscores multisectoral actions are critical for minimizing the impact of pandemics such as COVID-19. In addition, investing to build resilient health systems at grassroots is a priority issue.

Conclusion:
Multisectoral support was intensive at beginning and helped in directing human, material, and financial resources toward the response. But the intensity of the response faded away and essential services suffered in the first few months of the pandemic.

Increasing community access to COVID-19 vaccination among high-risk populations between March and May 2021 in Kisumu County, Kenya

Ms. Jemima Kibira, University of Maryland School of Medicine

Introduction/ Background:
Kenya initially targeted vaccination for populations at high risk for exposure to COVID-19: health care workers, teachers, uniformed officers, and people >58 years of age. Vaccination was offered in static health care facilities. In Kisumu County, uptake among teachers and those >58 years was comparatively lower than other target groups.

Methods:
The program adopted an outreach-based model to increase COVID-19 vaccination uptake among teachers and the elderly. This model involved: 1. Pre-identification of schools and remote health facilities as vaccination sites, 2. Household level mobilization through community health volunteers and local media preceding the outreach, and 3. Awareness creation in high-volume areas through a public address system for 7 days. Data was abstracted from the MoH ChanjoKe system (electronic COVID-19 vaccine data capture tool) before and after the introduction of interventions. We used descriptive analysis and proportions to compare individuals vaccinated during those dates.

Results:
A total of 5,234 persons were vaccinated from 17th to 21st May compared to 1,148 persons vaccinated during the preceding week, a 4.8-fold increase.

Among those aged >58 years there was an almost 11-fold increase in vaccination from 170 people to 1824 people.

Among teachers there was an almost 6-fold increase from 267 people vaccinated to 1570 people vaccinated. All other groups achieved 2- to 6- fold increases in total number of people vaccinated.

Impact:
This is approach may be used as an alternative model of reaching populations eligible for vaccination who are at high risk of getting severe form of COVID-19 due to the nature of their work- or age-related factors.

Conclusion:
Outreach-based vaccination demonstrated improved access to COVID-19 vaccination among teachers and persons aged >58 years old. This could be an important model to reach populations eligible for vaccination who may not primarily have access to traditional static vaccination sites.

Pooling sample can increase SARS-CoV-2 capacity testing in resource limiting settings

Dr. Nafissatou Leye, L'Institut de Recherche en Santé, de Surveillance Épidémiologique et de Formations

Introduction/ Background:
The global spread of SARS-CoV-2 and high demand for reagents may cause a challenge in procurement and the testing process, impacting turnaround times and the epidemiological data for optimal response mainly in low-income countries. To overcome this bottleneck, evaluating pooling system in the testing could be a solution

Methods:
For pooling strategy, 100 ul of each sample were pooled for up to 4 samples and extract using the same technology. The swabs were Oropharyngeal and nasopharyngeal swabs collected from individual attending clinic at Thies région and tested by Real-Time PCR after inactivation and RNA extraction using KingFisher Flex machine from ThermoFisher according to the manufacturer. SARS-CoV-2 detection were done using AllplexTM 2019-nCoV assay from Seegene targetting N, E, RdRp Gene in Biorad CFX96. All Samples are test

individually and pooled. Ct values were compared between positives samples and result obtained with pooling.

Results:
We include in this analysis 43 pool of 4 samples each including 54 positive SARS-CoV-2 pooled with 114 negative samples and 40 pool of 4 negatives samples.

Among positives sample included in the pool, 19 had Ct between 17 and 25, 23 between 25 to 30 and 12 had more than 30.

Our result confirms that all 54 positives samples pooled in negatives samples were detected by pooling. The pooling was associated with a loss of 0.8 average of Ct ranging between -1.2 to 2.8.

All samples individually negatives were also negatives in the pooling. The complete analysis is ongoing.

Impact:
This study indicates that pooling sample is practical and can be used for community surveillance, testing of low-risk populations, and in resource-limited settings to mitigate reagent stock out. This can allow to reduce testing turnaround times and faster public health authorities' response to the global pandemic, especially in low-income countries.

Conclusion:
Our preliminary data confirms that pooling sample correctly identifies SARS-CoV-2 infected individual in 100% of our sample with an expected average of loss of ct of 0.8. This strategy can increase testing throughput in RLS and reduce turnaround time.

Predictors of COVID-19 vaccine hesitancy in South African local communities

Dr. Patrick de Marie Katoto, Cochrane South Africa, South African Medical Research Council

Introduction/ Background:
In May 2021, the South African government launched a mass COVID-19 vaccination campaign, with the ambitious goal of reaching 40 million adults (approximately 67% of the population) by December 2021. Understanding predictors of COVID-19 vaccine acceptance at community level was needed to help in achieving this ambitious goal.

Methods:
We conducted a population-based survey (n=1193) between June and July 2021 amongst adults living in four diverse South African communities. The survey formed part of a broader, mixed-methods study to understand and develop local responses to address vaccine hesitancy (The VaxScenes Study). The survey used an adapted version of the World Health Organization's Behavioral and Social Drivers of Vaccination tool. We used logistic regression to determine predictors of vaccine hesitancy; defined as uncertainty or intention to refuse COVID-19 vaccination.

Results:
The mean age of participants was 39 (standard deviation 15) years, 53% were women and half trusted healthcare workers for reliable information. A third of respondents (32%) were vaccine hesitant.

Independent predictors of vaccine hesitancy included concerns about side-effects (odds ratio [OR] 11.41, 95% confidence interval [CI] 3.5-50.80), lack of access to the online government COVID-19 vaccine registration platform (OR 4.75, 95%CI 2.15-10.37), distrust of government (OR 3.0, 95%CI 1.33- 6.77), belief in conspiracy theories (OR 3.01, 95%CI 1.32-6.77), having no monthly income (OR 1.84, 95%CI 1.12-3.07), and depending on someone else to make the vaccination decision (OR 2.47; 95%CI 1.06-5.77).

Impact:
The significant proportion of vaccine hesitancy observed at the community level may have an impact on the government's endeavor to attain

herd immunity. Our results might inform the development of interventions to promote mass COVID-19 vaccination uptake at the community level.

Conclusion:
We identified modifiable predictors of vaccine hesitancy at the start of South African's COVID-19 vaccination rollout. These factors should be addressed through tailored communication and other effective strategies that increase vaccine literacy, reach low-income households, and engender confidence in government.

Public Health Emergency Operation Centres (PHEOCs): key ingredient to improve public health response in Nigeria, 2020

Dr. Olaolu Aderinola, Nigeria Centre for Disease Control

Introduction/ Background:
A Public Health Emergency Operations Centre (PHEOC) is a physical location for the coordination of information and resources to support incident management activities. Nigeria had its first confirmed case of COVID-19 on 27th February 2020. The Incident Management System (IMS) was activated in the PHEOCs across the country for response.

Methods:
Secondary data analysis was done using data from an adapted World Health Organisation (WHO) checklist on state preparedness for COVID-19. Response was received from State Epidemiologists from 17th March to 31st March, 2010. Thirty-one (31) states and the Federal Capital Territory (FCT) returned the checklist out of 36 states and the FCT. Questions covered five key areas on coordination which include availability of preparedness and response plan, functional multisectoral coordination mechanism, functional PHEOC organizational structure which can be activated in 120 minutes, funds for response activities,

established PHEOC in the state. Data was analysed for means and proportions.

Results:
A total of 32 (86.5%) states and Federal Capital Territory (FCT) responded out of the 36 states and the FCT.

Ten (31.3%) states had all five key areas for effective coordination of the response.

Four (12.5%) states had less than three of the key areas ready for response.

Twenty-seven (84.4%) states had a PHEOC established, a functional organization structure and multi-sectoral coordination.

However, 20 (62.5%) states did not have readily accessible funds for response.

Impact:
The PHEOC emergency management model has been shown to be effective especially at the subnational level. Despite the paucity of funds and resources, it was used as a platform to mobilise resources across the states of the federation.

Conclusion:
There is a need to strengthen the existing PHEOCs at the state level and establish more at the local government levels for prompt efficient and effective public health response. The high level of preparedness helped Nigeria to respond effectively to the COVID-19 outbreak.

Rapid evidence reviews to inform COVID-19 treatment guidelines in South Africa.

Ms. Trudy D. Leong, National Institute for Communicable Diseases

Introduction/ Background:
In March 2020, the South African National Essential Medicines List Committee established a multidisciplinary expert panel to review emerging

evidence for COVID-19 medicines quickly and systematically. Recommendations inform National Department of Health COVID-19 guidelines. We describe implementation of this rapid review mechanism and the impact of recommendations on medicines utilisation.

Methods:
A protocol was developed for conducting rapid reviews, including the formulation of pre-specified review question, search of at least 2 databases, data extraction and synthesis, evidence appraisal, and summarising key findings and recommendations (PROSPERO registration: CRD42021286710). The COVID-nma initiative was engaged, using global evidence syntheses, adapted to local context. National Surveillance Centre medicines procurement data were analysed, monitoring the impact of the guidelines on medicine use. Pre-pandemic medicine use (2019) was compared to pandemic use (2020), as a ratio of utilisation per 1000 uninsured population for corticosteroids, azithromycin, colchicine, and vitamin C.

Results:
To date the committee have reviewed 26 medicines (for treatment and prevention of COVID-19) by conducting 52 rapid reviews (including updates and evidence summaries). Review of aggregate procurement data showed that utilisation of corticosteroids (that is recommended for hospitalised COVID-19 patients on oxygen), increased 1.6-fold across all 9 South African provinces. Colchicine and azithromycin (not recommended to treat COVID-19) use did not change. However, use of vitamin C (not recommended) increased 2.2-fold.

Impact:
A generic rapid review protocol using GRADE principles and an explicit evidence-to-decision framework promoted adaptation of global evidence to develop robust and transparent guidelines. Medicines utilisation data, though,

suggests that investment is needed to strengthen guideline implementation.

Conclusion:
Through extensive collaboration, the Department of Health managed therapeutic uncertainty by developing and implementing a rapid, robust, and transparent evidence-informed approach. However, the impact on clinical practice is uncertain, highlighting the need for more intensive investigation of patient-level prescribing data and engagement with healthcare providers.

Relationship between Stringency Index and Covid-19 confirmed cases in East Africa

Ms. Nathalie Uwamahoro, Africa Centre for Disease Control and Prevention

Introduction/ Background:
Governments worldwide have established measures to alleviate the spread of Coronavirus disease (COVID-19). To quantify the strictness of governments' response to COVID-19, the Oxford COVID-19 Government Response Tracker developed a Global Stringency Index. Our research aims to examine the relationship between the Stringency Index and COVID-19 cases in East Africa.

Methods:
To assess the impact of the non-pharmaceutical interventions (also known as lockdown measures) taken by different African countries on the spread of COVID-19, our research used publicly available confirmed COVID-19 cases and Stringency Index data from Our World in Data online platform. We focused our analysis on the correlation between the Stringency Index and confirmed COVID-19 cases in East Africa, particularly Rwanda, Kenya, Uganda, Tanzania, and Burundi. Furthermore, we analyzed Stringency index and COVID-19 confirmed cases timeseries of Rwanda.

Results:
Our preliminary results show that the correlation value between daily COVID-19 confirmed cases and

Stringency index was equal to -0.57, -0.36, -0.15, 0.14, 0.2 in Rwanda, Kenya, Uganda, Tanzania, and Burundi respectively.

While we plotted the Stringency Index and COVID-19 confirmed cases time series of Rwanda, we found that from June 1st, 2021 to September 26th, 2021 the Rwandan stringency index was constant at 54.63 while the cases were decreasing after the third wave.

Impact:
Since the stringency index examine how well different governments worldwide respond to COVID-19, our research aims to expand on assessing the contextual factors that make a difference in the African setting and establishing their efficacy and broad applicability to other African countries.

Conclusion:
The inverse relationship observed between the Stringency Index and confirmed COVID-19 cases suggests that the stricter the measures established by governments the fewer there were new infections of COVID-19 and vice versa. Our research underscores the need to contextualize stringency measures within the African setting.

Training a continent: a process evaluation of a virtual training on infection prevention and control in Africa in the context of COVID-19

Mr. Emilio Hornsey , London School of Hygiene and Tropical Medicine

Introduction/ Background:
Strengthening IPC capacity was identified as a key priority intervention to prepare African Union (AU) member states to curb the COVID-19 pandemic. We aimed to undertake a process evaluation of virtual training developed through the Africa Taskforce for Coronavirus (AFTCOR) to inform and improve both ongoing and future programming.

Methods:

The scope of the evaluation was agreed through discussion with the training organisers and advisory members, in a design workshop. A mixed-methods approach was used; data collection was partly prospective and partly retrospective due to the rapid start of some of the training activities. Existing available data included: usage analytics, the content of questions posed during webinar and community of practice, and the results of a feedback survey sent to participants after each webinar. In-depth qualitative interviews were conducted with sample webinar participants.

Results:
The rapid development of this training was efficient and responsive. The training reached high numbers, over 6000 viewers across the two rounds across the various channels overall, but the numbers varied hugely by location. Participants engaged well with the questions time during the webinar, but the asynchronous community of practice was less utilised during the evaluation timeframe. The African focus of the webinars was appreciated by many participants and the more practical and context specific the content, the better it was appreciated.

Impact:
As part of the work of AFTCOR IPC TWG, the Africa Centres for Disease Control and Prevention (Africa CDC) in collaboration with Infection Control Africa Network (ICAN) delivers virtual IPC training across AU member states. This project directly informed the development of the training package, which continues to this day.

Conclusion:
The move towards online training provides a huge opportunity to improve infection prevention and control across the African continent. It is an efficient way of improving access to timely and relevant technical knowledge.

Tunisian first COVID-19 Intra-Action Review, March-July 2021

Dr. Leila Bouabid Fantar, National Observatory of New and Emerging Diseases

Introduction/ Background:
The objective of the Intra-Action Review (IAR) was to review the Tunisian COVID-19 national preparedness and response best practices and challenges to adjust the response to the crisis and impact of COVID-19 pandemic on health systems.

Methods:
RIA is an interactive and structured methodology, developed by WHO to identify best practices and challenges in a response to an ongoing crisis. The first RIA on COVID-19 response in Tunisia was carried out, under the Tunisian Ministry of Health in cooperation with the German Biological Safety Program and the Biosecurity Cooperation Project in Tunisia, from March 30 to July 1, 2021.

Four pillars of the Covid-19 response were selected for review: coordination, laboratory, points of entry, and logistic support.

Results:
The RIA identified 24 best practices, 23 challenges and 23 recommendations to improve the current response by adopting appropriate actions for immediate, mid and long-term implementation.

The best practices include: availability of a prevention, preparedness, response and resilience plan (2P2R), an Early Warning, Alert and Response System (EWARS); regular weekly teleconference "EPICOV"; trained Rapid Response Teams (RRTs), Field epidemiologist and laboratory staff, decentralization of SARS-CoV-2 testing; and an efficient stock management system.

The most important challenges were leadership and coordination mechanism, legal framework, human resources, and genomic-sequencing surveillance capacity.

Impact:
The RIA was an opportunity to analyze the operational capacity of the Tunisian health system to respond to the pandemic in collaboration with other relevant sectors. The results of the RIA will serve to adjust the national response to Covid-19.

Conclusion:
The recommendations target a legal framework, a quality assurance management system and an Integrated Disease Surveillance and Response (IDRS) system. The RIA recommended also to enhance coordination within and between pillars; and mobilize funds to support 2P2R, EWARS, IDRS and human resources and provide a basis for future joint activities.

Track 6: Digitisation, Modelling and Analytics to Support an Effective Public Health Response to the COVID-19 Pandemic

This session explored how digitisation, modelling and analytics can be fruitfully employed to sustain the public health goals of quality, accessibility, efficiency and equity in health care.

The future of public health is increasingly digital. The COVID-19 pandemic has accelerated the advent of digital tools and technologies for public health messaging, epidemiologic surveillance, screening and diagnosis for rapid case identification, interruption of community transmission and clinical care delivery. The digital tools not

only improve the public health response, but also generate vast amounts of data which, when harnessed within national health information systems, open avenues for advanced analytics, disease modelling and forecasting. This reinforces the capacity of health authorities and policymakers to manage a disease outbreak by choosing appropriate responses and planning for future scenarios.

Track 6 included 10 abstract-driven oral presentations and 9 accepted abstracts as posters. Oral presentation sessions for this track were held on Thursday 16 December 2021 from 1:00 – 2:30PM EAT.

Oral Presentations – Session 1

The following abstracts were presented in Track 6 Parallel Session 1. The session was co-moderated by Professor Tobias Rinke de Wit (Director of Research, PharmAccess Foundation and Dr. Marisa Klopper, (Stellenbosch University).

Data Mining of community pharmacy records unearthed massive self-medication for treatment of COVID-19 in Uganda

Dr. Agnes Kiragga, Head of Statistics and Data Science, Infectious Diseases Institute of Makerere University

Introduction/ Background:
Self-Medication (SM) involves the utilisation of medicines to treat self-recognised symptoms or diseases without consultation and irrational use of over-the-counter drugs. We aimed to estimate the extent of SM for drugs used to treat COVID-19 symptoms through data mining of community pharmacy records in Uganda.

Methods:
The study was conducted in Kampala, Uganda where we extracted data from community pharmacies with functional Electronic Health Records between January 2018 and June 2021. The data included number of clients purchasing the following drugs that were used to treat COVID-19 and its symptoms: Azithromycin, Augmentin, Dexamethasone, Vitamin C, Vitamin D and Zinc. A negative binomial model was used to estimate the incident rate ratios for each drug to compare the effect of COVID-19 on SM. Data mining, cleaning and analysis were performed using R Software.

Results:
We extracted data from 10 community pharmacies in Kampala. 369 clients purchased at least one of the six drugs in the 12 months preceding March 2020 and a three-fold increase of 1202 customers between March 2020-June 2021.

There was a statistically significant increase in SM of Azithromycin during the COVID-19 pandemic with Incidence Rate Ratio (IRR) 1.17 (95% CI: 1.06 – 1.32), 1.07(95% CI: 1.04-1.11) for Vitamin C, and 2.13 (95% CI: 1.02 – 6.05) for Vitamin D.

We observed non- significant increases, 1.04 (95% CI: 0.88–1.26) for Augmentin, 1.21 (95% CI: 0.94-1.68) for Dexamethasone, and 1.11 (95% CI: 0.94-1.68) for Zinc.

Impact:
During the COVID-19 pandemic, the lack of definitive treatment or limited access to vaccines led to increased SM. This work demonstrates the potential impact on SM on drug resistance and drug development pipelines needs to be explored through innovative data science tools.

Conclusion:
Community pharmacy data records are a valuable source for identification of SM in Africa. SM to treat COVID-19, including the irrational use of antibiotics and other OTC drugs may lead to polypharmacy and fuel the looming pandemic of antibiotic resistance.

How Modelling and Analytics Informed the South African Government's COVID-19 Planning and Budgeting

Dr. Harry Moultrie, Senior Medical Epidemiologist, National Institute for Communicable Diseases

Introduction/ Background:

The South African COVID-19 Modelling Consortium (SACMC) was established in March 2020 to support government planning and budgeting for COVID-19 related healthcare. We developed tools in response to changing decision maker needs in different stages of the epidemic, allowing the South African government to plan several months ahead of time.

Methods:

Our tools included generalised SEIR models, short-term forecasts, cost and budget impact models, and online dashboards to help government and the public visualise our projections during the first wave and track the epidemic trajectory and forecast hospitalisation trends during the second and third wave. Given the rapidly changing nature of the pandemic, the model projections and methods were updated regularly. Projections, forecasts and monitoring metrics were regularly disseminated via dashboards.

Results:

The updates reflected 1) the changing policy priorities; 2) the availability of new data, in particular from South African data systems whose coverage was improving continuously; and 3) the evolving response to COVID-19 in South Africa such as changes in lockdown levels and resulting mobility and contact rates, testing policy, contact tracing strategy, and hospitalisation criteria. Insights into population behaviour, for example in reaction to increases in cases and deaths during first wave in May to August 2020, required the incorporation of behavioural response.

Impact:

We incorporated these aspects into projecting a third wave and developed additional methodology that allowed us to forecast short-term trends in hospital admissions as the third wave started rolling. The SACMC has further updated the models

to incorporate the impact of the vaccines and advise on booster options.

Conclusion:

The SACMC's models, developed rapidly in an emergency setting and regularly updated with local data, supported national and provincial government to plan several months ahead of time, expand hospital capacity, allocate budgets, and procure additional resources where possible.

MomCare Adaptations During the COVID-19 Pandemic in Kenya, September 2020

Dr. Emma Waiyaiya, Director of Value Based Care, PharmAccess Foundation

Introduction/ Background:

In response to the disruption of care driven by the pandemic outbreak, MomCare, (digital pregnancy-model) provided dedicated support to pregnant women and healthcare facilities including

  i. overview of prioritized health data and birth planning
  ii. extended bed allowance,
  iii. emergency ambulance during curfew
  iv. MS campaign
  v. COVID-19 preparedness support.

Methods:

The retrospective study uses cross sectional data of 13,443 pregnant women enrolled into the program across 26 clinics within Nairobi, Kisumu and Kakamega. Care utilization and outcomes data collected during the 6 months prior to COVID-19 outbreak (September 2019 – February 2020) and those collected during the first 6 months of the pandemic (March 2020 – August 2020) were compared using paired t-tests. All tests with p-values less than 0,05 are considered significant.

Results:

Comparison of the fifteen outcome variables across the two periods and the three counties shows that in Kisumu and Kakamega counties, the percentage of skilled deliveries increased

significantly (p0.05). Other indicators of quality of care, including the percentage of caesarian deliveries, folate/iron supplements, urinalysis, ultrasound, oxytocin, and hemoglobin tests at delivery, were maintained. Only the provision of Vitamin K to newborns dropped significantly (p0.01) during the pandemic (Nairobi and Kakamega).

Impact:
MomCare's response plan proved effective to support health seeking behavior, access to care and quality care delivery during the pandemic outbreak; mitigating against indirect deaths maternal, neonatal, stillbirths. These results prove the value of a digital health system infrastructure that links demand and supply as an effective epidemic preparedness approach.

Conclusion:
MomCare's findings suggest that a digital platform efficiently supported sustained quality care delivery connecting mothers and facilities during the pandemic outbreak.

There is a wide opportunity for public health practitioners to promote data-driven, patient centered personalized care, guarantee transparency, and ensure that vulnerable individuals continue to access quality pregnancy care.

OTOI-NARIMA Model for Forecasting Seasonality of Covid-19 Waves: Case of Kenya

Dr. Shem Sam, Regional Coordinator, Lake Region Economic Bloc

Introduction/ Background:
Kenya's three waves caught authorities responsible for disease surveillance of the pandemic with surprise, resulting in loss of life and livelihoods. There was need for accurate modelling to inform surveillance, planning, budgeting, enhanced response, and accelerated recovery to save lives. The length of duration, seasonality, and periodicity are desired.

Methods:
392 daily cases data from March 13, 2020 to April 9, 2021 was used after relevant statistical tests. Normalized series and ordered moving averages are superimposed, tested for stationarity and cointegration to establish order of integration I(d) and cointegration rank.

The series are used to derive OTOI-NARIMA model. The model is tested for auto-correlation (ACF/PACF) and validity (Ljung-Box test). The restricted model is used to forecasts and visualised to describe trajectory of Kenya's 3rd and 4th Waves.

Results:
OTOI-NARIMA is superior and accurately predicted both the 3rd and 4th Kenyan waves and peak intensities. It precisely established seasonality and periodicity of waves. Model projections were used to inform covid-19 resurgence preparedness in LREB-Kenya before peak intensities on June 26 and August 11, 2021. During the assessment, health systems strengthening and covid resources coordination were recommended in LREB.

Based on the recommendations, COVID-Dx platform by PharmAccess Foundation is being used for effective and efficient covid-19 services coordination. In preparation for predicted 5th and 6th waves, between November, 2021 to June, 2022, COVID-Dx digitization is used to inform healthcare strengthening.

Impact:
Optimal use of fragile health infrastructure in LREB as a result of healthcare systems strengthening recommended after assessment of preparedness based on model predictions. Relatively, more lives have been saved and accelerated socioeconomic recovery and resilience of vulnerable communities.

Conclusion:
The OTOI-NARIMA model has been used in Kenya as a forewarning tool to inform preparedness, health systems strengthening, and public sensitization on

vaccination ahead of predicted waves to safeguard lives and protect livelihoods.

Modelling death trends to support Public Health decisions in Tunisia

Professor Hedia Bellali, Head of Epidemiology Department, Habib Thameur Hospital, Tunis El Manar University, Tunisia

Introduction/ Background:
Understanding the dynamics COVID-19 transmission is essential, to assess the effectivness of the implemented control measures. The aim of this study is to find out what type of model can explain the trend in the cumulative number of confirmed COVID-19 deaths for implementing and adjusting public health and social measures.

Methods:
We analyzed the trend of cumulative deaths by different methods of time series analysis using regression models with curve estimation to identify the trend line that most closely matches the observed data and calculating the coefficient of determination R2. We also calculated the daily growth factor (GF) for COVID-19 deaths. The best fitted model was smoothed and projected to predict cumulative deaths the next 15 and 30 days. The comparison of predicted and observed values allowed the assessment of the control measures effectiveness.

Results:
From March 18th 2020 to October 31st 2021, 25248 COVID-19 confirmed deaths were reported. Trend analysis and GF showed that from August until October 05, 2020, the number of deaths grew exponentially. The parametric model which matches with the observed trend of cumulative deaths was the exponential model (R2=95.6%) and the daily GF of new deaths was above 1 during this period. Over the last month, the number of the daily deaths decreased, the GF was under 1 and the trend of the cumulative deaths was stable to the

acceleration of the linear growth slope without changing in the model.

Impact:
Modelling the confirmed COVID-19 deaths trend allowed real time surveillance of the epidemiological situation and the evaluation of the effectiveness of the control measures, to reinforce and to timely adjust them to limit and curb the epidemic. Active and real-time surveillance was the crucial element of the epidemic control strategy.

Conclusion:
During an epidemic, active real-time mortality surveillance provides essential information to formulate an evidence-based response. Compiling and analyzing all deaths can overcome ambiguities in detecting the real number of infected cases.

Oral Presentations – Session 2

The following abstracts were presented in Track 6 Parallel Session 2. The session was co-moderated by Ms. Shingai Machingaidze (Africa CDC) and Ms. Chiamaka Ojiako (Global Health Advocacy Incubator).

Using a digital health solution to support Antigen RDT (AgRDT) testing for COVID-19 at taxi ranks in Johannesburg, South Africa

Mr. Mohammed Majam, Head of Medical Technologies at Ezintsha, Wits University

Introduction/ Background:
Previous studies in South Africa indicated that minibus taxis are among the drivers of airborne disease transmission. This study delivered COVID-19 rapid antigen testing to people frequenting high-volume taxi ranks in Johannesburg, supported by a digital backbone for clinical decision making and real-time data capture, transmission and analysis.

Methods:

Prior to the intervention, a phone-based random survey of commuters' knowledge, attitudes, and practices regarding COVID- 19 testing was conducted. Testing points were established in ventilated areas of the ranks. Consenting individuals completed a digital screening questionnaire on COVID-19 risks with an inbuilt algorithm selecting individuals for testing. Testing was conducted by trained nurses and results sent to patients' phones. Positive cases received information on health facilities to attend if needed and were followed up for two weeks by SMS and WhatsApp for self-reporting of symptom severity. Real-time data was captured digitally and transmitted to the national dashboard.

Results:
In the first month of the study, coinciding with the latter part of South Africa's third wave, there was high demand for testing:

78% of 1,591 individuals surveyed had never been tested, but 84% responded that they would get tested in the rank if available.

3,924 individuals were screened, with 10.1% identified as moderate risk and 24.3% as high risk.

1,187 Ag-RDT tests were completed. Positivity rate was 16% (190/1,187) overall, and higher among individuals identified through the digital algorithm as high-risk (19%), compared to those classified as moderate risk (8%).

Impact:
Decentralisation of testing, especially to high-transmission settings, can strengthen the COVID-19. This in turn requires robust mechanisms for data management, supervision and follow-up, especially if testing is delivered closer to patients outside health facilities. This study shows how combined use of digital solutions and rapid tests can achieve these aims.

Conclusion:

Findings indicate a high demand for COVID-19 testing in public transport hubs, and the utility of digital tools to support monitored delivery of diagnosis in such settings. With increased availability of point-of-care rapid tests, such approaches could catalyse expanded access to testing, leading to earlier case detection and improved surveillance.

A Data Visualization Approach to Mitigating the Impacts of the Global COVID-19 Pandemic

Mr. Isaac Coffie, Graduate Research Assistant, Carnegie Mellon University Africa

Introduction/ Background:
Since the COVID-19 pandemic engulfed the world, researchers and scientists have explored different techniques to mitigate the impacts of the SARS-CoV-2 virus. Alongside the rollout of COVID vaccines, researchers are implementing predictive algorithms and visualization tools to equip stakeholders with insights on the pandemic and help them make data-driven decisions.

Methods:
In this research, we leveraged publicly available COVID-19 datasets collected by Oxford University's "Our World in Data" team to build an interactive web-based dashboard that monitors the pandemic across all African countries. We studied and analyzed more than 10 existing COVID-19 dashboards to gain insights and create visualizations that most accurately tell the story in the data to both technical and non-technical persons. We built a data quality pipeline to clean, impute and transform inconsistent and anomalous data points in the Our World in Data COVID dataset before rendering it to the dashboard for public use.

Results:
Our work has given individuals and government agencies the capability to monitor the pandemic within a centralized repository. Hitherto, information about COVID-19 in African countries has been in websites whose contextual focus is primarily on

advanced countries. With our contribution, stakeholders can view information and interact with the charts related to cases, deaths, tests, vaccinations, and other relevant indicators in a unified web platform that focuses primarily on African countries. Besides the many features supported on the dashboard, the ability to compare the pandemic situation between African countries and regions is particularly informative.

Impact:

We believe that by creating interactive visualizations that leverage open-source datasets, governments and health practitioners can devise mitigative strategies based on the stories told by the data and the visualizations. It is for this purpose that we embarked on this project – to help stakeholders make data-driven decisions and save lives.

Conclusion:

Finally, our analyses have outlined a number of limitations that make the case for better cooperation between academia and governments in accessing protected data, thereby allowing academic partners to build prototypes, tools and products that accompany policy makers in their decision making.

Feasibility and Acceptability of Public-Private Partnership Model for Combatting COVID-19 in Kisumu, Kenya

Ms. Corrie Mevis, Research Social Scientist, Kenya Medical Research Institute / Center for Global Health Research

Introduction/Background:

The effect of COVID-19 on weak health systems has been devastating, especially in sub-Saharan Africa. The private sector can provide complementary support to address health crises within vulnerable public health systems. This paper provides a qualitative description on the Feasibility and Acceptability of the Public-Private Partnership Model in combating COVID-19.

Methods:

We carried out a feasibility and acceptability study of a unique Public-Private Partnership Model. COVID-19 samples were collected from participating sites and tested at centralized government referencing laboratory at the Kenya Medical Research Institute. We conducted a qualitative study using an explanatory research design in 5 participating health facilities in Kisumu County. We did in-depth interviews (n=49) with purposively selected key policymakers, health workers and patients. Interviews were audio-recorded. Data was transcribed in verbatim form and analyzed thematically using Nvivo 11.

Results:

Notable advantages of the Public-Private Partnership Model included:

1. The model helped complement tasks between Kisumu Department of Health and public and private healthcare providers, with support from an NGO (PharmAccess).
2. The model increased testing capacity at the county level by increasing the number of sample collection sites.
3. COVID-19 data digitalization, and semi-real time digital dashboards aided reporting of COVID-19 results needed for immediate contact tracing.
4. The model increased capacity building of the health workers improved adherence to MoH guidelines.

Inhibitors included lack of comprehensive policies on communication channels and inadequate financial resources.

Impact:

The Partnership increased health workers knowledge and testing capacity enabling majority of the Kisumu population to access COVID-19 testing in addition to digitalization of COVID-19 data for real time transmission.

Conclusion:
A digitally supported Public-Private Partnership Model for combatting COVID-19 is feasible and acceptable by all participating stakeholders. This model is scalable and currently being deployed to 13 additional counties in Kenya.

COVID-19 Impact on the Performance of Healthcare Medium Size Enterprises in Kenya and the Role of Flexible Digital Cash Advances to Absorb Economic Shocks

Mr. Kennedy Okongo, Director of East Africa, Medical Credit Fund Africa

Introduction/ Background:
Medical Credit Fund (MCF) works to improve quality and access to financing for small and medium size enterprises in the health sector. Since 2011. This abstract describes how COVID-19 affected health SMEs in Kenya, and the role of MCF's Cash Advance (digital mobile loan) in absorbing the concomitant economic shocks.

Methods:
The first telephone survey was conducted in mid-2020 (254 respondents). This was conducted once via telephone (Computer-assisted telephone interviewing; CATI).

The second telephone survey was conducted at the end of 2020 (199 respondents). This contained many of the same questions as the first survey and was also conducted via telephone (Computer-assisted telephone interviewing; CATI).

A weekly online survey was conducted for the duration of 6 months (among a subset of 25 respondents). This contained only ten questions about client numbers, staffing and revenues. It was conducted via an SMS invitation to a mobile phone-based survey tool (Computer-assisted web interviewing; CAWI).

Results:
Half of the surveyed health SMEs applied for a Cash Advance (CA) loan during the pandemic. Of those health SMEs, the vast majority (44 percent of the sample) also received the CA loan. Only a small minority (4%) of health SMEs that applied for the CA loan had their applications rejected. The approximately three quarters receiving CA during the pandemic also received CA in the twelve months before the pandemic's start in March. Hence, a quarter of the CA health SMEs was a "new" borrower that had not received a CA in the twelve months preceding the pandemic.

Impact:
Health SMEs were not prepared for this economic shock and did not have access to working capital loans from bank, neither did they qualify for government support. MCF provided a fast and flexible solution through its mobile Cash Advance loans, which do not require collateral.

Conclusion:
Cash Advance disbursement increased from USD 6 million in 2019 to over USD 60 million since the beginning of 2020, with relatively stable repayment rates averaging 95%. With this credit, SMEs were able to purchase PPE, medicines, or equipment, and pay staff or invest in other COVID-19 related measures.

COVID-19 Data-Driven SIR Models, October 2021

Ms. Lise Kabarere, Graduate Research Assistant, Carnegie Mellon University Africa

Introduction/ Background:
COVID-19 was declared a global pandemic on March 11, 2020 by the World Health Organization. The Susceptible-Infected-Recovered (SIR) model was used in a bid to predict COVID-19. In this study, we use a data-driven SIR model to simulate the epidemic in Rwanda from March 16, 2020 to October 14, 2021.

Methods:
The online access of some COVID-19 data to the public has facilitated this research. The study uses publicly available data from Our World In Data

(OWID). The COVID-19 reported cases are used to estimate the spreading and the recovery rates.

These data-driven parameters are then recast into the basic SIR models and its simple extension, the Susceptible-Exposed-Infected-Recovered (SEIR) model. The Susceptible-Infected-Recovered (SIR) model is one of the most extensively used approaches for modeling infectious diseases.

Results:
The data-driven SIR model captures a single wave and single variant in some countries but has severe limitations in estimating the end of a wave or the risk of death. However, the SEIR model captures the different waves that were identified in the country but cannot be used to assess the risk of death. Also, the predictive capabilities of the SEIR model yielded better results compared with the SIR model.

Impact:
The aim of this research is to demonstrate the inadequacy of the SIR model and its extension due to its limitations to estimate waves as well as the mortality risks.

Conclusion:
The public data has limitations in terms of recovered cases and exposed cases. The limitations identified for the SIR and SEIR models, which consist of not being able to estimate a wave or the risk of death, suggest the use of improved mathematical approaches to predict the outbreak of COVID-19.

Track 6 Accepted Poster Abstracts

Characterising social contacts under COVID-19 control measures in 18 African countries

Ms. Zlatina Dobreva, London School of Hygiene and Tropical Medicine

Introduction/ Background:
Without effective pharmaceutical interventions early in the COVID-19 pandemic, control measures were adopted to limit SARS-CoV-2 transmission. Social contact studies provide useful evidence for policy makers on the effectiveness of these, while also providing important parameters for modelling SARS-CoV-2 transmission. However, very few studies have been conducted in African countries.

Methods:
We analysed nationally representative cross-sectional survey data from 18 African countries, collected by the Partnership for Evidence-based Responses to COVID-19 (PERC) during 4-17 August 2020. Adult respondents reported contacts made in the previous day and their attitudes towards COVID-19. We calculated the mean total daily contacts by age group, adjusting for population structure. We compared mean contacts by demographic and socio-economic factors. We relate contact patterns to those pre-pandemic, the Oxford Government Response Stringency Index, and Google mobility data.

Results:
Contacts between people aged 18-55 represented 50% of total contacts in most countries. Ethiopia (9), South Africa (17), and Zimbabwe (14) had the lowest number of mean contacts, while Cameroon (41) and Sudan (40) had the highest.

Men had significantly more contacts than women; those in large households (7+ members) had more than those in than smaller ones. There was no variation by education level, self-reported health, or COVID-19 attitudes.

Mean reported contacts were correlated with Google mobility (coef. 0.574, p = 0.051) and stringency index (coef. -0.120, p = 0.304).

Impact:
These are the first COVID-19 social contact data collected for all countries but Kenya, Ethiopia, and South Africa, and are valuable tools for pandemic planning, including for mathematical modelling informing disease transmission.

Conclusion:
Although there may be limitations in collecting contact data via a phone-based survey, the breadth of data arising from such surveys is a key strength of this study. Such data may inform policymakers in targeting control measures.

COVID-19: some simple filtering algorithms, November 2021

Professor Hamidou Tembine , Africa Centres for Disease Control and Prevention

Introduction/ Background:
COVID-19 was declared a global pandemic on March 11, 2020 by the World Health Organization. Susceptible-Exposed- Infected-Recovered-Dead (SEIRD) has been used to predict its outbreak. However, it should be handled with precaution when it comes to predicting the end of the waves.

Methods:
In this study, we use some basic filters to show how bad the prediction of COVID-19 data can be. This study uses the publicly available data from the Center for Systems Science and Engineering (CSSE) through their github repository. Reinforcement learning, machine learning, exponential fitting, exponential smoothing and ARIMA are used on the same COVID data set and same time window. Their root mean square errors as well as their l2 errors are investigated as performance criteria.

Results:
Using the time horizon of 605 days, the RMSE are 0.6619 for reinforcement learning, 5.7549 for exponential smoothing, 274.3350 for machine learning, 274.3350 for single exponential and 137.5769 for ARIMA for short-term.

On a longer-term basis, machine learning, exponential smoothing and single exponential were evaluated using RMSE and the results are 173.2891 for machine learning, 909.5221 for exponential smoothing and 289.2051 for single exponential. l2 errors were plotted on a graph as well.

Impact:
The filters used in this study do not allow us to estimate unreported cases, unreported deaths, hospitalized cases etc. "S+E+I+R+D=N" does not hold in the filter. The use of improved filtering techniques is to be investigated.

Conclusion:
The methods above can be reasonably good enough for short-term tracking and filtering by designing the parameters properly. For long-term forecasts, however, the trend is different. The basic machine learning method appears to be progressively performant as the training data size increases. The l1-norm needs to be investigated.

Development and validation of an RNA extraction kit for the molecular diagnosis of SARS-CoV-2 infection in Nigeria

Dr. Muinah Fowora, Nigerian Institute of Medical Research

Introduction/ Background:
The COVID-19 pandemic has impacted public health laboratories with shortages and an increase in the cost of RNA extraction kits. The aim of this project was to develop and validate an RNA extraction kit for use in the diagnosis of SARS-CoV-2 infection to improve COVID-19 testing and surveillance in Nigeria.

Methods:
The developed kit is based on the spin-column method and named the NIMR Biotech Total RNA Extraction Kit. The kit is intended for RNA extraction from different specimens, including blood, animal tissues, cell lines, bacteria, viruses, and swabs. Analytical validation of the kit for COVID-19 diagnosis was done at six different COVID-19 testing sites on 20 different nasopharyngeal and oropharyngeal specimens, with the results compared using NIMR Biotech. Kit and another commercial RNA extraction kit (spin-column and magnetic-bead based).

Results:

Validation results showed an average correlation of 93% when compared to other spin-column based kits. When compared with the Qiagen RNA extraction kit, the performance indices of the kit were sensitivity of 94%, specificity of 100%, positive predictive value of 100%, negative predictive values of 94.7%, and accuracy of 95%. The NIMR Biotech total RNA kit showed a good correlation with the DaanGene and the Geneaid extraction kits. In both instances, there was only one disparity between the NIMR Biotech kit and these two kits.

Impact:

The developed RNA extraction kit from this study provides a suitable and cheaper alternative to high-end, commercially available RNA extraction kits. The adoption of this kit in all COVID-19 testing laboratories in Nigeria, and Africa, will help scale-up COVID-19 testing in Africa.

Conclusion:

NIMR Biotech's Total RNA extraction kit is sufficiently robust for the extraction of viral and human RNA from oropharyngeal and nasopharyngeal samples. The kit correlates better with the spin-column-based RNA extraction method when compared to the magnetic-bead-based method and will be useful for monitoring SARS-CoV-2 infection and other RNA viruses.

Digitalizing a public-private systems approach for combatting COVID-19 in Kisumu, Kenya

Mr. Emmanuel Milimo, PharmAccess Foundation

Introduction/ Background:

May 2021, Kisumu County was affected by a COVID-19 Delta variant outbreak. For non-resilient health systems with data channels based on paper, such outbreaks are a major challenge. A public-private partnership was initiated in Kisumu, Kenya. This partnership emphasizes digital mobile solutions that have a high potential for scalability.

Methods:

The partnership was between Kisumu County, KEMRI, PharmAccess, and healthcare facilities to roll out the implementation research. All those accessing tests as per the case definition of the MoH case definition were eligible for inclusion. We digitalized the Ministry of Health COVID-19 Case Identification Form, gathered data in healthcare facilities on digital tools, and shared aggregated results via a co-created (semi-) live dashboard to all relevant stakeholders. We performed descriptive analyses on the data. Additionally, semi-structured interviews with key stakeholders on the experiences of the project will provide qualitative insights.

Results:

As of November 2021, 32 healthcare facilities are connected to the dashboard, over 23,000 COVID-19 tests have been done with more than 2,800 positive cases: 52% Delta variant, 45% Alpha variant, and 4% Beta variant.

All key staff are connected to the digital tools and actively use them for decision-making. Geo-mapping of cases has shown to be useful for disease surveillance, especially case-tracking. Proper training and technical support for the digital tools and dashboard, co-creation with all users, and having a strong roll-out plan are key for success.

Impact:

Public-private partnerships offer the possibility of scaling up diagnostic capacity and using technology to track the epidemic in real-time guiding efficient allocation of limited resources in an evidence-based manner, a good step towards epidemic preparedness. Better decision making and targeted action can be taken because of this digitalized systems approach.

Conclusion:

Digital platforms have a key role to play in epidemics tracking and preparedness. From these outcomes, the digital platform we developed during this study is being scaled up to 14 more counties of

Kenya to be used to track the epidemic in a population of over 15 million people.

Implementation and utility of a training dashboard for laboratory training programs in response to the COVID-19 outbreak in Africa.

Dr. Aytenew Eshete, Africa Centres for Disease Control and Prevention

Introduction/ Background:
The Africa CDC organized continental training to establish testing capacity in MS. Africa CDC developed and implemented a training dashboard to track all training programs and use for planning and decision making. This study describes the implementation and utility of the laboratory training dashboard in the context of COVID-19 response.

Methods:
Google Spreadsheets was used to keep track of the training data. A comma-separated values training data file was used to create a training dashboard in Google Data Studio, where it was broken down into metrics and dimensions that could be used in dashboard reports connected between training data and dashboard reports. Data was imported and explored in an excel file, and a dashboard data modelling was created. Using training data KPIs, graphical displays were created, and data was examined... The reports and visualizations on the developed dashboard are automatically updated in real-time with the most recent data from the datasets.

Results:
The collection of training data and visualization on a dashboard proved useful for immediate generation of report. As of October 2021, a total of 15,548 laboratory personnel had been trained. Of these, 1,117 (7.7%) received hands-on and virtual training on RT-PCR, 430 (2.9%) on Biosafety and Biosecurity, 137 (0.9%) on LQMS, 78 (0.7%) on COVID-19 Genome Sequencing, 99 (0.8%) on GeneXpert and 13,627 (87%) on Ag–RDT testing in 55 Member States. Over 50 webinar sessions with total

23,063 participants were held to build the capacity of national and subnational level staff in all countries in the Africa Region.

Impact:
The dashboard primarily reported training data trends and disaggregated data by country, laboratory disciplines, and maps and graphs to make the data more appealing, shareable, and convertible into a report. By enhancing reporting and promoting timely decision-making, the training dashboard improved laboratory trainings in the context of COVID-19 response efforts.

Conclusion:
Tracking of all training programs in real time using interactive training dashboard will improve the use of data in subsequent decision making and measuring the progress during outbreak response. The dashboard reports and visualizations are shared with key stakeholders and used for workforce planning and monitoring.

Implementation Support Guide: Development of a National Georeferenced Community Health Worker Master List Hosted in a Registry

Dr. Madeleine Ballard, Community Health Impact Coalition

Introduction/ Background:
Community Health Workers (CHWs) have been a cornerstone of health delivery across the globe for over a century. Unfortunately, this vital cadre is often not counted: information on numbers and location of active CHWs is frequently unavailable and/or inaccurate. This undermines health system planning and impedes CHWs' provision of care.

Methods:
A functional and institutionalized national georeferenced CHW master list (CHWML) closes these gaps. This document was drafted in response to the urgent need to count and identify CHWs as part of the COVID-19 response. It was a collaborative effort by the Clinton Health Access

Initiative (CHAI), Community Health Impact Coalition (CHIC), Global Fund, Living Goods, Health GeoLab Collaborative (HGLC), and UNICEF. More than 50 organizations provided technical review, including Africa CDC, USAID and WHO. Representatives from the ministries of health of Ethiopia, Kenya, Mali, Rwanda, Uganda, Sierra Leone, Togo and Zambia inputted their technical expertise and ongoing needs.

Results:
A CHWML is a single source of truth containing the data elements required to uniquely identify, effectively describe, enumerate, locate, and contact all CHWs in a country. This guidance was developed to support national governments and their technical/financial partners to develop functional, continuously maintained, shared, and institutionalized CHWML hosted in a national registry. It describes a 7-step process for generating, sharing, and maintaining the CHWML in a registry. Each step includes a decision checklist and key considerations for implementation. The guidance also includes a 3-stage maturity continuum, five candid national-level experiences implementing CHWMLs, and practical resources to aid in operationalization.

Impact:
Accurate, up-to-date, reliable data on CHWs, which captures their location, qualifications and activities, is critical for strategic decision-making. Hosted and kept up to date in a CHWML, these data are vital not only to support existing CHWs, but to identify and close coverage gaps in pursuit of universal health coverage.

Conclusion:
While one-off georeferenced censuses of CHWs may be effective for establishing a baseline, it is only a first step toward establishing a functional and institutionalized CHWML. Investing in the development and use of a CHWMLs is a fundamental step in maximizing the impact, efficiency, and equity of health service delivery.

Implementing a E-Health Tool for COVID-19 Care in West and Central Africa

Dr. M. Bernice Corinne Akpovo, ANRS | Emerging Infectious Disease

Introduction/ Background:
Limited access to Covid-19 guidelines may have led to patient mismanagement and antibiotic overuse. E-health tools can improve access to Covid-19 guidelines. This qualitative study supported by ANRS, Expertise France aims to identify the implementation challenges of a CDSS and aims to improve the management of Covid-19 and common infections.

Methods:
By videoconference, 21 qualitative, semi structured interviews were conducted with health care practitioners (57%), health care actors trained in engineering (9%), project managers (14%), biologists (5%), microbiologists/antimicrobial resistance experts (10%), and anthropologists (5%).

Once transcribed by an external firm, the data were analyzed by the same researchers following a thematic analysis. Identified site visits were conducted in Abidjan and an acceptability questionnaire completed by the practitioners and the responses have been analyzed.

Results:
This analysis revealed limited access to Covid-19 clinical guidelines and infections in general, which were identified as structural challenges for non-specialist practitioners depending on the country.

The clinical decision support system (CDSS) <<Antibioclic Afrique>> was deployed on a pilot basis in Abidjan (Côte d'Ivoire). Out of 1380 practitioners who visited the website in 2390 sessions from February to October 2021, 62.5% had never had access to such a tool and 53.8% found it very relevant.

These results formed the basis for a pilot CDSS for antimicrobial prescribing in Africa. (https://www.antibioclic-afrique.com) available as an IOS and Android mobile application.

Impact:
According to WHO, the diffusion of digital health tools is still very limited in Africa . This CDSS aims at improving the management of Covid-19 by strengthening prescribers' capacities and their adherence to clinical guidelines. Considering the weight of socio-economic factors in the misuse of antibiotics, qualitative multi-dimensional studies are needed.

Conclusion:
These results confirm the relevance of the CDSS for better access to Covid-19 clinical guidelines and demonstrate that digital tools can help practitioners in their diagnostic and therapeutic decisions. The survey continues and the feedback from users will allow us to improve it.

[Interventions to improve COVID-19 preparedness among health facilities empaneled on the Lagos State Health Insurance Scheme](#)

Dr. Ibironke Dada, PharmAccess Foundation

Introduction/ Background:
The index case for SARS-CoV-2 entered in February 2020 through the international airport in Lagos, the most populous state in Nigeria. This epicenter recorded 77,676 confirmed cases as of October 15, 2021. Particularly at the onset, there was a dearth of information on preparedness of health facilities to manage COVID-19.

Methods:
We developed and applied SafeCare4Covid, a paper-based preparedness checklist, and organized webinars for health providers jointly with the Lagos State Health Management Agency. The tool was digitized, and evolved into a free, globally available self-assessment application, following World Health Organization guidelines. It quantifies COVID-19-related capabilities with 31 questions (score range, 0-100) and availability of COVID-19-related essential medical supplies with a 23-supplies checklist (0-100). Preparedness is assessed r.e. infrastructure, infection prevention, triaging, COVID-19 trainings, staffing, emergency response team, referral, and supplies (PPEs and oxygen). Each facility received an automated quality improvement plan. Data was shared through dashboards with stakeholders for decision-making.

Results:
Between July 2020-March 2021, 66 health facilities in Nigeria completed the SafeCare4Covid self-assessment (56 in Lagos, 44 of those private and 12 public).

The average capability score (n=66) was 71 (interquartile range, 61–86), and the average supply score (n=51) was 80 (74–91).
Majority of facilities did not offer COVID-19 tests/did not report test-access status (95.5%, 63/66), nor had guidelines for the management of confirmed cases, COVID-19 sample processing/referral, staff mental support and contact tracing.

Many centers did not have infection prevention policies (44%, 29/66). Supply of N95/FFP2 respirators was limited.

Impact:
The SafeCare4Covid tool generated an automated customized quality improvement plan outlining corrective actions to improve the facility's preparedness (processes, infrastructure and supplies) to prevent the spread of COVID-19 and other infections within and to the community.

Conclusion:
Digitizing the SafeCare4Covid tool improved the efficiency and timeliness of assessing health facility epidemic readiness. The tool facilitated corrective actions focusing on capacity building of case management, infection prevention protocols, and

procurement of PPEs to prevent facility-acquired COVID-19 infections.

Machine learning as a rapid and reliable Covid-19 screening method

Professor Youssef Zied Elhechmi, The National Observatory of New and Emerging Diseases

Introduction/ Background:
The most important strategy in terms of COVID19 rapid prevention is the increased testing, diagnosis, isolation, contact tracing to identify, quarantine and test close contacts. This study aimed to create a screening tool for COVID-19 based on a supervised machine learning model using extreme gradient boosting algorithm.

Methods:
We included all patients screened for COVID-19 using rt-PCR between March 2020 and October 2020. Data about 14 clinical parameters and daily prevalence of COVID-19 were collected. We used the extreme gradient boosting algorithm as a supervised machine learning training method. A machine learning model was trained on 1554 cases (757 confirmed COVID-19) and tested on an independent sample of 340 cases (169 confirmed COVID-19). The assessment of the machine learning model was based on the receiver operating characteristics curve, sensitivity, specificity, positive and negative predictive values and the Mathews coefficient of correlation. The gold standard was the SARS-CoV-2 rt-PCR.

Results:

Our model successfully predicted rt-PCR positivity with an accuracy of 97.06%. The area under the Receiver Operating Characteristic Curve was 0.990 (95%CI) [0.982-0.998].

When tested for the prediction of the rt-PCR positive test without using active cases as a feature, the model showed an accuracy of 80.0%, and the area under the Receiver Operating Characteristic Curve was 0.845 (95%CI) [0.804-0.887].

At the threshold value of COVID-19 prediction = 50%, the sensitivity, specificity, positive and negative predictive value, and Mathews coefficient of correlation were respectively 92.98%, 100%, 100%, 93.37% and 0.932.

Impact:
Since the best strategy to control the COVID-19 pandemic is the increased testing, diagnosis, isolation, contact tracing to identify, quarantine and test close contacts, the solution presented in this study precisely adress this strategy with an early, accessible, simple and reliable COVID-19 screening tool using a supervised machine learning method.

Conclusion:
Our machine learning model was able to accurately predict SARS-Cov-2 rt-PCR positivity using simple clinical and epidemiological features. This proposed rapid and accessible screening tool can help in the fighting of the COVID-19 pandemic especially in regions suffering from the lack of access to other COVID-19 screening tools.
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