Understanding the Unique Challenges & Opportunities of Combating COVID-19 in LMICs
### Agenda

- Brief introduction to AMIA’s Webinar Series, the role of Global Health Informatics, and moderators:
  - **Carl Leitner, PhD**, Technical Director, Digital Square at PATH Member, AMIA Global Health Informatics Working Group
  - **Hamish Fraser, MD, MBChb, MSc, FACMI**, Associate Professor of Medical Science, Brown Center for Biomedical Informatics, Brown University
  - **Theresa Cullen, MD, MS, FAMIA**, Director of Public Health, Pima County, Arizona, and Affiliate Scientist, Regenstrief Institute
- Introduction to the panelists:
  - **Carol Kamasaka**, Division of Health Information Management, Uganda Ministry of Health
  - **Trad Hatton, MA, MHS**, Country Director for PATH in the Democratic Republic of the Congo (DRC)
  - **Jacob Odhambo**, The Palladium Group, Deputy Chief of Party, KeHMIS
  - **Ashish Joshi, PhD MBBS MPH**, Senior Associate Dean of Academic and Student Affairs, and Professor, Population Health Informatics Graduate School of Public Health and Health Policy, City University of New York
- Audience Q&A
Presenters

John W. Loonsk, MD, FACMI Adjunct Associate Professor, Johns Hopkins Bloomberg School of Public Health & Consulting Chief Medical Informatics Officer, Association of Public Health Laboratories

Laura A. Conn, MPH eCR lead, Public Health Informatics Office, Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention

Steven R. Lane, MD, MPH, FAAFP Clinical Informatics Director, Privacy, Information Security & Interoperability Sutter Health, Clinical Professor, Family & Community Medicine University of California San Francisco

Catherine Staes, RN, MPH, PhD, FACMI Professor & Director, Nursing Informatics, College of Nursing, University of Utah
Health Informatics is the science of how to use data, information, and knowledge to improve human health, including the execution of scientific research, the delivery of health care services, and the promotion of public health. AMIA is the multi-disciplinary, inter-professional home for 5,400+ health informatics experts.

Digital Square is a partnership of the world’s leading digital health experts from 40+ organizations and countries working together to strengthen digital health systems in emerging economies. We support co-investment into scalable technology solutions and create the environments in which they can be sustained. Digital Square is led by and housed at PATH, the leader in global health innovation.
Working Groups of AMIA

- Biomedical Imaging Informatics
- Clinical Decision Support
- Clinical Information Systems
- Clinical Research Informatics
- Consumer and Pervasive Health Informatics
- Dental Informatics
- Education
- Evaluation
- Bioinformatics
- Ethical, Legal and Social Issues
- Genomics and Translational Global Health Informatics
- People and Organizational Issues

- Clinical Research
- Consumer Informatics
- Translational Bioinformatics
- Public Health Informatics
- Clinical Informatics

- Intensive Care Informatics
- Knowledge Discovery and Data Mining
- Knowledge Representation and Semantics
- Nursing Informatics
- Open Source Student
- Pharmacoinformatics
- Primary Care Informatics
- Public Health Informatics
- Regional Informatics Action
- Visual Analytics
- Natural Language Processing
To highlight how our members and the broader informatics community is addressing this global pandemic we are launching the AMIA COVID-19 Webinar Series.

We will look at the pandemic through a health informatics lens and is designed to share informatics responses to the COVID-19 pandemic. Panelists will share their specific domain expertise, including clinical informatics, public health informatics, translational bioinformatics, clinical research informatics, and consumer health informatics.

We will also have special emphasis webinars covering topics related to global health, telemedicine, and public policy during the COVID-19 pandemic. These webinars are open to all at no cost.
COVID-19 CHALLENGES AND OPPORTUNITIES

EXPERIENCES FROM UGANDA
UGANDA COVID-19 STATISTICS

Total confirmed cases: 696
Total recoveries: 240
Admissions: 456
Total repatriations: 125
Self –exit: 33
COVID-19 RESPONSE STRUCTURE

- National Task Force
  - Incident Management Team
    - ICT, Innovations and Strategic Information
    - Coordination
    - Laboratory
    - Logistics
    - Risk Communication and Community Engagement
    - Surveillance
    - Human Resource
    - Mental Health and Psychosocial Support
    - Research, Therapeutics & Vaccines
• **Disruptions in continuity of other healthcare services**  “Between January and April 2020, the cases of malaria diagnoses increased by 56%. Health facilities' delivery has decreased by 15%. The number of children receiving Immunisation services (DPT3) dropped by 20%.” ~ Dr. Jane Ruth Aceng, 13th June 2020

• **Paucity of infrastructural and human resources**

• **Social Distancing Vs the socio-ecological- economic environment.**

Humans are social beings but key to defeating the COVID-19 pandemic is social distancing, confinement, and self-quarantine, public health measures that have been met with resistance.
• Infrastructural boost eg increased connectivity of health services delivery points to the national internet backbone

• Strengthening of private-public partnerships for better healthcare delivery

• Leveraging of Information technology to combat covid-19 with sustainability of solutions beyond COVID-19 in mind
ICT, INNOVATIONS AND STRATEGIC INFORMATION PILLAR

- **ICT AND INNOVATION**: Interoperable secure digital health solutions adhering to existing legal frameworks
- **DATA MANAGEMENT**: Data access and data quality
- **DATA ANALYTICS**: Foster data use through provision of timely data analytics

SUB-COMMITTEES
ICT AND INNOVATIONS SUBCOMMITTEE

• Ensuring systems alignment with the ehealth policy and other existing legal frameworks
• Systems deployed are speaking to pillar needs
  o Certification guidelines
• Systems integration
• Training and capacity building in the approved systems
A variety of integrated systems have been deployed. These include;

- **eiDSR** (electronic Integrated Disease Surveillance System based on DHIS2)
- Case Investigation and Points of Entry Management
- **Go.Data**
- Contact Listing and Follow Ups
Laboratory Information Management Systems
The various testing laboratories had already approved LIMS that they have integrated with eIDSR for seamless information flow.

Results Dispatch System (Both Web and SMS based)
Used for disseminating COVID-19 test results.
SYSTEMS UNDER USE FOR COVID RESPONSE

**Restrack**
Tracking samples from points of collection to the laboratory

**Integrated Alerts System**
Picks alerts from call centers across the country in addition to other alerts approved systems like the USSD based *260# and the android application(Call the Doctor)
SYSTEMS UNDER USE FOR COVID RESPONSE

Other categories of systems include:

- Contact tracing applications (Both based on Bluetooth and Ultrasound)
- Risk Communication and Community engagement applications (SMS, Web and USSD)
THANK YOU!
The Role of Digital Health Tools and Approaches for COVID 19 Response in the Democratic Republic of Congo

Trad Hatton
Country Director
PATH-DRC
Today, PATH is harnessing the power of digital tools and fostering innovation in communities everywhere to bring good health within reach of more people faster.

Digital Health accelerates health equity.

PATH’s Vision
PATH envisions a world where innovation ensures that Health is within reach for everyone.

Digital Health Mission
Ensure digital innovations improve health.

Guiding Principles
We will:
- Put the user first.
- Collaborate for impact.
- Focus on sustainability
- Uphold country ownership
- Evaluate and evolve solutions.
PATH is uniquely positioned in the global digital health space and in DR Congo.

TRUSTED, TECHNOLOGY-AGNOSTIC STRATEGIC ADVISOR for countries.

INCUBATOR OF INNOVATIVE BUSINESS MODELS with non-traditional stakeholders, including private sector partners.

PROVIDER OF DIGITAL EXCELLENCE for PATH and PATH partners.

DESIGNER OF COMPLEX SOLUTIONS from global financing mechanisms to country enterprise architectures.

THOUGHT LEADER supporting investment coordination and scale of digital health global goods.
PATH’s donors in the DRC

- Bill and Melinda Gates Foundation (BMGF)
- United States Agency for International Development (USAID)
- Centers for Disease Control (CDC)
- Resolve to Save Lives (RTSL)
- Global Fund
- Goldsmith Foundation

Selected PATH Projects in DRC

- Digital Health in DRC
  - Support development of the National Digital Health Strategy in, Operationalization of the National Agency for Clinical Engineering, Information and Health Informatics (ANICiiS)

- Global Health Security Agenda
  - Establishment of DRC’s first Emergency Operations Center for epidemic response

- COVID19 Data Architecture and Systems Development for DRC National Response

- COVID19 Investigation and Rapid Response in Kinshasa
Democratic Republic of the Congo

Problems/Challenges

- Population of 80 million served by a largely broken health system with under-trained and underpaid health care workers
- Poor infrastructure including road infrastructure, health facility infrastructure, IT infrastructure
- Human resources concentrated in the urban centers with few skilled health care workers in rural areas

Opportunities

- Private sector mobile telephone operators are expanding coverage rapidly in DRC.
- Leadership from among President and MoH leadership for Digital Transformation
- Digital solutions are a way to leapfrog structural issues
“Congolese Digitalization will be a lever for integration, good governance, economic growth and social progress». (Translation from French)

Son Excellence Felix Antoine Tshisekedi Tshilombo
3 Tools and Approaches

- ANICIIS – Digital Health Agency of DRC
- Mobile Emergency Operations Center
- Digitization of COVID 19 data collection, integration and analysis
MoH established ANICiiS to promote and coordinate the digital health transformation in the DRC aligned with:

- ANICiiS coordinates the development, adoption and maintenance of digital technologies and biomedical equipment for the delivery of quality health care services, the management of the health system and the sharing of health information.
  - Design and implement digital health programs
  - Harmonize multiple digital health investments in country
ANICiiS Support to COVID19 Response

- Coordination and technical support for identification of architecture for COVID19 data management system
- Chat bot named Doctor ANICiiS to provide population with accurate data and information on COVID. Contributes to fight against misinformation.
- ANICiiS COVID19 SMS channel sends prevention messages to all Congolese with cellphone
- ANICiiS COVID19 web page on freebasix

https://www.stopcoronavirusrdc.info/
Mobile Emergency Operations Center in DRC

Combines all digital capacity and makes mobile via 4x4 which can be deployed to outbreak areas for first response.

Mobile Emergency Operation Centers are a transformational tool for epidemic response, particularly in remote rural areas which lack connectivity and strategic expertise in response such as is the case of COVID, Ebola, measles outbreaks in DRC.
An integrated COVID data system, developed within the national DHIS2 infrastructure, that allows all the different stakeholders involved in the COVID detection and case management to report and access the data relevant for the case follow up. Monitoring teams have access to all the data through dashboards.
Dashboards to be used by Decision Makers
Leveraging Cross Border Digital Health Solution for COVID-19 Response
OpenHIE Component Layer

Registry Services
- Terminology Services
- Client Registry
- Facility Registry
- Health Worker Registry

Business Domain Services
- Shared Health Record
- Health Mgmt Info System

Authentication
Interlinking Service
Entity Mapping

Interoperability Layer

Point of Service
- Mobile System
- Electronic Medical Record
Patient visits facility. They are first searched in in the EMR which consults the Client registry (ex. EMPI/MedicCR/OpenCR). If new, the patients are added in the client registry.
Patient encounter details are entered in EMR and saved on the Shared Health Record. During visits, Health care workers are validated through the Health care workers registry.
Reporting on lab results. Lab results definition verifies in the terminology service to ensure unambiguous interpretations of the concepts.
The Cross Border Digital Health Solution is part of the USAID funded Cross Border Health Integrated Partnerships Program (CB-HIPP - https://www.fhi360.org/projects/cross-border-health-integrated-partnership-project-cb-hipp) implemented by FHI360. IntelliSOFT Consulting Limited is sub-contracted by FHI360 to develop and implement the Cross Border Digital Health Solution (CB-HIPP).
SMAART: A Population Health Informatics framework to address COVID-19

Ashish Joshi PhD, MBBS, MPH
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City University of New York, Graduate School of Public Health and Health Policy
New York
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Overview

- Need for a population health informatics framework
- SMAART informatics framework and its applications
- Adapting SMAART Informatics framework to address COVID-19
- Work in progress
Number of Internet Users globally
4.54 billion
Penetration: 59%

Unique Mobile Phone Users globally
5.19 billion
Penetration: 67%

Active Social Media Users globally
3.8 billion
Penetration: 49%
What Happens in an Internet Minute?

1,572,877 GB of global IP data transferred

- 347,222 Tweets
- 3.3 Million pieces of content shared
- 6.9 Million messages sent

Netflix + Youtube = more than 1/2 of all traffic

And Future Growth is Staggering

By 2017, mobile traffic will have grown 13X in just 5 years

In 2017, there will be 3X more connected devices than people on Earth

All digital data created reached 4 zettabytes in 2013
Need for a Human Centered Informatics Aid

INFORMATION lost

(Temporal) When

Human Mind Processing Data

INFORMATION retained

INFORMATION lost

KNOWLEDGE creation

Impact Decision-Making

INFORMATION retained

INFORMATION lost

Knowledge creation

Influence Programs and Policies

Spatial (Where)

Multi-dimension, Multi-faceted, Multi-level

Attribute (Who, What, How)
Need for **Human centered**, **Data driven**, **Evidence based**, **Transformative shifts**, **Integrated approaches**, and **New solutions** to enhance population health outcomes and well-being across diverse settings.
SMAART: A Human Centered Informatics Platform to support Population Health Interventions globally

- Population Health Informatics (PopHI) framework
- Technology enabled internet, or standalone
- Collect process and present population health data (meaningful and contextual relevance)
- Inform design, development, implementation and evaluation of human centered interventions
- Facilitate data driven, evidence based policy making.

**Sustainable** **M**ultisector **A**ccessible **A**ffordable **R**eimbursable **T**ailored

- Community based surveillance
- Population health dashboards
- Consumer health information platforms
**SMAART Informatics Theoretical framework**

- **Human Centered and Grounded theory approach**
  - Active involvement and understanding of users
  - Understanding task requirements
  - Appropriate allocation of function between user and system,
  - Iteration of design solutions
  - Multidisciplinary design teams.

- **Cognitive Fit Theory**
  - Identifies appropriate representation for a given task performed by users

- **Information processing theory**
  - Facilitates presentation of information as a meaningful unit.

- **Learning behavioral and humanistic theories**
  - Information highly interconnected, relevant to learner, multiple content formats and feedback given based on responses
Application of SMAART INFORMATICS framework to enhance population health

Programs, Policies, Interventions

Community based SMAART DIGITAL HUB

Information Processing Theory

Human Centered approach

Humanistic, Behavioral, Learning and Self-Efficacy theory

Research enabled Action oriented Policy Interventions driven by Data

Data, Information Knowledge approach
Adapting SMAART Informatics framework to address COVID-19

How wealth of COVID-19 data can be used by policymakers in evidence-based decision making?

Navigating a path out of this pandemic crisis will require **effective integration of data into decision making** (April 1, 2020 World Economic Forum).
Data Challenges

Volume of Data
Scale of Data

Variety of Data
Different forms of Data

Velocity of Data
Speed with which data is generated

Veracity of Data
Uncertainty of data

Wearable sensors

Increased digital data

Increased mobile phones

Too Much Information

Too much relevant information too quick

Difficult to distinguish which information is reliable and helpful

? VALUE

MEANINGFUL DATA
CONTEXTUAL & CULTURAL RELEVANCE
Technology challenges

- Access to technology
- Technology skills
- Financial barrier
- Technical barrier
- Lack of awareness
- Privacy and Quality
SMAART RapidTracker
A Global Policy Informatics Tool to Track COVID-19 Outbreak

Research enabled Action oriented Policy Interventions driven by Data

• Global Policy informatics platform

• Tracks geospatial spread of COVID-19 outbreak and policy actions globally

• Designed and developed using SMAART informatics framework
SMAART Informatics framework

DATA

POLICY

Data driven, Evidence-based solutions into Practice

SMAART INFORMATICS
SMAART RapidTracker
A Global Policy Informatics Tool to Track COVID-19 Outbreak

Geographic coverage
- World
- Country
- States (India and US)

Trends
- Track Spatial Temporal trends

Data recorded
- COVID-19 Total cases
- COVID-19 New cases
- COVID-19 Total fatality
- COVID-19 New fatality
- COVID-19 Recovered cases

Variables derived
- Per million
- Daily rate of change
- 7-day average change

Advisories issued
Policies implemented

Features
- Compare
- Select
- Rank

Data Sources
Up to date collection of data from publicly reliable available sources of information

Digital Resource Module
Repository of evidence based digital COVID-19 resources (e.g. WhatsApp groups, apps, screening tools)

Insights Module
Generate meaningful trends and present findings in an interactive format using maps, charts, graphs

©SMAART Rapid Tracker 2020
### SMAART RAPID TRACKER AS A DECISION AID TOOL: GLOBAL VIEW

#### Global Spatiotemporal Trends of COVID-19

**TOTAL CASES**

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>7,553,182</td>
<td>1.93%</td>
</tr>
</tbody>
</table>

**NEW CASES**

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>142,672</td>
<td>4.47%</td>
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</tbody>
</table>

**TOTAL FATALITY**

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>423,349</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

**NEW FATALITY**

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>5,055</td>
<td>2.64%</td>
</tr>
</tbody>
</table>

**COUNTRYWISE DATA AS ON 13TH JUNE 2020**

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Cases</th>
<th>New Cases</th>
<th>Total Fertility</th>
<th>New Fertility</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States of America</td>
<td>↑1.09%</td>
<td>↑7.04%</td>
<td>↑0.64%</td>
<td>↑13.82%</td>
</tr>
<tr>
<td>Brazil</td>
<td>↑3.94%</td>
<td>↓7.60%</td>
<td>↑3.12%</td>
<td>↓2.75%</td>
</tr>
<tr>
<td>India</td>
<td>↑3.85%</td>
<td>↑4.58%</td>
<td>↑4.54%</td>
<td>↓2.53%</td>
</tr>
</tbody>
</table>

Showing 1 to 3 of 3 entries (filtered from 216 total entries)
**DATA SOURCES**

<table>
<thead>
<tr>
<th>World Data</th>
<th>Source</th>
<th>Link</th>
</tr>
</thead>
</table>

|--------------------------------------|-------------------|----------------------|

|-----------|-------------------|----------------------|


| Italy | Government website | [www.salute.gov.it](www.salute.gov.it) [www.protezionehigienica.it](www.protezionehigienica.it) [www.governo.it](www.governo.it) |

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**INSIGHTS**

- **COVID-19 Infections among South American Countries**
  - By SRT Team | June 7th, 2020

- **COVID-19 Infections in Gulf Cooperation Council Countries**
  - By SRT Team | May 27th, 2020

- **Countries with highest COVID-19 cases and fatality per million**
  - By Ashish Joshi | May 9th, 2020

- **India's Response to COVID-19 Outbreak**
  - By Ashish Joshi | April 23rd, 2020

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**INSIGHT MODULE**

- **COUNTRIES WITH HIGHEST COVID-19 CASES AND FATALITY PER MILLION AS ON 15TH JUNE 2020**

  - [Graph showing data](graph1)

- **COVID-19 Apps in Global Settings**

  - **Australia: COVIDSafe app**
    - The COVIDSafe app speeds up contacting people exposed to coronavirus (COVID-19).
    - This helps us support and protect you, your friends and family.

  - **Bulgaria: VirusSafe app**
    - VirusSafe is a mobile application, created to assist society and governmental institutions in the fight against COVID-19, approved by the Bulgarian Ministry.

  - **China: Chinese Health Code System**
    - Drawing on the experience of promoting health codes in Zhejiang and other places, and helping to classify and resume work ...
Work in Progress

Challenges

• Data updates at different time points
• Each country not releasing the same data at the same time
• No consistent classification of advisory and policy recommendations.
• Some of the links to the data sources not working or broken.

Opportunities

• Modular, flexible, data driven tool
• Develop global policy database to track government responses to COVID-19 pandemic.
• To be a decision aid tool for governments, policy makers, and researchers for informed policy making.
SMAART RAPID TRACKER
An opportunity of Virtual Experiential Learning during COVID-19

115+ students engaged

7 countries
- Australia
- Bangladesh
- India
- Indonesia
- Ireland
- United States
- United Kingdom
“Obstruction is Opportunity and Innovation is Struggle”

Ashish Joshi

Email: ashish.joshi@sph.cuny.edu

Webpage: smaartrapidtracker.org
Several additional webinars are being planned to highlight members of AMIA and the wider informatics community.

Visit AMIA.org/COVID19
Audience Q&A