The MRIIDS Team

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An epidemic anywhere is a risk for everyone. The world is now a global village…diseases do not require passports or visas.
PROBLEM STATEMENT:
How might we equip key health decision makers with tools that increase their readiness and ability to respond in an informed and timely manner to outbreaks?

SOLUTION
• Visualizing case data in real time
• Combining multiple data streams into a single probabilistic framework to provide short term projections
• Providing an intuitive interface that allows customization and data sharing
MRIIDS User Research
**USER RESEARCH SUMMARY**

**PHASE 1: Remote Interviews**
- 25 interviewees
- 19 organizations and teams
- 6 stakeholder categories

**PHASE 2: In-country Concept Testing**
- Senegal and Sierra Leone
- 34 interviewees
- 26 organizations and teams
- 6 stakeholder categories

**PHASE 3: In-country Prototype Testing**
- Senegal
- 34 interviewees
- 26 organizations and teams
- 6 stakeholder categories

76 Interviewees

45 organizations and teams

6 stakeholder categories*

*Public Health, Academics, Funders, Business/Security, Media, General
USER NEEDS

**PREPAREDNESS**
Most of the participants indicated that when there is no ongoing outbreak, their focus is on surveillance, monitoring and training. They wanted to better understand disease trends, areas with high risk, implement preventive methods and make sure that SOPs are updated and accessible for outbreak scenarios.

**USER NEEDS**
- HISTORIC DISEASE DATA
- AREAS UNDER RISK
- CONTEXTUAL AND DEMOGRAPHIC DATA

**OUTBREAK RESPONSE**
Participants explained that during an outbreak their mindset shifts to response and action. They expressed a desire to get a quick understanding of the current situation, make fast decisions on appropriate course of action, mobilise relevant resources to achieve results and manage the response process efficiently.

**USER NEEDS**
- SITUATION SNAPSHOT
- PRIORITISATION AND EFFICIENCY
- COORDINATION

**OPPORTUNITY AREA**
How might we equip national and province/regional health decision makers with appropriate visualisations and data sets, to help in monitoring and training in order to better prepare for an outbreak?

**OPPORTUNITY AREA**
How might we equip national health decision makers with snapshot views and prioritisation tools to help in quick decision making, coordination and efficient mobilization efforts during an outbreak?
“I would like to see a map visualisation of the ongoing outbreak with case counts, epi-curve, health facilities & health staff at the country level and zoom into the regional levels.”

Dr. Matar Camara, Policy & Health Specialist, USAID + Abt Associates, Dakar
RISK MAPPING

“Risk mapping is important during preparation phase when there is no outbreak, as it is during peace that we prepare for the war.”

Dr Alioune Badara Ly, Deputy In-charge at COUS, MoH, Dakar
MRIIDS – Data and Methods
1. Number of cases over time/space. From ProMED.

2. Transmissibility of pathogen. From literature reviews. Can vary across space e.g. with climate.

3. Connectivity between locations. Various models and data sources will be explored.

4. Host & environment susceptibility. E.g. vaccine coverage. From ghsagenda.org and other sources.

5. Ability to contain the outbreak. E.g. healthcare capacity. From Healthsites.io.

Model outputs: Mapping the risk of disease spread

A. What is the relative level of risk across space?  B. Where does the risk come from?
Data stream 1: case numbers
Example of the 2013-16 West African Ebola epidemic

Innovative Diseases
Surveillance:
• ProMED
• HealthMap

Traditional Disease
Surveillance:
• WHO
Data stream 2: transmissibility

Retrieved from the literature…

Or estimated in real time

A review of epidemiological parameters from Ebola outbreaks to inform early public health decision-making

Cori et al. AJE 2013
Estimated transmissibility in real-time

$R_0 = 2.02 [1.79-2.26]$  
(similar to previous outbreaks)

Comparing transmissibility based on different data sources
Connectivity

https://www.unglobalpulse.org/
Local susceptibility?

4. Host & environment susceptibility.
E.g. vaccine coverage.
From ghsagenda.org and other sources.
Model validation

Predicted continental spread of the 2013-16 West African Ebola epidemic

Guinea, 2014-15

21 Nov 2014

Predicted regional spread of the 2018 Ebola outbreak from Equateur, DRC

21 May 2018
Valuable attributes in terms of Epidemic Preparedness include:

- ICU beds
- ventilators
- hospital beds
- number of Doctors
- number of Nurses

The attributes that have been shared are:

- Name - BOURGUIBA - Poste de Santé
- Nature of facility - Poste de Santé
- Ownership - Public
- Latitude - 14.71477948
- Longitude - 17.45315688
- Source of info name - Ministère de la Santé du Sénégal
- Source of info URL - https://senegal.dhis2.org

What stops the Ministry of Health sharing the number of Doctors at each facility?
What is the risk?
What is the incentive to share?
PRODUCT DESIGN AND DEVELOPMENT
From 1 March to 31 March 2015, the Ebola outbreak in Liberia has affected 207 people (69 confirmed, 21 probable, 117 suspected cases). The regions affected by the Ebola outbreak in Liberia are:
1. Bomi (45)
2. Margibi (29)
3. Gbarpolu (27)
4. Nimba (26)
5. Montserrado (19)
6. Bong (14)
Ebola Outbreak

SNAPSHOT RISK

Liberia

Reported cases from: 1 March to 31 March 2015

SUMMARY
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Updated on: 2 April 2015

Updated on: 31 March 2015
Reported cases from: 1 April 2014 to 31 March 2015

6,525

**Confirmed** 2,508

**Probable** 1,239

**Suspected** 2,778

**SUMMARY**

From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases).

The regions affected by the Ebola outbreak in Liberia are:

1. Montserrado (2,045)
2. Bomi (1,497)
3. Bong (908)
4. Lofa (870)
5. Margibi (672)
6. Nimba (420)

Read more
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Ebola Outbreak

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Read more
Case Counts

- 0
- 250
- 500
- 750
- 1,000
- 1,250
- 1,500
- 1,750
- 2,000
- 2,250

Confirmed
- 589

Probable
- 287

Suspected
- 621

SUMMARY
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases) and the region of Bomi has reported 1,497 cases (589 confirmed, 287 probable, 621 suspected).

The districts affected by the Ebola outbreak in Bomi are:
1. Dewoin (765)
2. Klay (332)
3. Mocca (258)

Read more
1,497

Confirmed: 589
Probable: 287
Suspected: 621

SUMMARY
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases) and the region of Bomi has reported 1,497 cases (589 confirmed, 287 probable, 621 suspected).

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3. Mecca (258)

Read more

TABLE OF REPORTED CASES
Reported cases for Ebola outbreak in Liberia from 2nd May 2014 to 2nd April 2015.

LIBERIA v/s BOMI
Comparison of total case counts and deaths between Liberia and Bomi from 2nd May 2014 to 2nd April 2015.
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases).

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Updated on: 2 April 2015
SUMMARY

From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases).

The projected cases in Liberia from 2 April to 30 April 2015 will be 197. According to the projection, the regions that will be most affected in Liberia in the coming 4 weeks will be:

1. Montserrado (45)
2. Bomi (41)
3. Bong (22)
4. Lofa (21)
5. Margibi (16)
6. Nimba (15)
7. Grand Bassa (10)
8. Grand Cape Mount (6)
9. Sinoe (5)
10. River Gee (3)

Read more
SUMMARY
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases) and the region of Bomi has reported 1,497 cases (589 confirmed, 287 probable, 621 suspected).

The projected cases in Bomi from 2 April to 30 April 2015 will be 41. According to the projection, the districts that will be most affected in Bomi in the coming 4 weeks will be:
1. Dewoin (21)
2. Klay (12)
3. Mecca (8)
SUMMARY
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases).

The top six regions in Liberia under the highest risk of importing Ebola to Bomi region are:
1. Montserrado (high)
2. Bong (high)
3. Lofa (medium-high)
4. Margibi (medium)
5. River Cess (medium)
6. Grand Gedeh (medium)

The top six regions in Liberia under the highest risk of getting Ebola exported from Bomi region are:
1. Grand Cape Mount (high)
2. Montserrado (high)
3. Gbarpolu (medium-high)
4. Grand Bassa (medium-high)
5. Sinoe (medium-high)
6. Margibi (medium)

To learn more about the data sources and risk model used, please see the About section.
SUMMARY
From 1 April 2014 to 31 March 2015, the Ebola outbreak in Liberia has affected 6,525 people (2,508 confirmed, 1,239 probable, 2,778 suspected cases).

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5. River Cess (medium)
6. Grand Gedeh (medium)

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4. HISTORIC DISEASE DATA
**Ebola Outbreaks in West Africa from 1999 to 2014**

**1999 Sudan Ebola Outbreak**
- Reported Cases: 128
- Virus: Zaire Ebola

**SUMMARY**
The 1999 Ebola outbreak in Sudan started on 5th June, affected 128 people and killed 75 before it ended on 2nd October 1999.

The Ebola epidemic was caused by a strain of the Sudan ebolavirus and affected the regions of Darfur and Kordofan. Read more

**2002 Republic Of Congo Ebola Outbreak**
- Reported Cases: 113
- Virus: Zaire Ebola

**SUMMARY**

The Ebola epidemic was caused by a strain of the Zaire ebolavirus and affected the regions of Brazzaville and Pool. Read more

**2005 Democratic Republic Of Congo Ebola Outbreak**
- Reported Cases: 657
- Virus: Bundibugyo Ebola

**SUMMARY**
The 2005 Ebola outbreak in the Democratic Republic of Congo started on 1st May, affected 657 people and killed 401 before it ended on 12th December 2005.

The Ebola epidemic was caused by a strain of the Bundibugyo ebolavirus and affected the region of Katanga. Read more
Ebola Outbreaks in West Africa from 1999 to 2014

1999 Sudan Ebola Outbreak
- Reported Cases: 128
- Virus: Zaire Ebola
- SUMMARY: The 1999 Ebola outbreak in Sudan started on 5th June, affected 128 people and killed 75 before it ended on 2nd October 1999. The Ebola epidemic was caused by a strain of the Sudan ebolavirus and affected the regions of Darfur and Kordofan. Read more

2002 Republic Of Congo Ebola Outbreak
- Reported Cases: 113
- Virus: Zaire Ebola
- SUMMARY: The 2002 Ebola outbreak in the Republic of Congo started on 15th March, affected 113 people and killed 85 before it ended on 24th April 2003. The Ebola epidemic was caused by a strain of the Zaire ebolavirus and affected the regions of Brazzaville and Pool. Read more

2005 Democratic Republic Of Congo Ebola Outbreak
- Reported Cases: 657
- Virus: Bundibugyo Ebola
- SUMMARY: The 2005 Ebola outbreak in the Democratic Republic of Congo started on 1st May, affected 657 people and killed 401 before it ended on 12th December 2005. The Ebola epidemic was caused by a strain of the Bundibugyo ebolavirus and affected the region of Katanga. Read more
SUMMARY
From 15 March 2002 to 24 April 2003, the Ebola outbreak in Republic of Congo affected 143 people. The regions affected by the Ebola outbreak were:
1. Brazzaville (45)
2. Pool (29)
3. Bouenza (14)
4. Lekoumou (13)
5. Plateaux (12)

Go back to the List of all outbreaks in the region of West Africa.
NEXT STEPS
Build buy in and user base in select countries - Integration with existing healthcare data reporting and analysis platforms such as DHIS-2

Expand to other priority diseases
  - Yellow Fever - vector borne and vaccination

Real time, open data sources - develop partnerships with other organization to integrate other available data

Increased automation and integration of different elements

Sustainability/Funding
THANK YOU