Global Health Diagnostics: needs, challenges and promises

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Diagnostics Landscape in the Developing World

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- **Lack of access**

  Although high-quality diagnostics are available for many infectious diseases, they are neither affordable nor accessible to patients in the developing world

- **Lack of investment**

  Little industry interest in developing quality diagnostics for diseases prevalent in the developing world, due to a perceived lack of return for investment, and lack of investment by MOHs

- **Lack of regulatory oversight**

  Tests are often sold and used without evidence of effectiveness, discouraging companies with quality products from competing

- **Lack of quality standards for test evaluations**

  Claimed accuracy on product inserts often misleading

WHO recommends the use of syndromic management

- **Need**:
  - ~1 million children die of pneumonia each year
  - WHO guidelines for "Integrated management of childhood illness"

- **Challenges:**

  In malaria endemic areas of Africa:
  - Fever only: test for malaria, treat
  - Fever + fast breathing: give antibiotic (often just 1 antibiotic available and may not be appropriate)

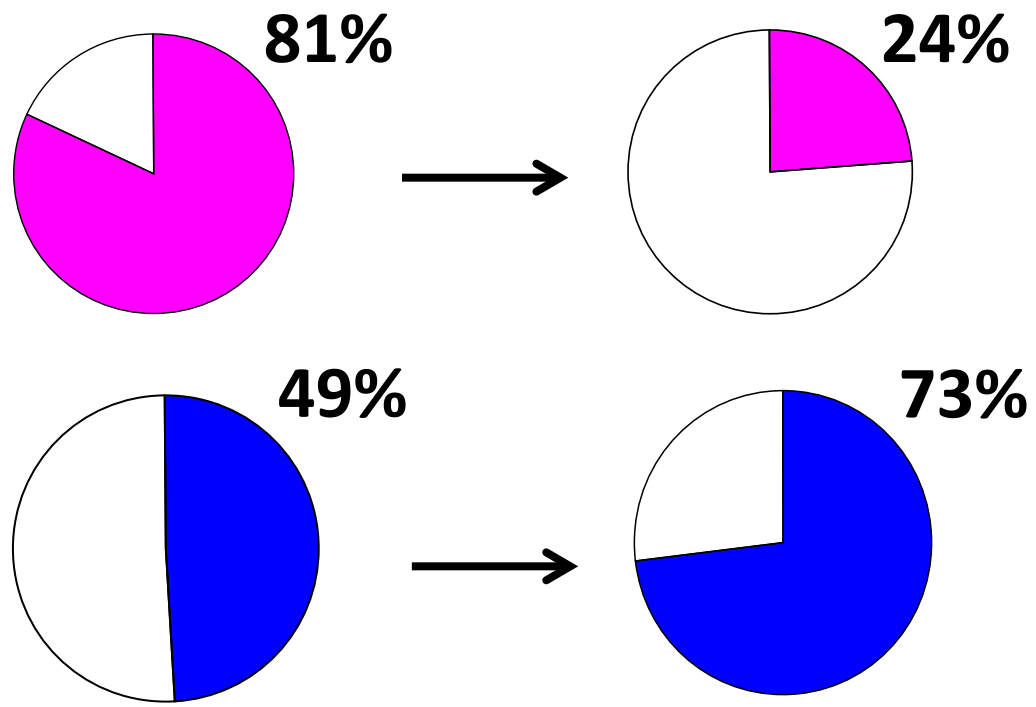
  In Asia and latin America
  - self-medication is a deeply entrenched cultural practice
  - antibiotics are sold over the counter
  - ? the financial incentives for individuals to:
    - pay for a test, wait for results and then pay for treatment (if indicated)

      vs just pay <50 cents for antibiotics over the counter?

Introduction of Malaria Rapid Tests

Antibiotic prescription study in Dar es Salaam

Proportion of febrile patients receiving:



D'Acremont et al, 2010

ASSURED

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A = Affordable

S = Sensitive

S = Specific

U = User-friendly

R = Rapid and robust

E = Equipment-free

D = Deliverable

✓ Affordability

✓ Accuracy

✓ Access

Cepheid: A Multi-disease Random Access Real-time PCR Platform

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Omni:
- 9 in. tall
- 1 kg
- AC or battery operated
- controlled via dedicated mobile device
- wireless, web enabled
- USD 2,895

MTB/RIF
MRSA
CT/Ng
HIV Viral Load
…..

5 20 80 500-1000 Samples per shift

Connectivity Solutions for Rapid Point-of-care Tests

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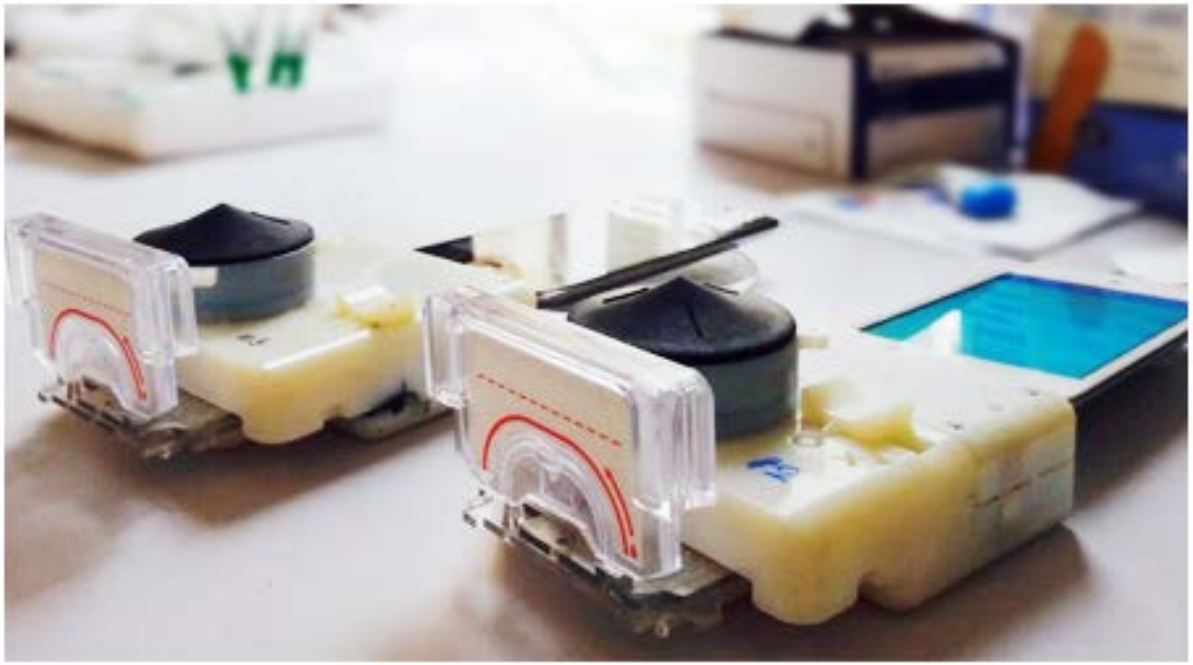
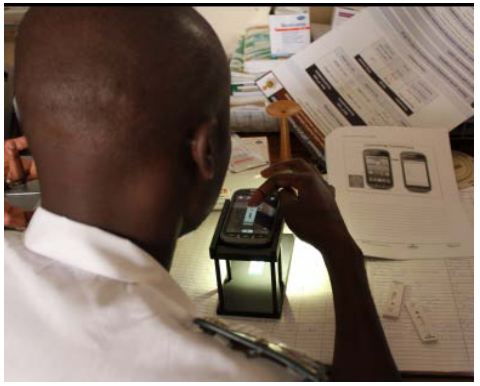
SHARE



Smartphone dongles performed a point-of-care HIV and syphilis test in Rwanda from finger prick whole blood in 15 minutes, operated by health care workers trained on a software app.

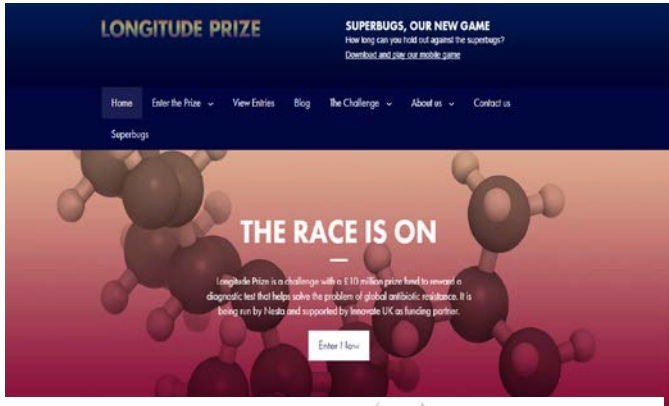
—Image courtesy of Samiksha Nayak for Columbia Engineering



Funding for AMR Activities

POC Test or test systems are needed to:

- improve the specificity of syndromic management leading to more targeted use of antibiotics
- AMR for surveillance & guiding treatment
- lower the cost of drug trials



<u>Incentivising Test Development</u>:

- The UK Longitude Prize £ 10 million
- The EC Horizon 2020 Prize: 1 million euros
- The US NIH AMR Prize of up to $ 20 million

<u>Global AMR Innovation Fund (target: $2 billion)</u>

Innovation in health service delivery:
Unmanned Aerial Vehicles

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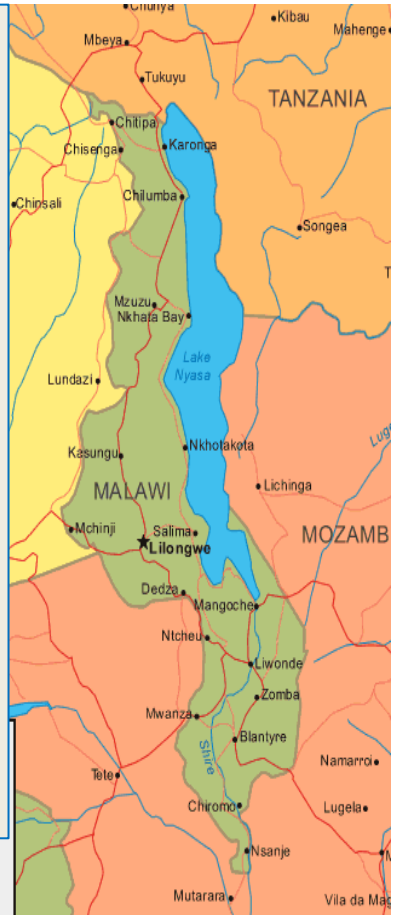
Cost: ~ $10,000
Payload : 5 lbs
Flight time: 30-60 min
Range: 20-60 miles

Operation: manual or pre-programmed for specific routes; need almost no room to land, and can even drop packages from a low hover; can deliver 100 HIV POC tests



The Way Forward

- In the developing world, many communities lack access to laboratories and diagnostics
- Simple affordable rapid POC tests are available to increase access to diagnosis of some infectious diseases but none can be used to reduce inappropriate prescribing
- Connectivity solutions can link data from POC testing, quality assurance stock management and automated surveillance systems
- New models of public-private product development partnerships are critical in leveraging diagnostic innovation in other priority areas for better, simpler diagnostics for combating AMR
- Economic models to incentise the use of tests before treatment are needed


Thank you