Informing Policy from a Microbiologist's Perspective

Peter Piot

Cape Town

African Society for Laboratory Medicine

1.12.2014

World AIDS Day

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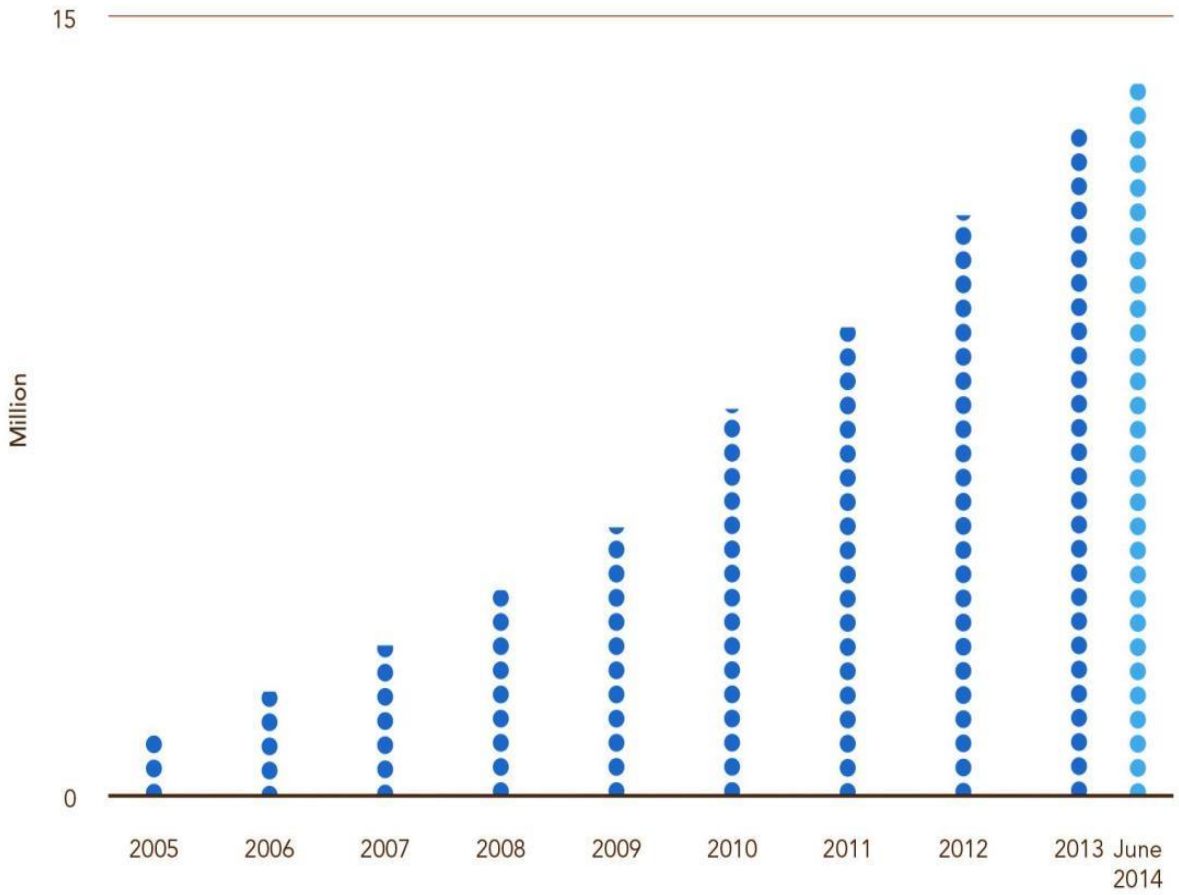
People receiving antiretroviral therapy, 2005 to June 2014, all countries

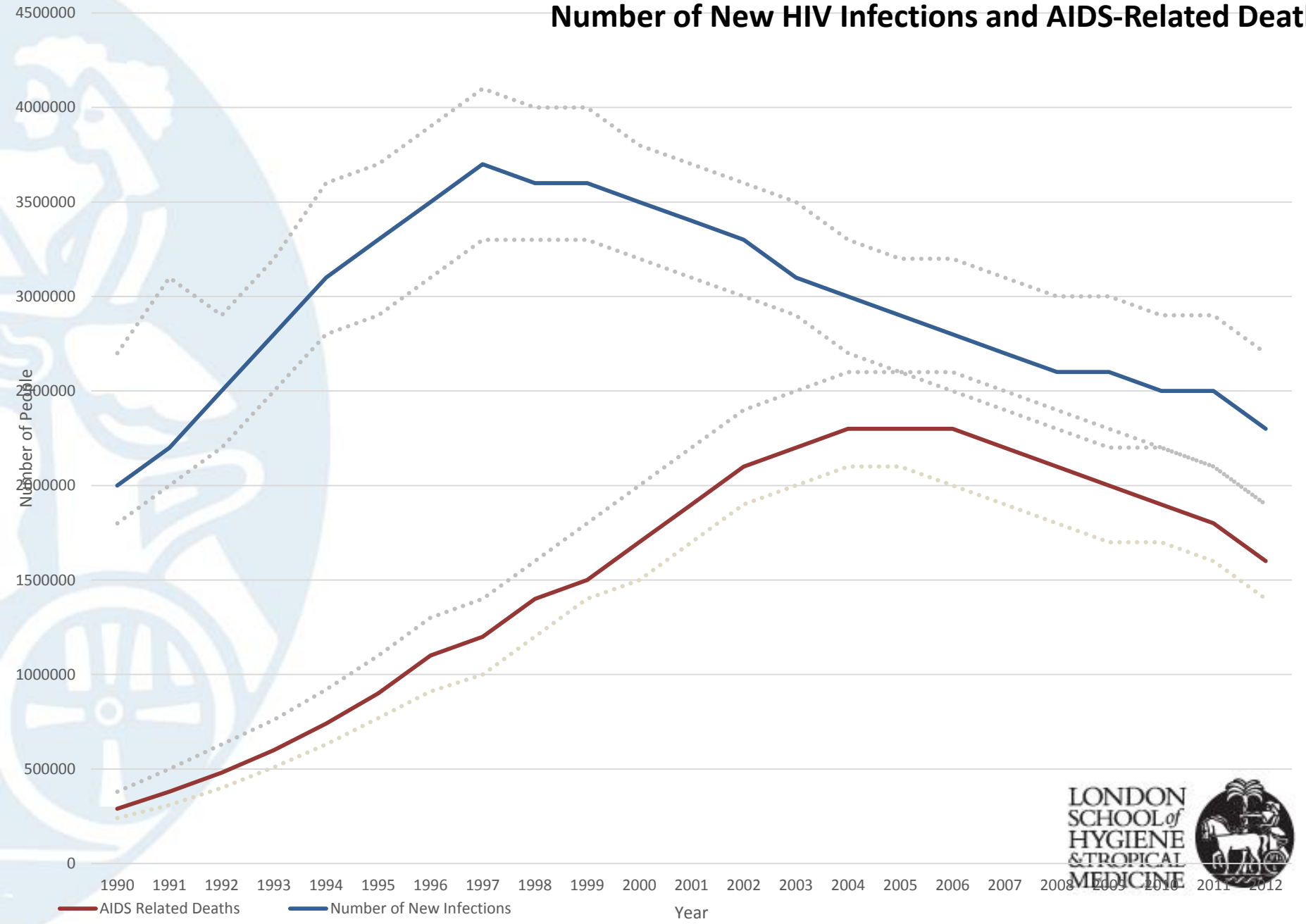


13.6 MILLION

People receiving antiretroviral therapy, June 2014

UNAIDS

Number of New HIV Infections and AIDS-Related Deaths



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Science

Politics

Services

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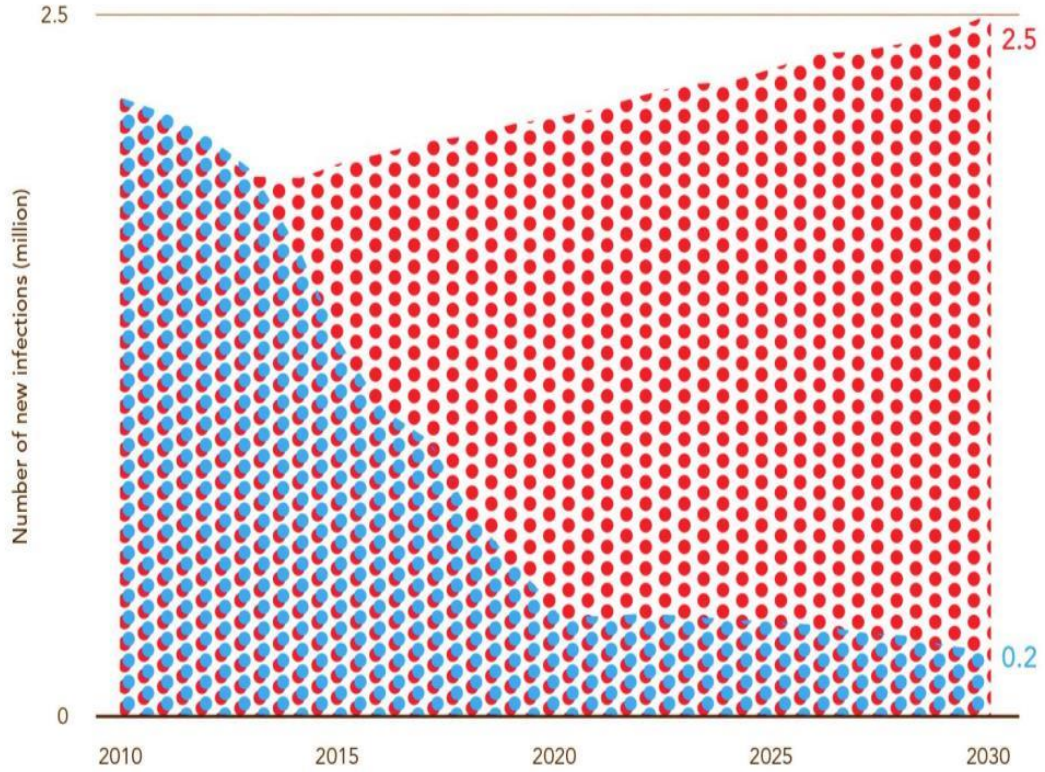
New HIV infections in low- and middle-income countries, 2010–2030, with achievement of ambitious Fast-Track Targets, compared to maintaining 2013 coverage



28
MILLION
Total HIV infections averted 2015–2030

- Ambitious targets
- Constant coverage

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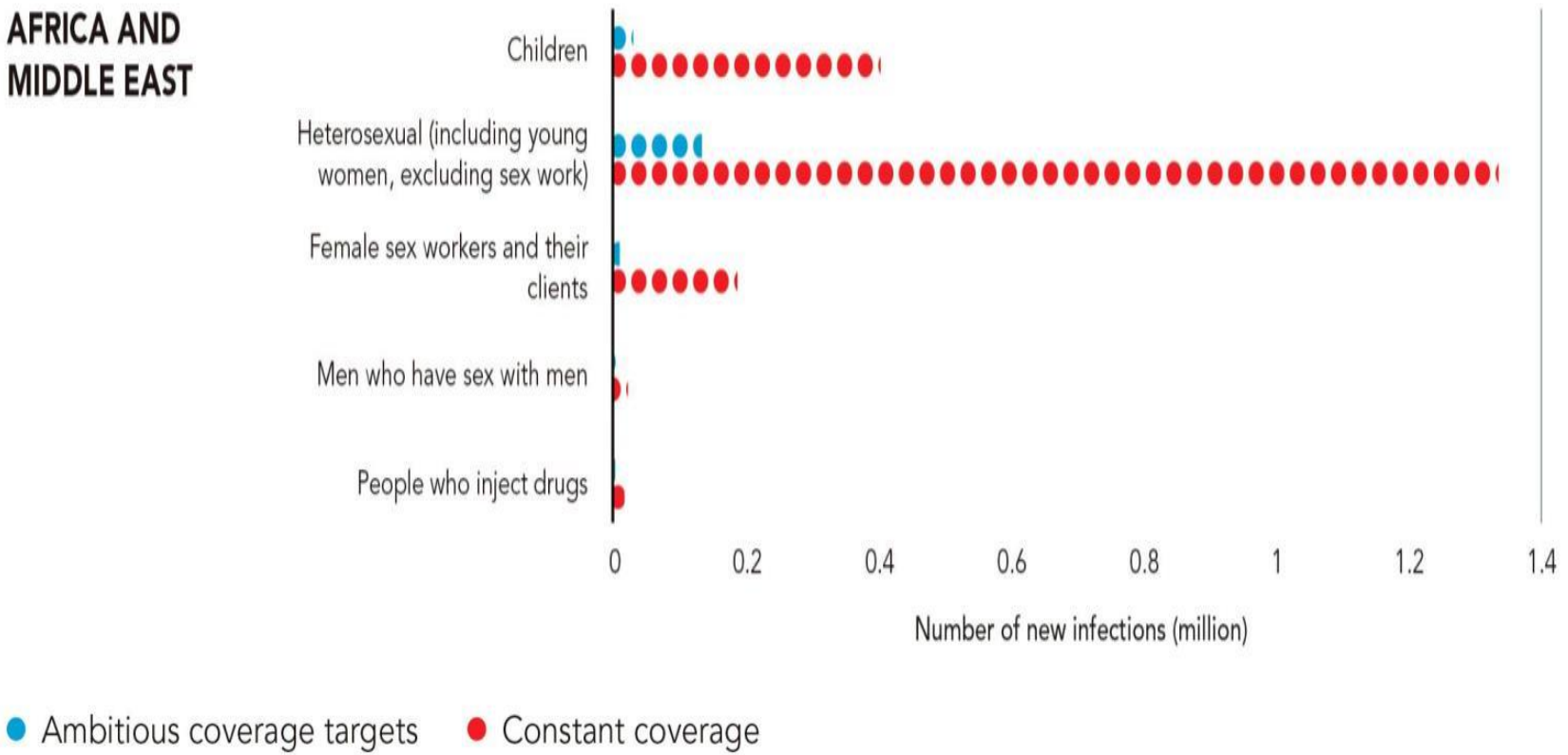
UNAIDS

Estimated new HIV infections in 2030 in low- and middle-income countries in Africa and Middle East, with achievement of Fast-Track Targets compared to continuation of 2013 coverage



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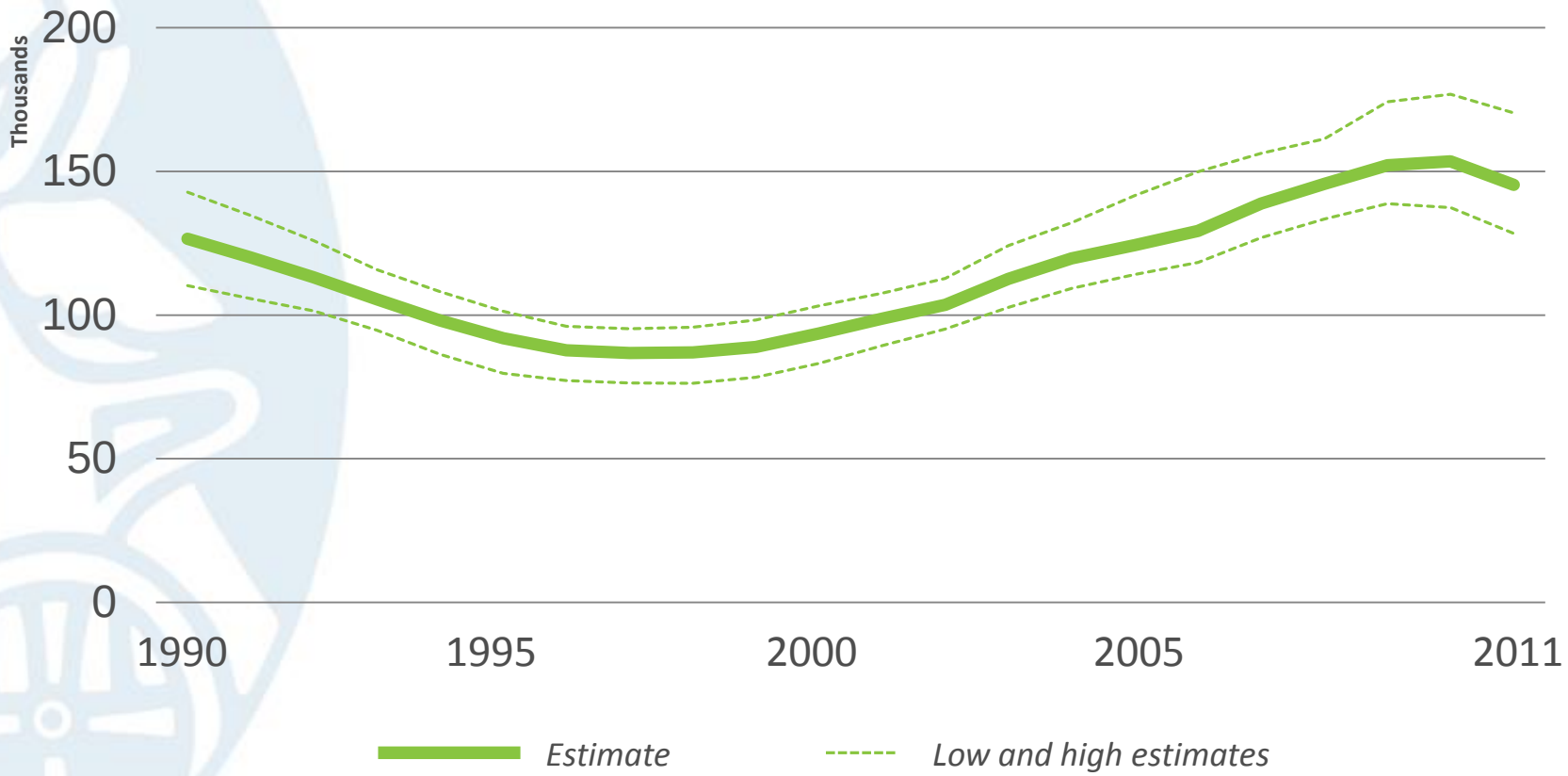
UNAIDS

Number of people newly infected with HIV, Uganda, 1990-2011



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Policies and practice must be informed by laboratory science

- Emerging infections
- Epidemiology
- Monitoring programmes
- Aetiology
- Treatment guidance
- Treatment monitoring

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“No future in infectious diseases!”

(1974)

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G. Lloink, J. Trans. R. Soc. trop. Med. Hyg. 1969, 63, 510.

ISOLATION OF MARBURG-LIKE VIRUS FROM A CASE OF HÆMORRHAGIC FEVER IN ZAIRE

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P. Piot
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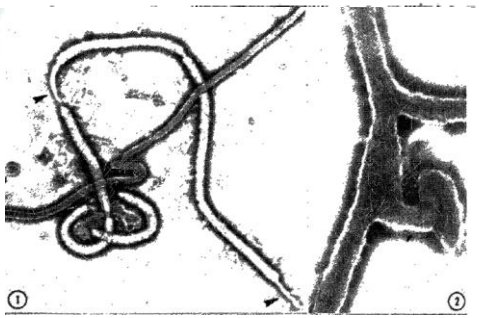
University of Antwerp and Institute of Tropical Medicine, Antwerp, Belgium, and Clinique Ngaliema, Kinshasa, Zaire

We record here our findings in the investigation of the outbreak of severe hæmorrhagic fever in Zaire.

SOURCE AND EXAMINATION OF SPECIMEN

A 42-year-old woman (patient M.E.) fell ill on Sept. 23, 1976, in Yambuku, Equateur Province, Zaire. She was transported by air on Sept. 25 to Kinshasa, where a hæmorrhagic syndrome gradually developed. Clotted blood taken on the 5th day of illness was sent on ice to the Institute of Tropical Medicine, Antwerp. The sample arrived in the evening of Sept. 29 and was kept in the refrigerator.

The next morning serum was inoculated into 6 young adult mice by intracerebral and intraperitoneal routes, into 2 litters



Preliminary Communications

ISOLATION AND PARTIAL CHARACTERISATION OF A NEW VIRUS CAUSING ACUTE HÆMORRHAGIC FEVER IN ZAIRE

K. M. Johnson
P. A. Webb
J. V. Lange
F. A. Murphy

Virology Division, Center for Disease Control, Atlanta, Georgia 30333, U.S.A.

An outbreak of hæmorrhagic fever with an exceptionally high mortality-rate occurred in southern Sudan and northern Zaire with peak case-rates in September, 1976. A W.H.O. International Commission operated in Sudan and Zaire from October onward.[1,2] Blood and tissue specimens from persons with hæmorrhagic disease were sent to laboratories in Belgium and England, and findings from these laboratories appear in the accompanying reports.[3,4] While these specimens were being studied, Mr E. T. W. Bowen (Microbiological Research Establishment, Porton Down) sent an aliquot of an acute blood specimen from a patient in Zaire (no. 718, patient M.E.) to the Center for Disease Control, Atlanta, for additional study.

This specimen, and all subsequent acute specimens, were inoculated into Vero (African green monkey) cells. Three days later a distinct cytopathic change (focal rounding and refractility) was evident, and an aliquot of supernatant fluid was removed for negative contrast electron microscopy.

The Ebola River

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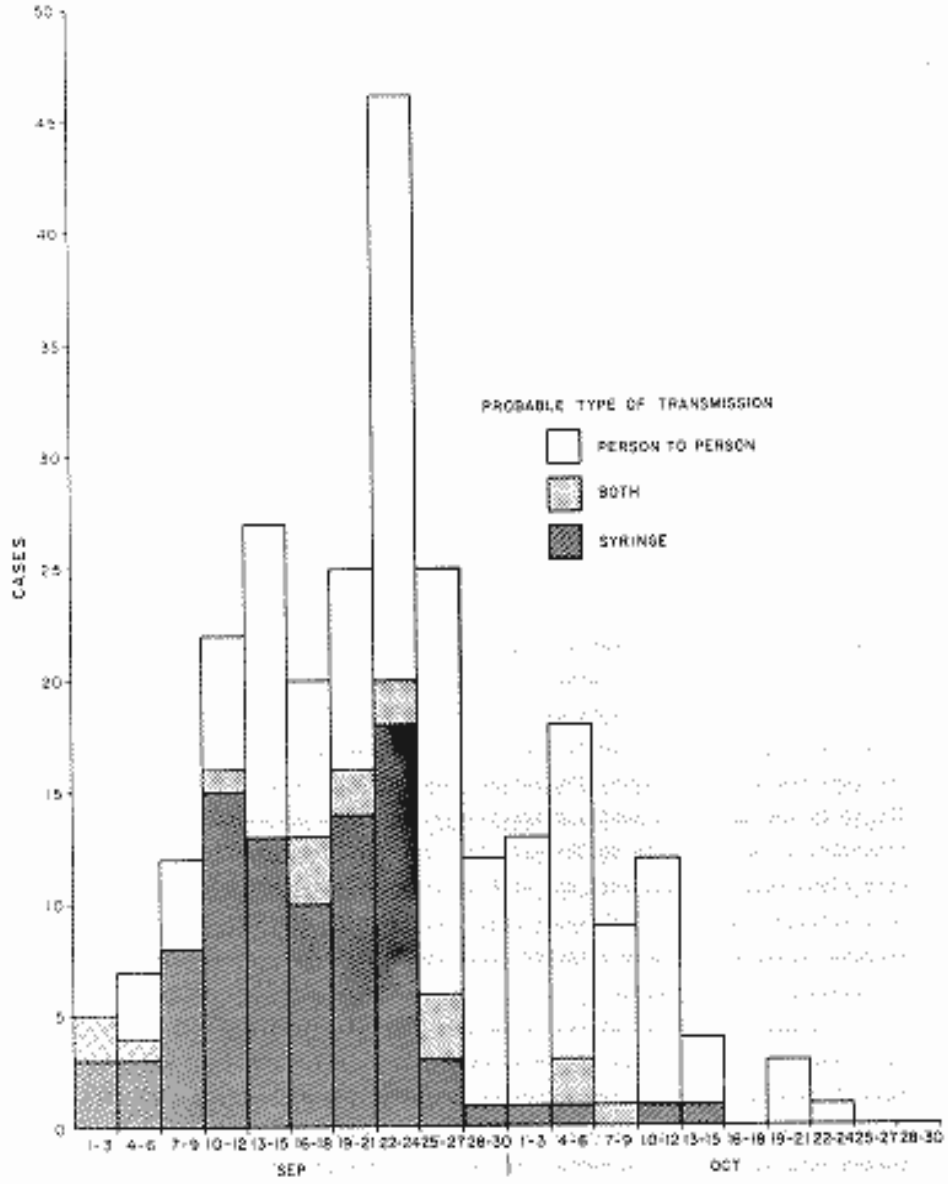
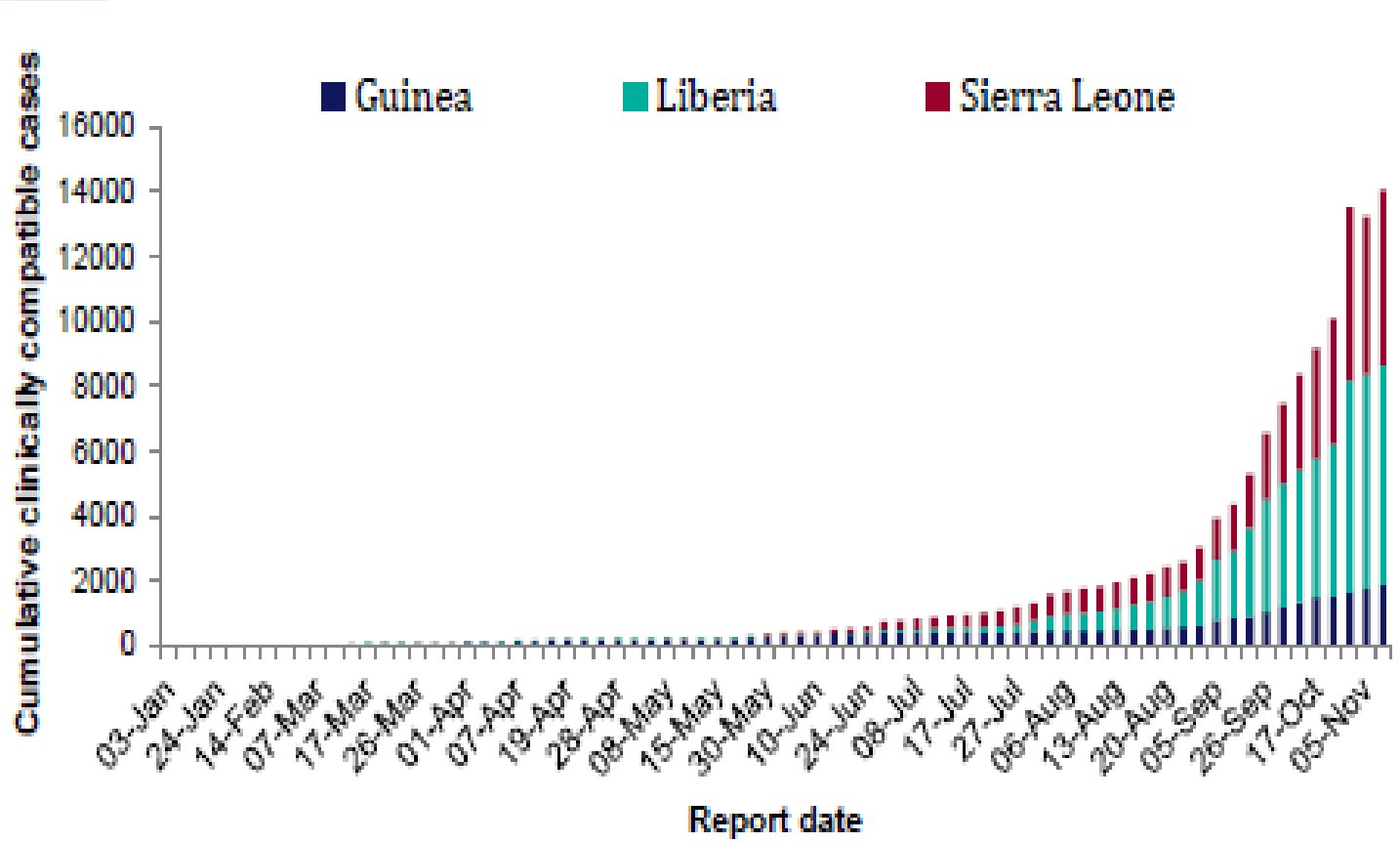


Fig.2 Cases of Ebola Hemorrhagic Fever, by day of onset, Equateur Region, Zaire, Africa, Sept. 1 - Oct. 30, 1976

Confirmed and probable cases of Ebola virus disease in Guinea, Liberia, and Sierra Leone (as of 09.11.14)



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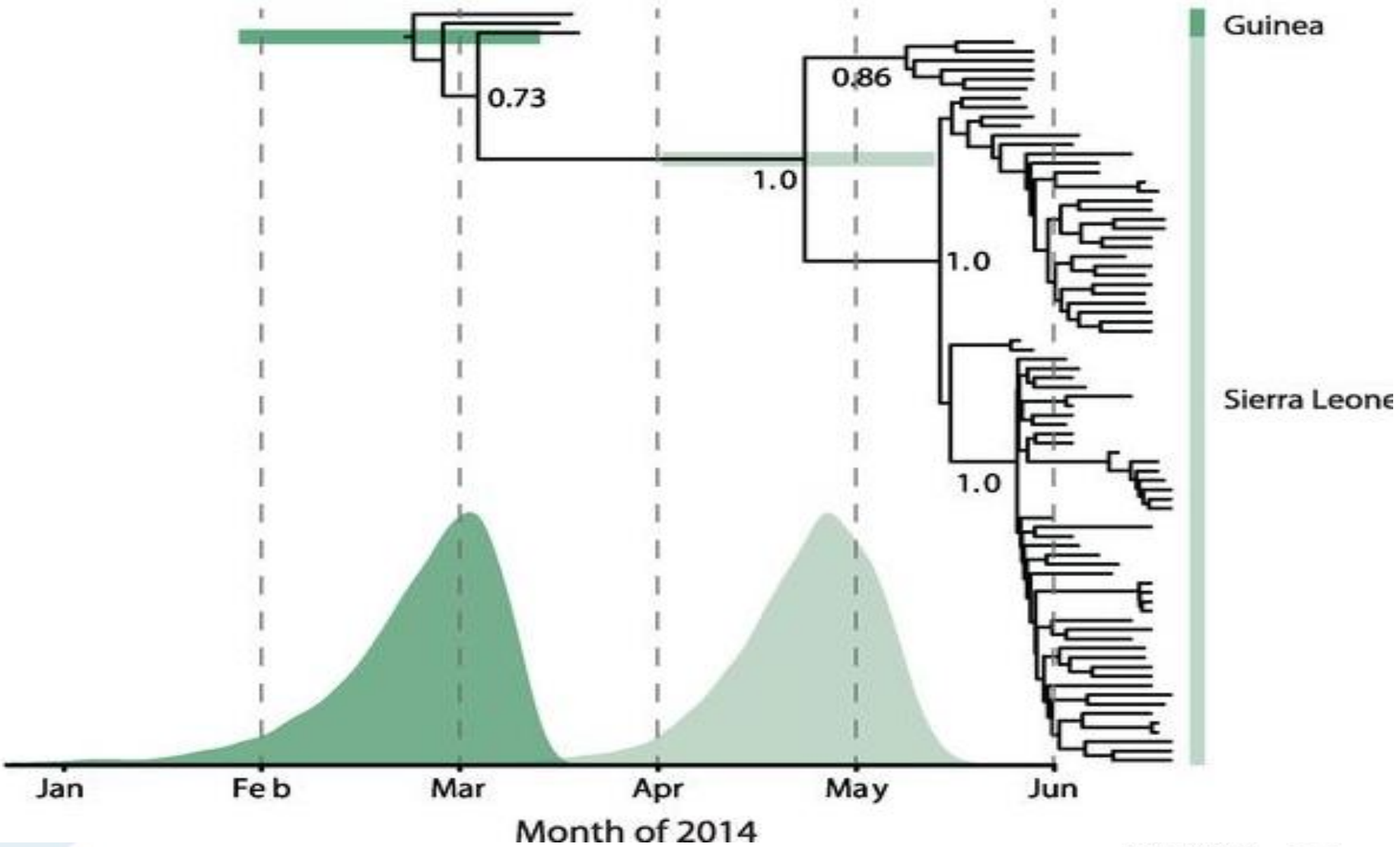
Source: PHE, 14.11.14

Genomic Surveillance
Spread of Ebola



Source: Science 2014,345:6202

Am. J. Trop. Med. Hyg., 52(1), 1995, pp. 98–100

A PILOT STUDY OF THE PREVALENCE OF HEPATITIS C VIRUS ANTIBODIES AND HEPATITIS C VIRUS RNA IN SOUTHERN CAMEROON

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Department of Infection and Immunity, Laboratory of Virology, Institute of Tropical Medicine, Antwerp, Belgium; Belgian Red Cross Blood Transfusion Centre, Leuven, Belgium; Virus-Immunology Unit, Faculty of Medicine, University of Yaounde I, Yaounde, Cameroon

Abstract. Information is lacking on the prevalence of hepatitis C virus (HCV) infection in most African countries. An algorithm based on a combination of enzyme immunoassays (EIAs) with different formats (a commercial test, an HCV antibody [Ab] III test, and an HCV core Ab EIA) was used to estimate the prevalence of HCV infection in different population groups from southern Cameroon. An overall high prevalence was observed, with a significant increasing trend for both sexes with respect to age. A high proportion (67.4%) of HCV-positive sera were viremic as demonstrated by the reverse transcription–polymerase chain reaction. We conclude that the prevalence of HCV is high in southern Cameroon and increases linearly with age.

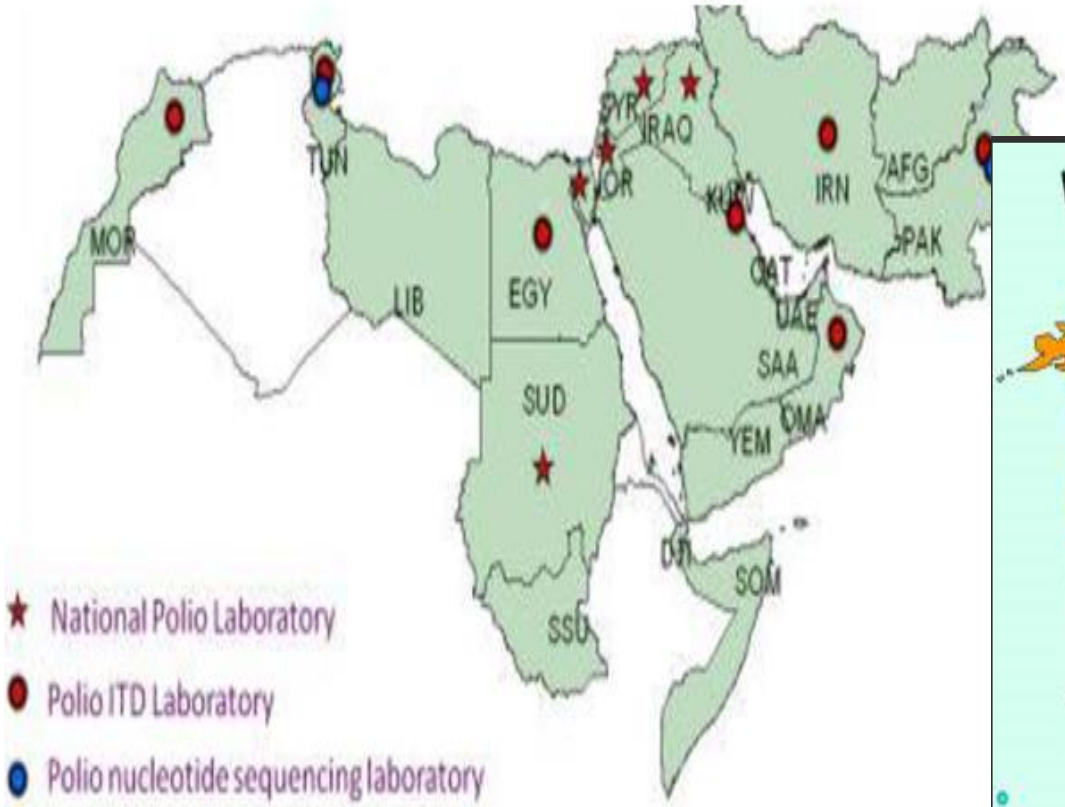
Serologic assays for the detection of antibodies against hepatitis C virus (HCV) became available soon after the viral genome was characterized.[1] The virus has been shown to be the cause in more than 90% of cases of transfusion-associated non-A, non-B hepatitis. Approximately 45–75% of those infected progress to chronic disease, and about 10% of these will develop cirrhosis.[2] The epidemiology of HCV infection in the developed countries has been well-docu-

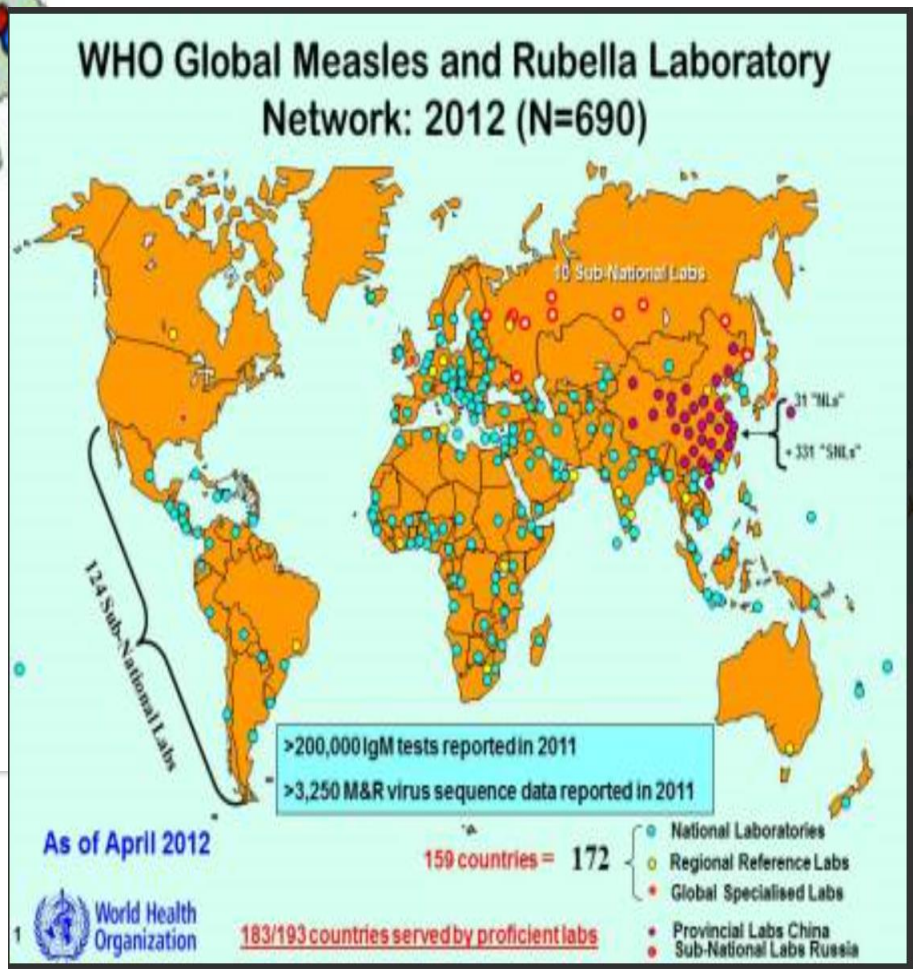
1994

southern Cameroon, were studied. They included five different population groups: 32 blood donors, 78 individuals being treated for various health problems (medical cases), 22 pregnant women, 94 surgical cases, and 25 patients being treated for different sexually transmitted diseases. One hundred twenty-six (50.2%) were males (age range 15–85 years, median age 39 years) and 125 (49.8%) were females (age range 14–70 years, median age 26 years). Individuals gave

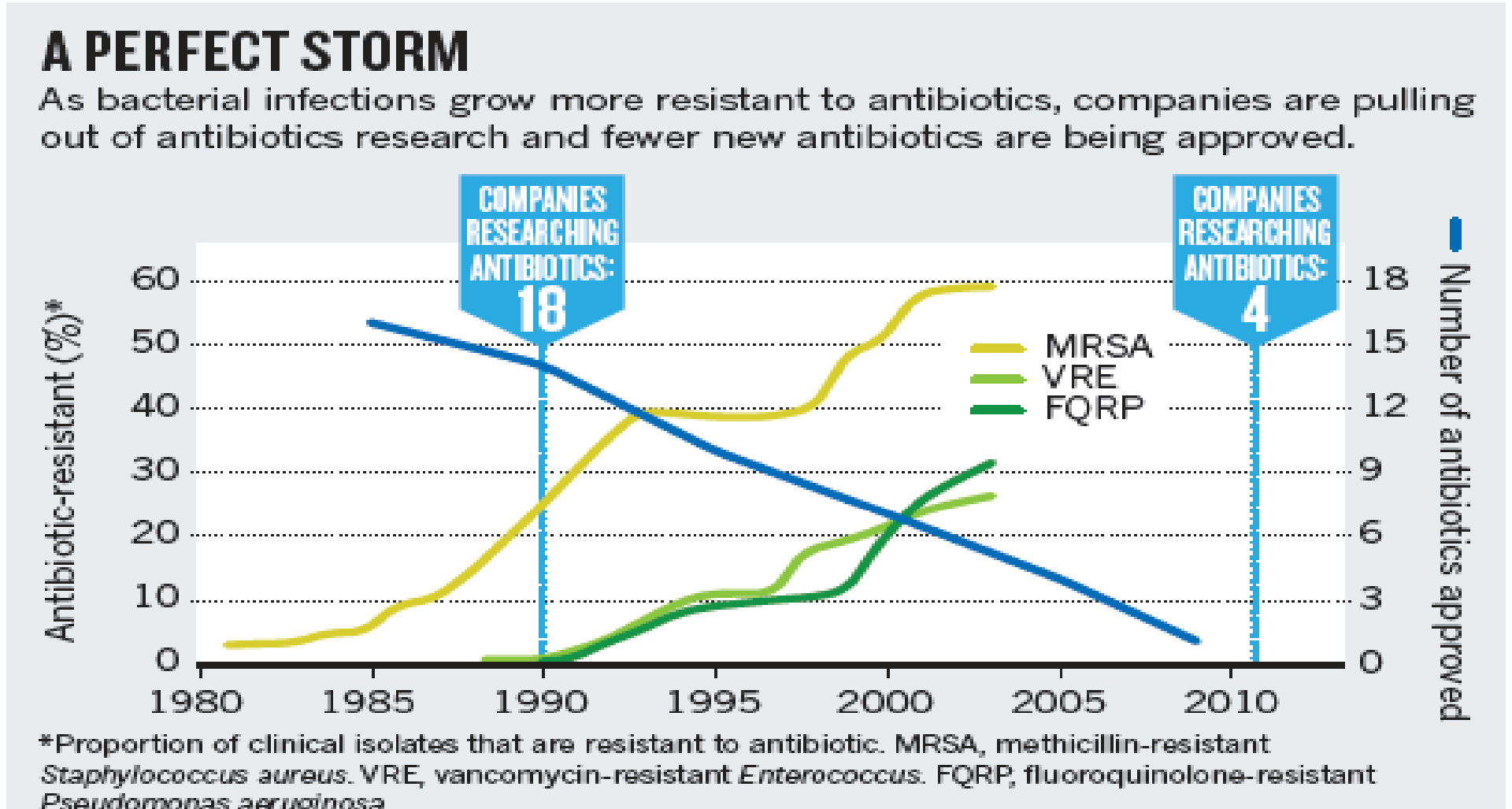
Surveillance labs key to polio eradication and other vaccine-preventable diseases

national viruses isolation, intratypic differentiation and nucleotide sequencing laboratories.





Piot P. Resistant gonococcus from the Ivory Coast. (Letter) Lancet 1977; i: 857.
Piot P et al. Antibiotic susceptibility of Neisseria gonorrhoeae strains from Europe and Africa. Antimicrob Ag Chemother 1979: 15: 535-539.



Longitude Prize 2014

- **Prize of £10 million**
- **2014 competition to create a cheap, accurate, rapid and easy-to-use point of care test kit for bacterial infections which will allow health professionals worldwide to administer the right antibiotics at the right time.**

See http://longitudeprize.org/

HIV Infection in Patients with Tuberculosis in Kinshasa, Zaire[1,]

ROBERT L. COLEBUNDERS, ROBERT W. RYDER, NZILA NZILAMBI, KALUNGA DIKILU, JEAN-CLAUDE WILLAME, MULUMBA KABOTO, NKOKO BAGALA, JACQUES JEUGMANS, KALALA MUEPU, HENRY L. FRANCIS, JONATHAN M. MANN, THOMAS C. QUINN, and PETER PIOT

SUMMARY To better define the interrelationship of infection with human immunodeficiency virus (HIV) and tuberculosis (TB), we conducted three HIV serosurveys of inpatients and outpatients with confirmed or suspected TB in Kinshasa, Zaire. HIV seroprevalence in hospitalized sanatorium patients did not change significantly in serosurveys conducted in 1985 and 1987 (92/231 [40%] versus 85/234 [36%]). These proportions were significantly higher than the 17% HIV seroprevalence observed in a 1987 serosurvey of 509 consecutive patients with an initial diagnosis of pulmonary TB seen at an outpatient TB diagnostic center in Kinshasa ($p < 0.001$). HIV seroprevalence was higher in sanatorium patients with extrapulmonary TB (22/46 [48%]) and suspected pulmonary TB (60/132 [45%]) than in patients with bacteriologically confirmed pulmonary TB (94/287 [33%]) ($p < 0.02$). Mycobacterium sputum isolation rates were similar in HIV-seropositive (28/34 [82%]) and HIV-seronegative patients (135/159 [85%]). All isolates were *Mycobacterium tuberculosis*. Eighteen (21%) of 84 HIV-seropositive sanatorium patients in 1987, who were followed for two months after admission, had died, compared with 11 (9%) of 128 HIV-seronegative patients ($p < 0.01$). However, clearance rates of acid-fast bacilli from sputum after standard therapy were equally good in HIV-seropositive and HIV-seronegative survivors. With the growing AIDS problem, the serious TB burden in sub-Saharan Africa may become even more onerous and may critically overload the stressed African health care systems.

AM REV RESPIR DIS 1989; 139:1082-1085

Introduction

Most adults in central Africa are latently infected with *Mycobacterium tuberculosis* (1), which may be reactivated because of immunosuppression (2) caused by human immunodeficiency virus (HIV) infection. In urban centers of central Africa, 5 to 20% of the sexually active population is infected with HIV (3). Therefore, if HIV and tuberculosis (TB) are associated in a sense that infection with one could favor the development of disease by the other, serious public health problems could arise.

1989

H eroprevalence rates in TB patients in Africa have been reported (4, 5). To define the relationship between

The way forward

- Health systems capacity
- No compromise on quality
- Innovation in products and delivery
- Human resources & higher education
- Collaboration
- Politics and advocacy

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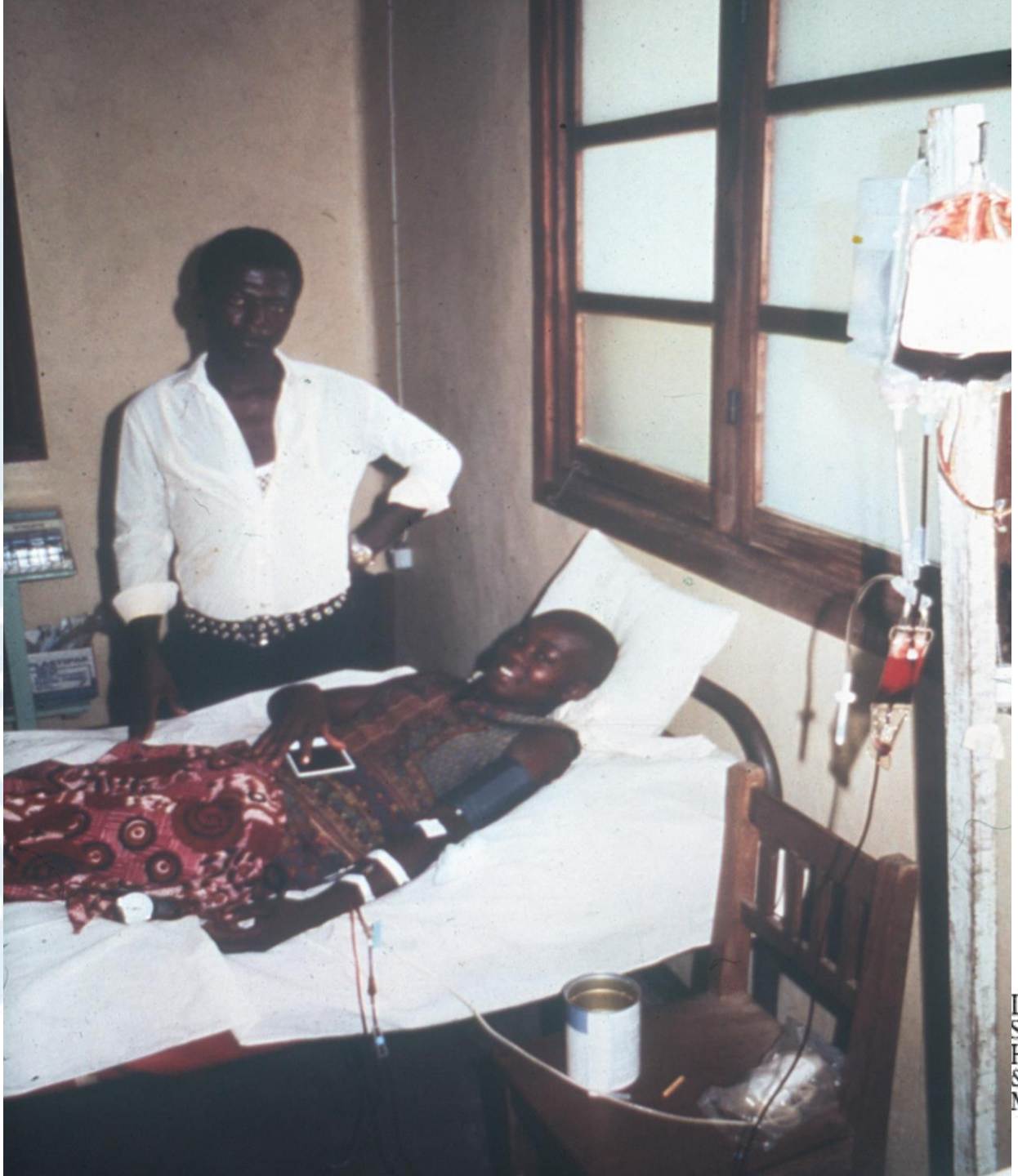
Yambuku Hospital Lab, DRC 2014



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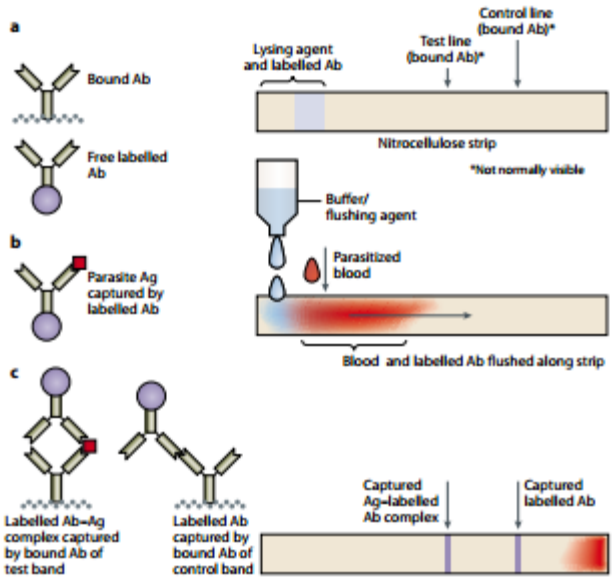
Malaria: Rapid Diagnostic Tests (RDTs)



Mode of action of common malaria RDT format:

(a) Dye-labeled antibody (Ab), specific for target antigen, is present on the lower end of the nitrocellulose strip or in a well provided with the strip. Antibody, also specific for the target antigen, is bound to the strip in a thin (test) line, and either antibody specific for the labeled antibody, or antigen, is bound at the control line.

(b) Blood and buffer, which have been placed on the strip or in the well, are mixed with the labeled antibody and are drawn up the strip across the lines of bound antibody.

(c) If antigen is present, some labeled antibody will be trapped on the test line. Other labeled antibody is trapped on the control line.

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HOOL of
GIENE
ROPICAL
DICINE

Mobile technology and disease prevention and treatment

- Smartphone-connected diagnostic test integrating biomarker discovery, microfluidics, nanosensors, genomics, microelectronics can:
  - Help manage outbreaks and prevent infectious and chronic diseases.
  - Improve access to tests in the community.

Africa's Scientific Capacity

The number of scientific papers produced by African's has **tripled in the past 10 years** to over **55,400** in 2013

However Africa only accounts for **2.4% of the world's total output**.

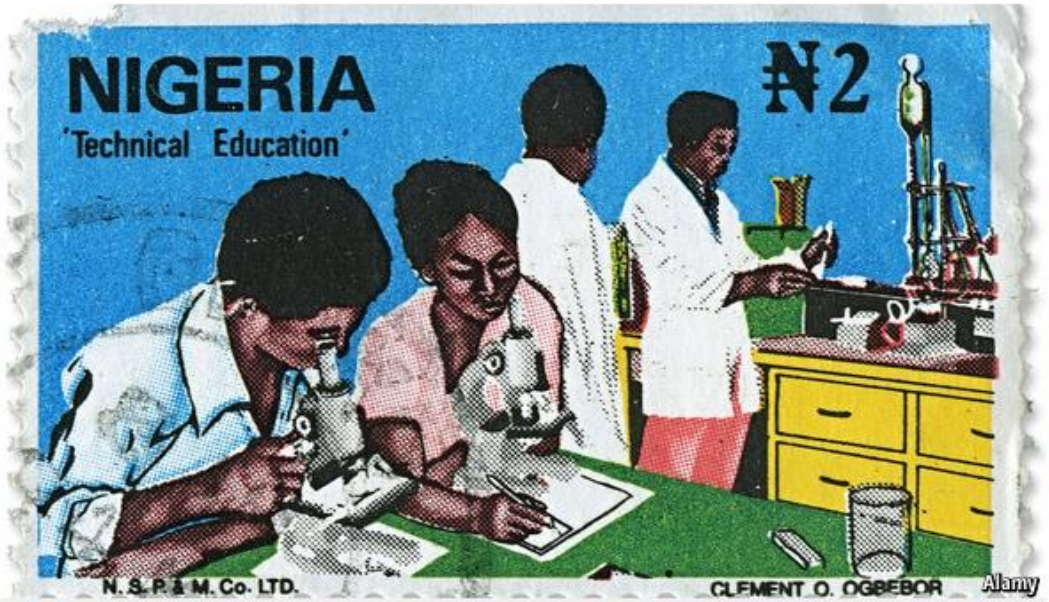
The Economist | World politics | Business & finance | Economics | Science & technology | Culture

Science in Africa

On the rise

Scientific research in Africa is gathering momentum

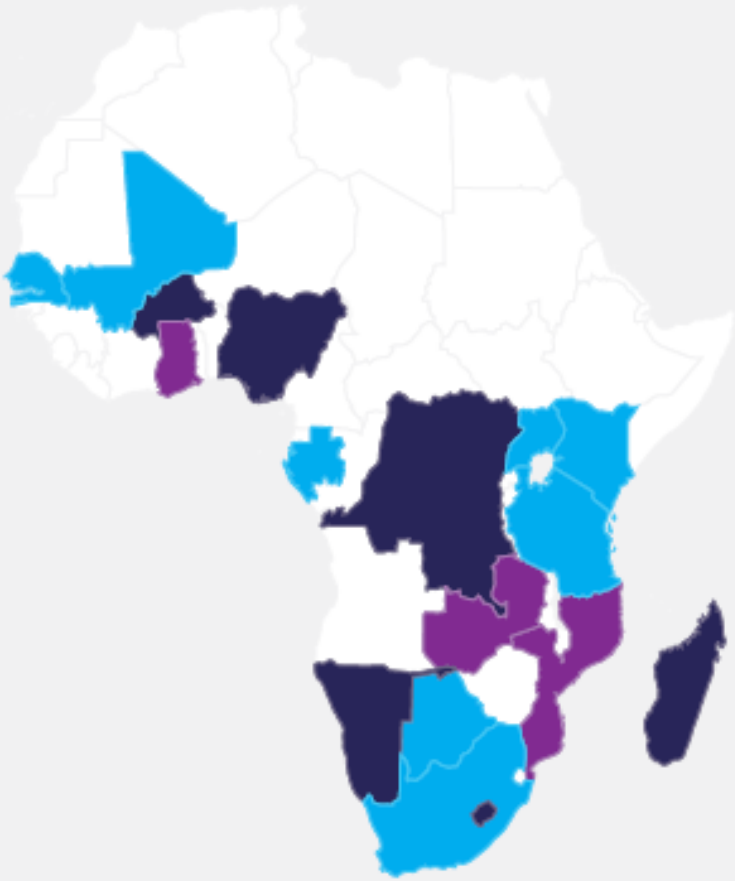
Aug 9th 2014 | LAGOS | From the print edition



The stamp of future success

Research and Development Investments

Low Country Investments in R&D



Most West African countries are placing less than 0.25% of the GDP in R&D investments, while East Africa remains largely below 0.5% of the GDP.

- 0.00% — 0.25%
- 0.26% — 0.50%
- 0.51% — 1.00%

· Gross domestic expenditure on R&D (GERD) as a percentage of GDP, 2011 or latest available year for sub-Saharan Africa. Source: UNESCO Institute of Statistics.

International Collaborations

EXTRA-REGIONAL COLLABORATION

42%-79%

In 2012, the dominant share of SSA research is a result of international collaboration (42%, 68%, and 79% of total research for West & Central, East, and Southern Africa, respectively.

INTER-REGIONAL COLLABORATION

0.9%-2.9%

Inter-African collaboration (without any South-African or international collaborator) comprises 2% of all East African research, 0.9% of West & Central Africa, and 2.9% of Southern Africa.

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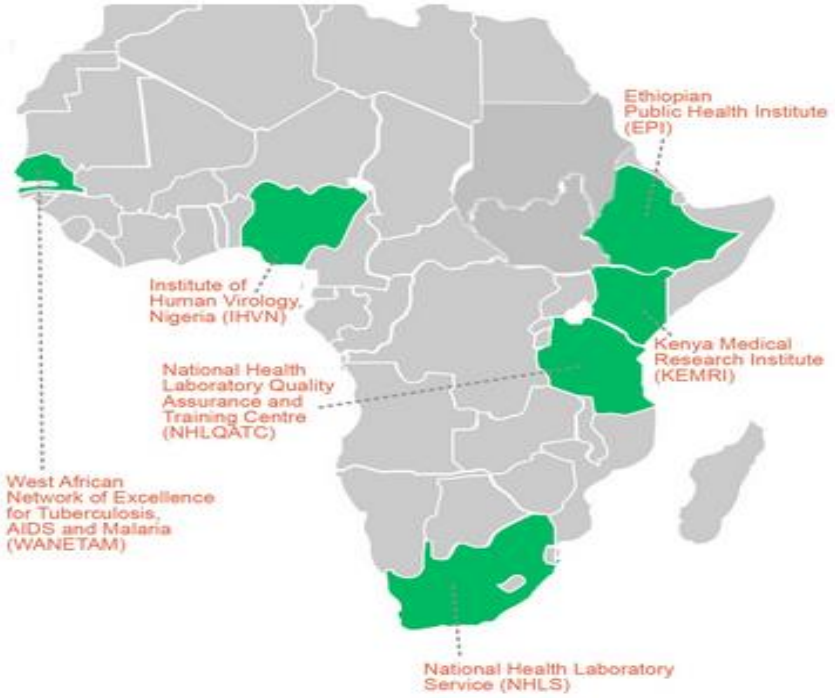
African Society of Laboratory Medicine

ASLM's Network of Collaborating Centres comprise of the leading national public health laboratories on the African continent. These Collaborating Centres play a key role in strengthening laboratory medicine and improving health outcomes in Africa by becoming leaders in several important initiatives.



Global Health 2.0

- PI = North Am/Europe/Japan
- "Study sites"
- Largely biomedical
- Infectious diseases, MCH

- Clinical trials, epidemiology

- Delivery of innovation
- Brain drain

- PI = global
- Centres of excellence
- Multi-disciplinary
- Broad health issues
- Full spectrum of translation from discovery
- Innovation of delivery
- Circular migration

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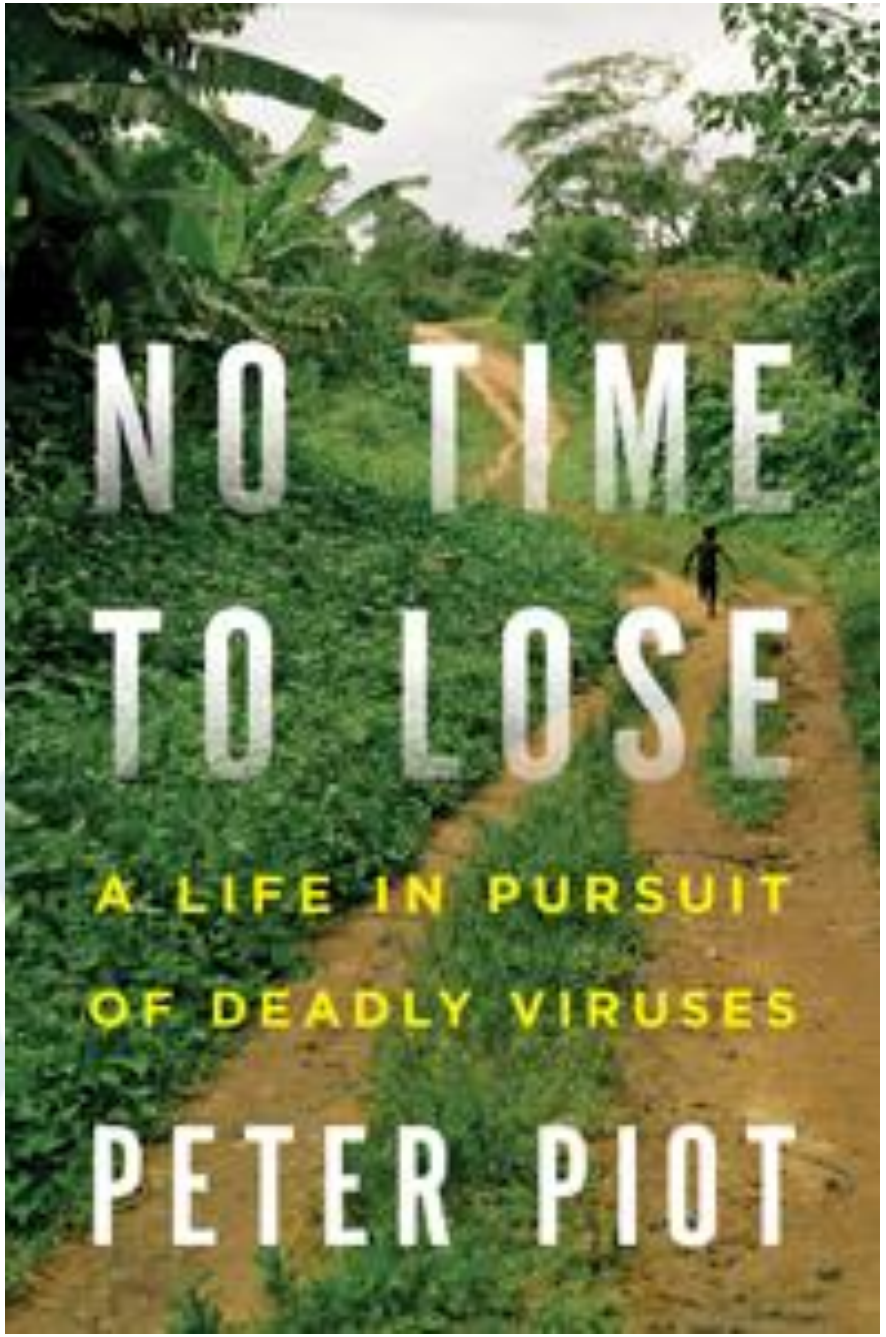

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