

# An overview of the CSIR Health Research Impact Area

## 4<sup>th</sup> Biennial Conference



Presented by: Dr Dusty Gardiner

Date: 9 October 2012

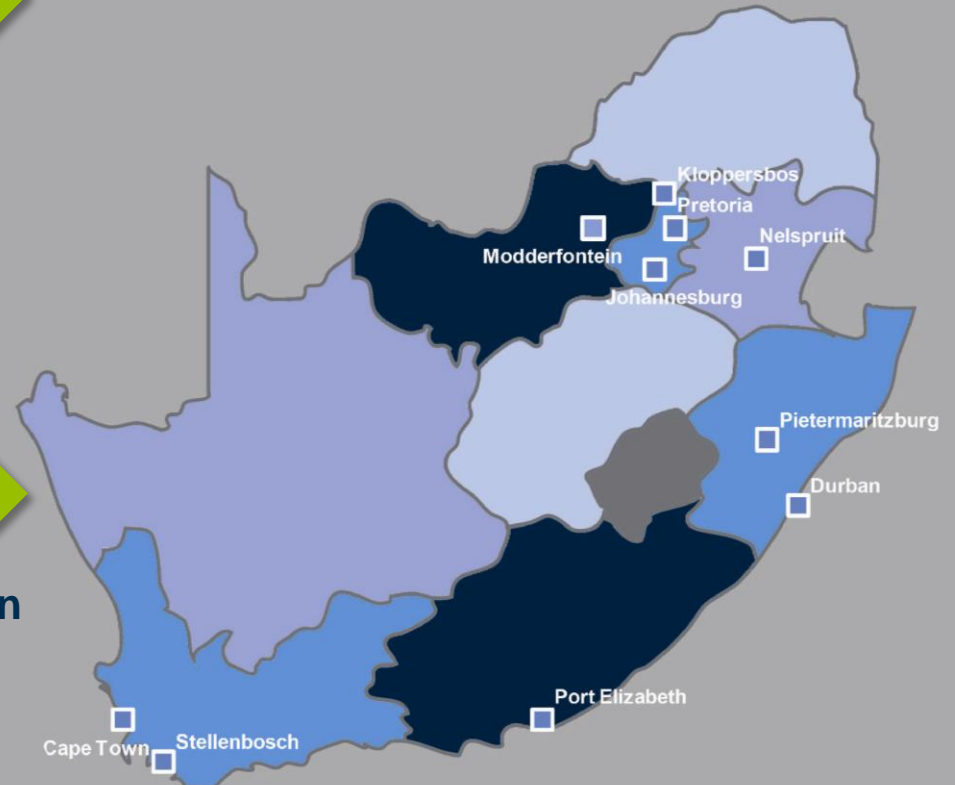
# CSIR: Some facts and figures

## People

- 2355 members of staff
- 1486 in SET \* base
- 295 with PhD
- 468 with MSc

## Financials (2010/11)

- Total operating income: R 1.72 billion

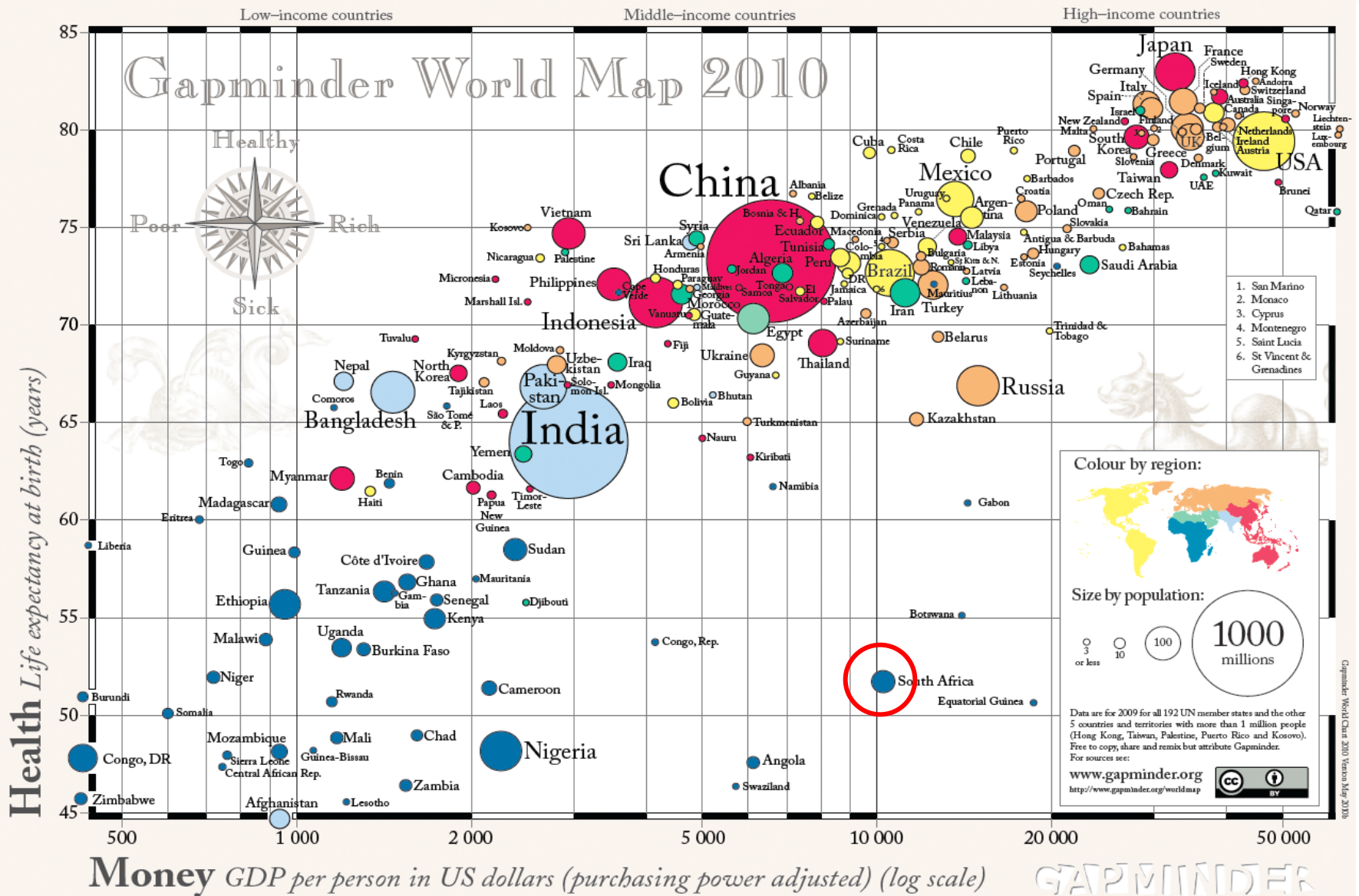


\* SET: Science, engineering and technology

# CSIR Research Impact Areas



# Health Landscape and Challenges





# CSIR response to health challenges: Burden of disease

## Intervention Areas

## CSIR Intervention

<b>Diagnosis</b> (Early, accurate detection of diseases of relevance to SA)	<b>Point of care diagnostics</b>
<b>eHealth</b> (Application of ICT platforms to support healthcare provision)	<b>Communication platforms (preventative health), telemedicine, epidemiology</b>
<b>Affordable and Effective Cures</b> (cost-effective, robust, validated solutions)	<b>Novel therapeutics, health technologies, devices and delivery systems</b>
<b>Nutrition</b> (Improved foods and supplements for general wellness and the prevention of specific conditions)	<b>Nutritional fortification, food supplements, value-added traditional foods</b>

# CSIR response to health challenges: Service delivery

## Health Care System Component

## CSIR Intervention

<b>Health Care Delivery</b> (Planning, coordinating, regulating, organizing, monitoring)	<b>Logistics, health data and information, enterprise architecture</b>
<b>Health Care Providers</b> (Public health system, practitioners, professional schools)	<b>Patient records and files</b>
<b>Institutions</b> (Hospitals, clinics, medical aid associations)	<b>Logistics, infrastructure, patient files, therapy management</b>
<b>Society</b> (Individuals and communities in need of prevention, diagnosis, treatment, rehabilitation)	<b>Personal health information, access to health information</b>

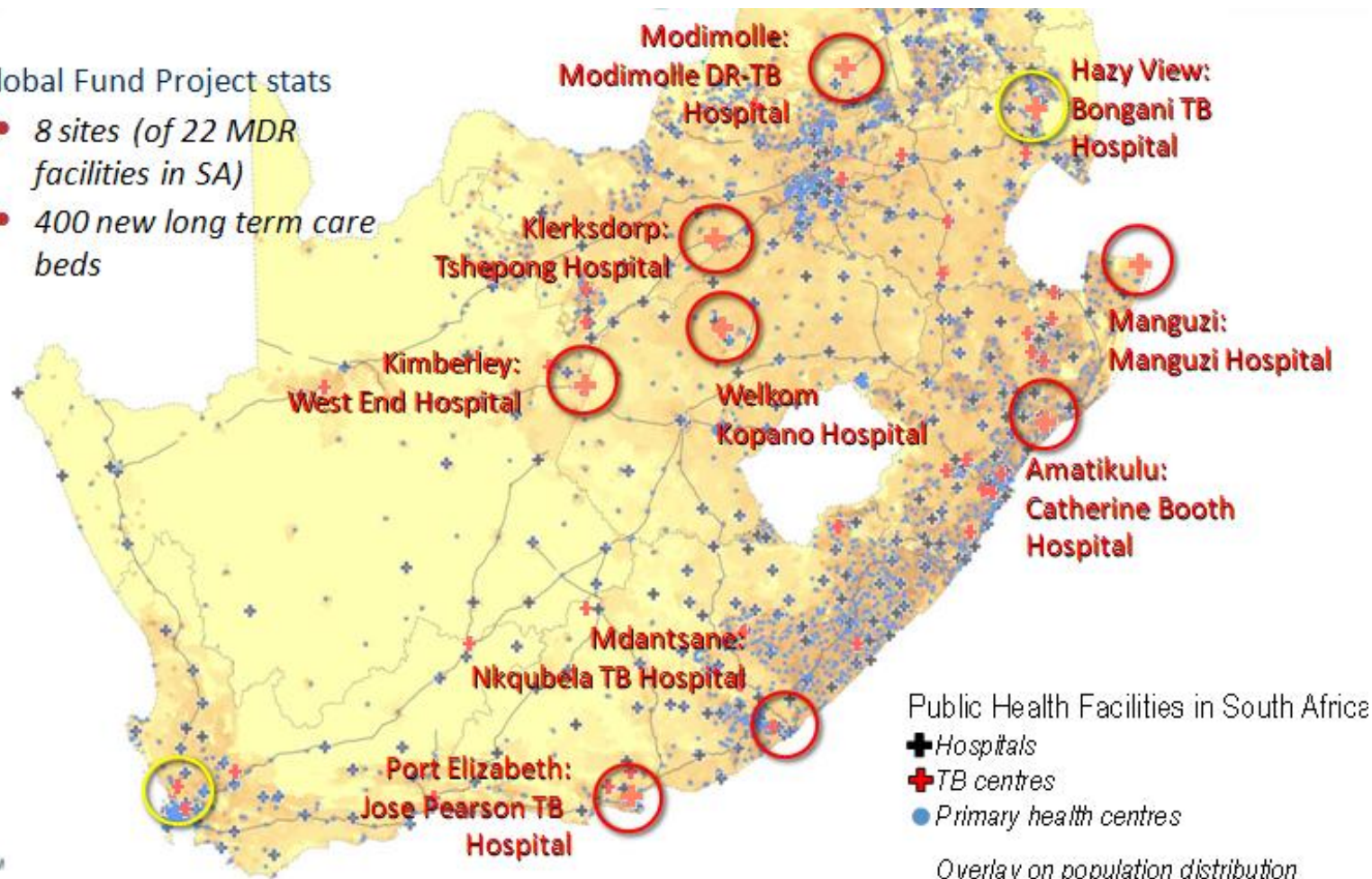
# Selected examples of CSIR health interventions



# Infrastructure: DoH/Global Fund Drug Resistant TB Infrastructure Project

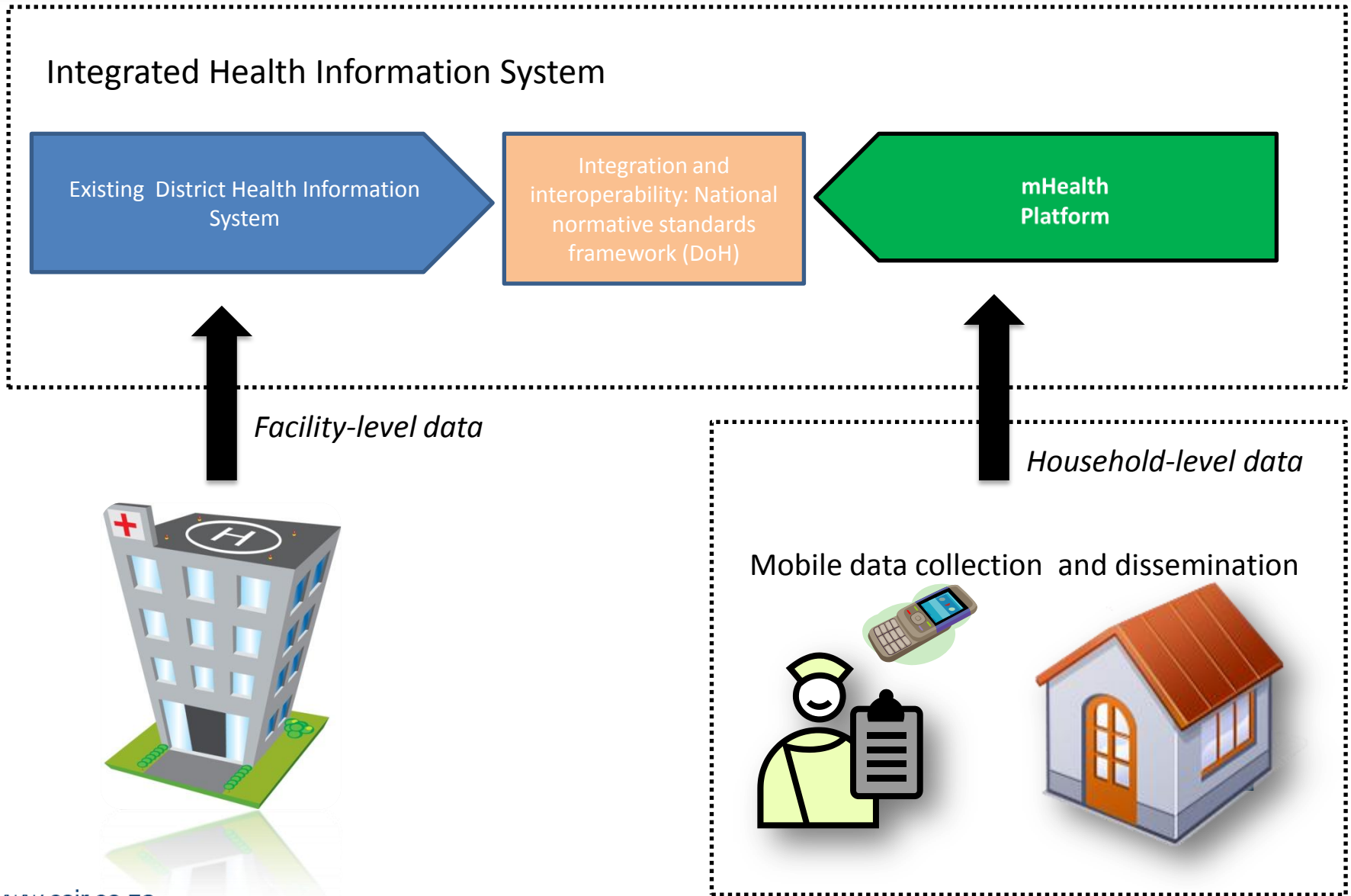
## Global Fund Project stats

- 8 sites (of 22 MDR facilities in SA)
- 400 new long term care beds



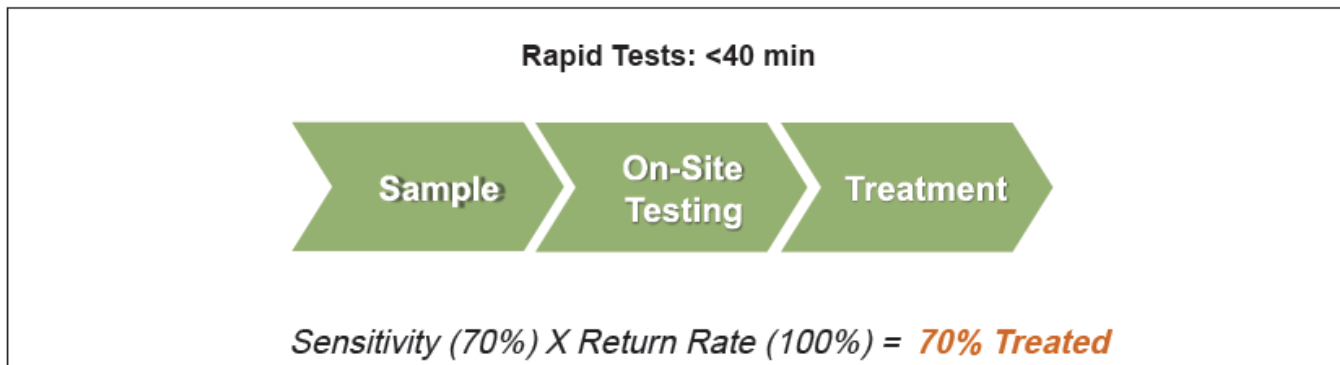
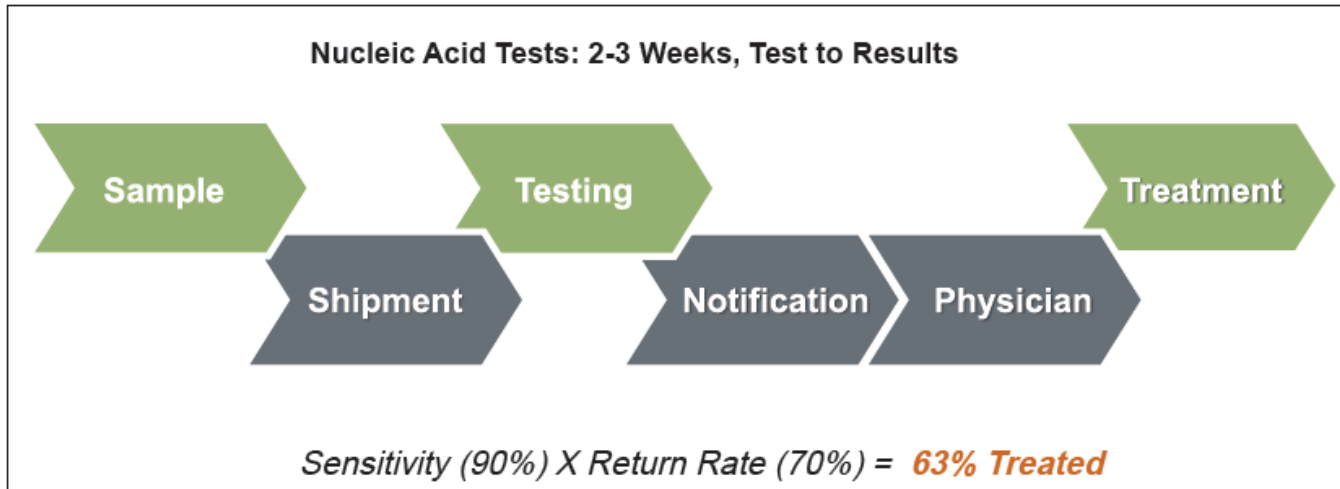


# ICT and Health



# Point of care diagnosis: Improved treatment efficiency

A rapid test performed at the point of care, even if less sensitive than a lab-based molecular test, can result in accurate diagnosis and treatment of more patients overall.



Bio Ventures for Global Health. 2010. The Diagnostics Innovation Map: Medical Diagnostics for the Unmet Needs of the Developing World.

# Point of care diagnosis



**Umbiflow:** foetal health assessment.  
Doppler ultrasound at the point of care.  
Tested in the clinical environment.  
Partners: MRC and W Cape Government;  
clinical validation.



**Cellnostics:** blood count analysis.  
Lenseless microscopy at the point of care.  
Partner: NHLS; clinical validation

# African traditional medicine: Standardised traditional medicine products; quality

*Harpagophytum procumbens* (Devil's claw)



*Pelargonium sidoides*



*Sutherlandia*



*African ginger*



HPLC MS Standardization

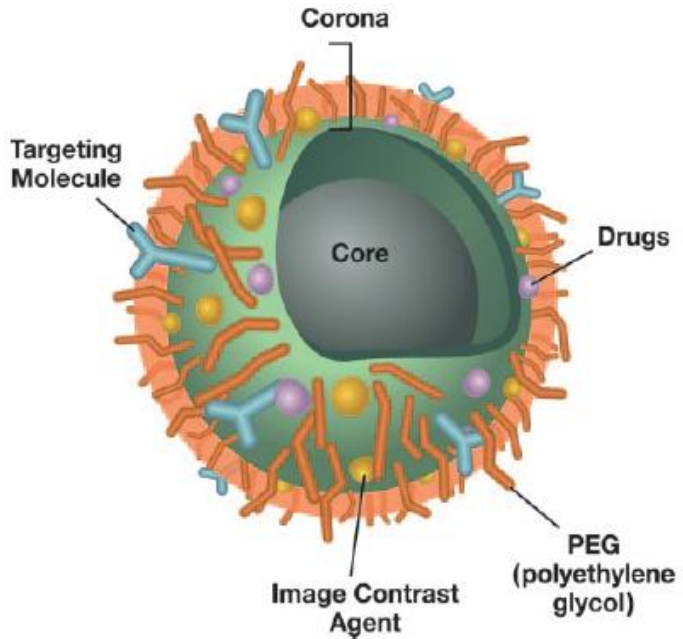




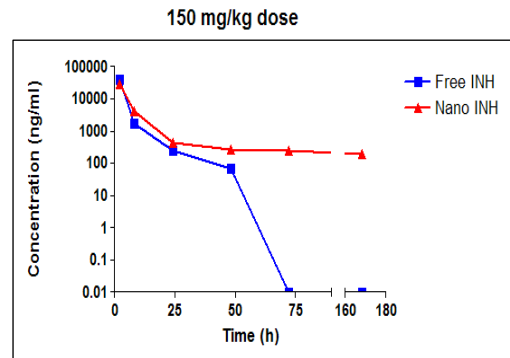
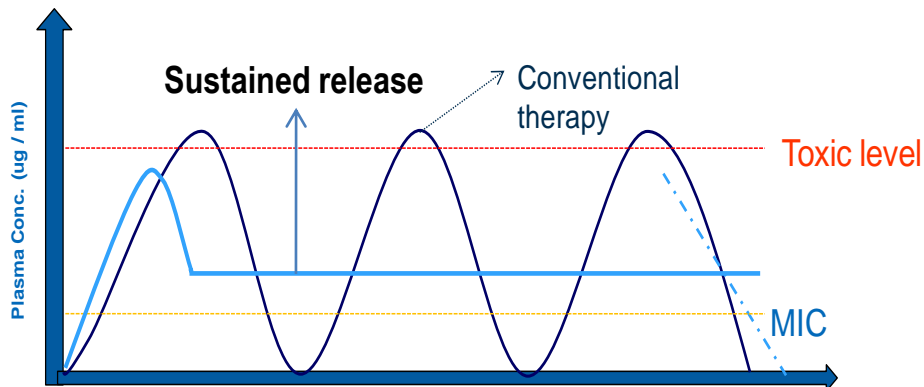
# Emerging health technologies



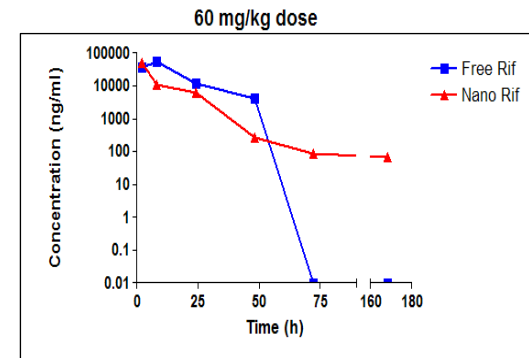
# Nano medicine: Drug delivery



McNeil, J ., Leukocyte Biol. 7 8 : 585-594, 2005



In vivo studies - isoniazid



In vivo studies - rifampicin

Swai et al., unpublished data

- Focus on delivery system for front line TB drugs
- Reduced dose and toxicity, reduced frequency of treatment

# Aptamer technology: TB diagnosis



## Sputum smear

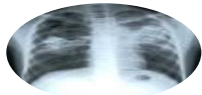
100 years old : false negatives



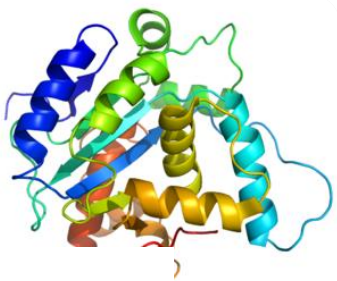
## X- ray

Subjective

Limited to pulmonary TB

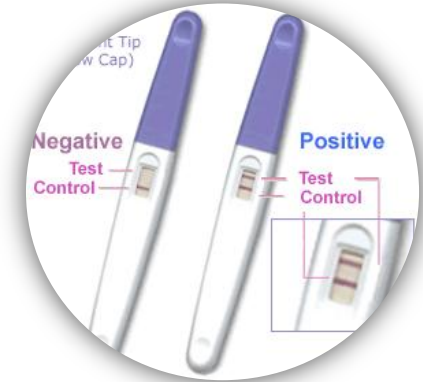
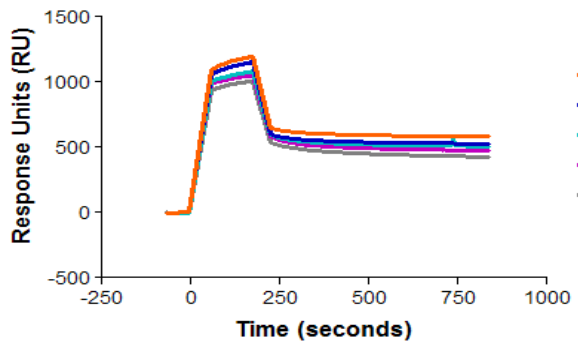


**PCR:** GeneXpert MTB/RIF – accurate, sensitive, expensive



Aptamers - oligonucleic acid or peptide molecules that bind to a specific target

CSIR 2.11

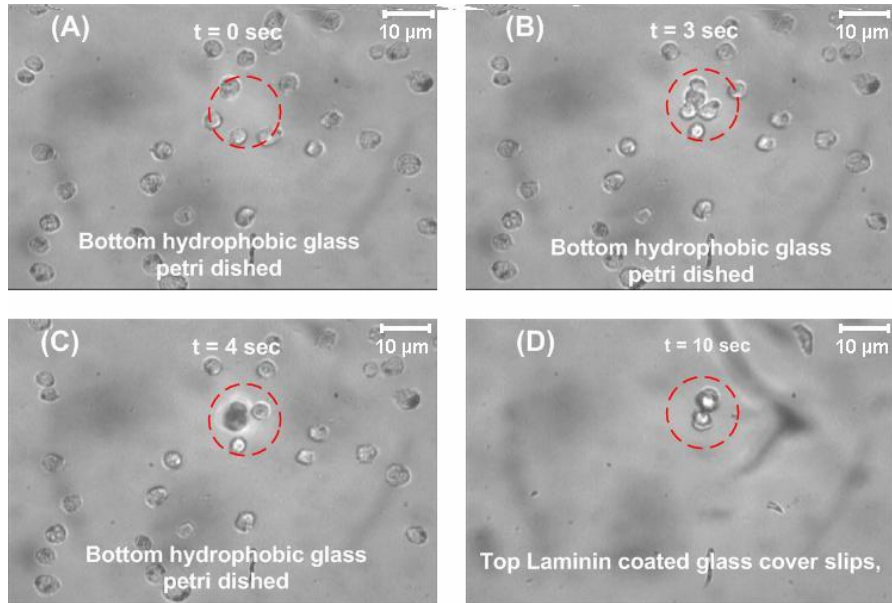


ASSURED POC diagnosis

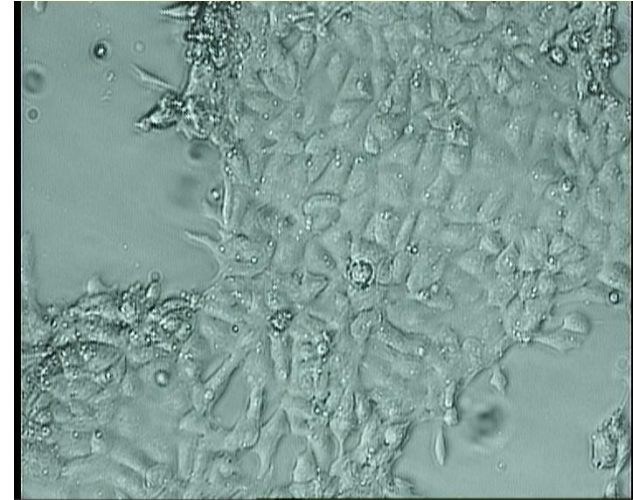
Aptamers bind to TB biomarkers with high affinity in sputum samples

Rotherham et al., 2012, PLoS One (In press)

# Lasers: Optical cell sorting, transfection and differentiation



## Optically differentiated stem cells



## Optically sorting cancerous from healthy cells

P. Mthunzi et. al, IEEE, *JSTQE* 2010

Applications in tissue engineering,  
diagnostics and personalised medicine



# Summary

The CSIR has deployed multi-disciplinary capabilities to provide solutions for key health challenges.

A balance is being maintained between delivering solutions for immediate health needs and building and deploying capabilities in emerging health technologies.

# Thank you

Matthew Chetty - ICT

Geoff Abbot - Infrastructure

Peta de Jager - Infrastructure

Jeremy Wallis - Diagnosis

Riaan Coetzee - Diagnosis

Dr Makobetsa Khati - Aptamers

Dr Patience Mthunzi - Lasers

Dr Hulda Swai – Nanomedicine

Dr Vinesh Maharaj – Traditional Medicine

Dr Rachel Chikwamba - Health RIA



**CSIR**

*our future through science*