



AFRICAN INSTITUTE  
FOR  
MATHEMATICAL SCIENCES

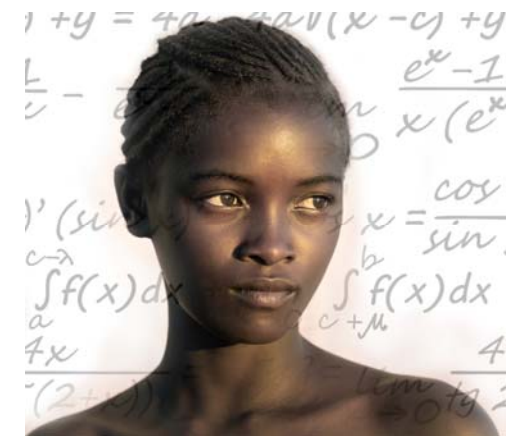


**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

# Introduction to AIMS and DocmeUP

Dr. Alessandro Crimi



# Africa raising



# Education and Research



## Seeking Science Slammers

*“From the big bang to the brain with mathematics”*

Can mathematics describe everything from the big bang to the functioning of the human brain?

For more information please contact Dr Arun Aniyar Kumar at the African Institute for Mathematical Sciences:  
Email: [workshops@aims.ac.za](mailto:workshops@aims.ac.za)

**Date:** 7 November 2014 from 14h30 to 17h00  
**Venue:** African Institute for Mathematical Sciences  
6 Melrose Road, Muizenberg, Cape Town



IMAGINARY  
AIMS-IMAGINARY  
Maths Communication in Africa  
Workshop & Exhibition



workshop-exhibition to share ideas and plan future scientific and educational public engagement/outreach activities with peers in Africa on maths communication. Organized by the African Institute for Mathematical Sciences (AIMS), IMAGINARY and the Mathematisches Forschungsinstitut Berlin.

5th–7th  
Nov. 2014  
Cape Town

African Institute for Mathematical Sciences - South Africa  
-7 Melrose place  
muizenberg 7745,  
Cape Town, South Africa



WHY MATH?



- South Africa
- Senegal
- Ghana
- Cameroon
- TANZANIA



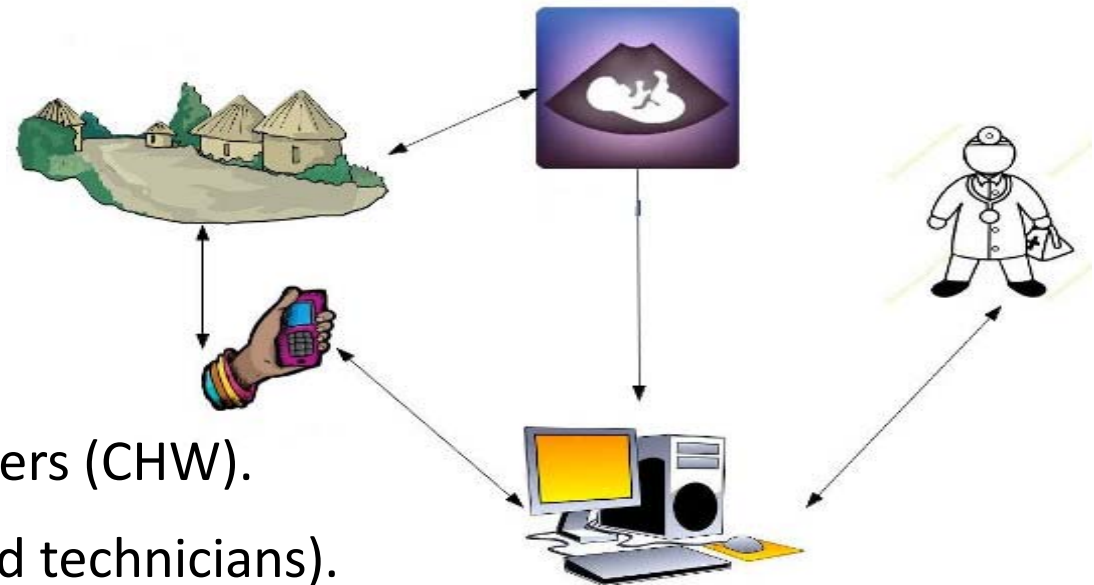
# docmeUP

- Low-income countries: shortage of medical staff in rural hospitals.
- Ghana: 380 infant mortalities per 100.000 live births, 75 times higher than mid/high income countries.
- Poor prenatal-care due to transportation issues.
- Home delivery and misbelieves are very common.













# DocmeUP, prenatal care for communities

- Medicine/Social Science.
- Computer science.
- Applied math
- Community Health Workers (CHW).
- Sonographers (ultrasound technicians).
- Online platform.
- Doctors.



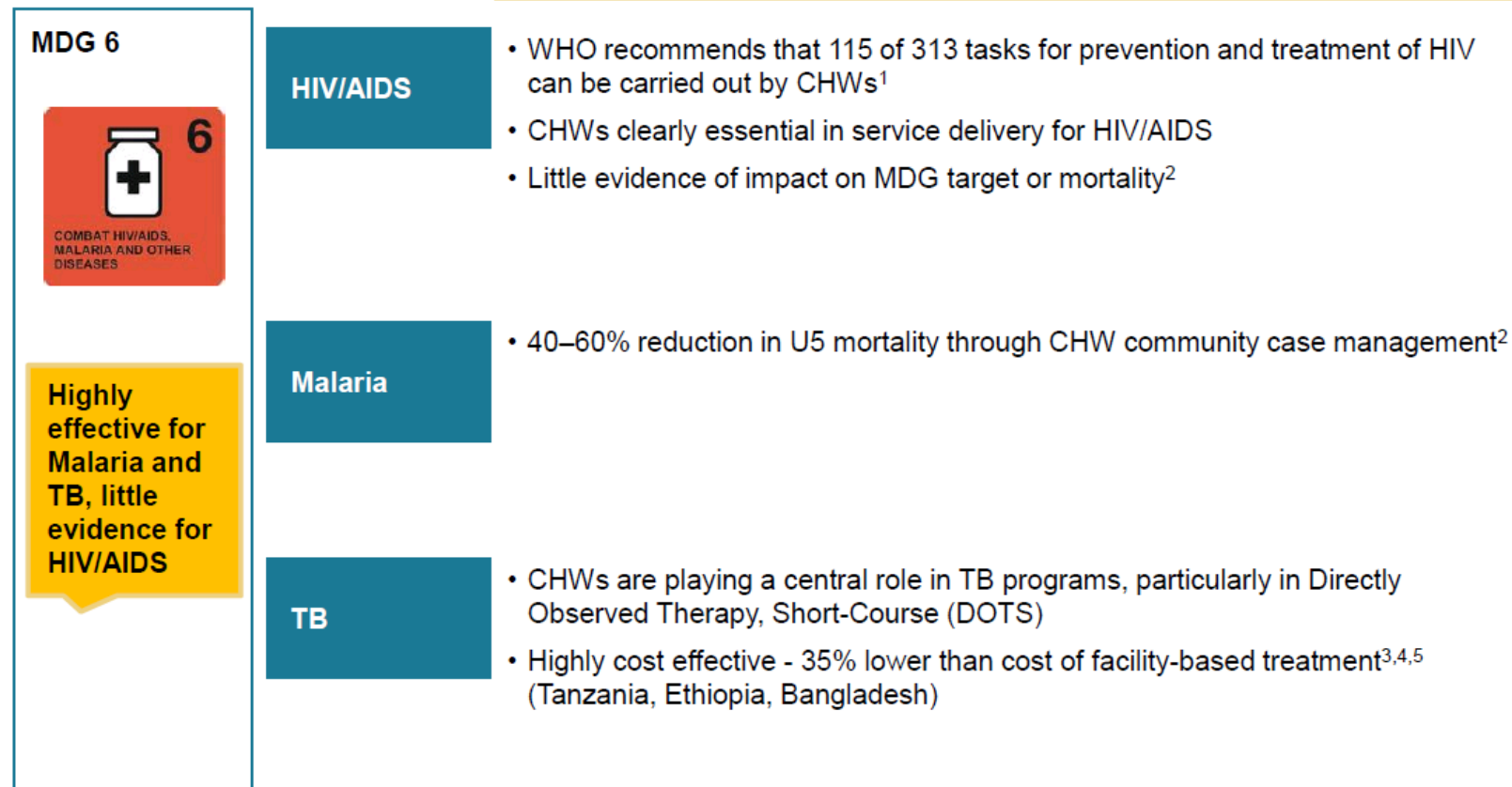
## CHW EFFECTIVENESS: STRONG EVIDENCE FOR A SIGNIFICANT REDUCTION IN CHILD MORTALITY

	Area	Reduction in Mortality, U5 %	Other relevant outcomes/comments
<b>MDG 4</b>  <p>REDUCE CHILD MORTALITY</p> <p><b>“At least a 25 % reduction for main drivers of mortality”</b></p>	Community case management of pneumonia	All children <sup>2</sup>  24 Children with disease  36	<ul style="list-style-type: none"> <li>• Cost per death prevented as low as \$2.64<sup>3</sup></li> <li>• Recent study shows a reduction as high as 70%<sup>4</sup></li> </ul>
	Diarrhea treatment	n/a	<ul style="list-style-type: none"> <li>• ORS may reduce mortality up to 93%<sup>10</sup></li> <li>• Zinc is estimated to reduce diarrhea mortality by 23%<sup>12</sup></li> <li>• BRAC Bangladesh increased ORS coverage up to 81% through CHWs/Oral Rehydration Extension Program Worker<sup>9</sup></li> </ul>
	Community case treatment of malaria <sup>8</sup>	All children  40 Children with disease  60 Severe malaria  53	<ul style="list-style-type: none"> <li>• In recent Madagascar trial with RDTs, 98% of all childhood cases were cured<sup>7</sup></li> </ul>
	Home-based newborn care	 29	<ul style="list-style-type: none"> <li>• Includes range of services: Umbilical cord care, initiation of breast feeding etc.<sup>9</sup></li> <li>• Participatory women’s groups facilitated through CHWs have shown ~30% reduction in neonatal mortality<sup>5</sup></li> </ul>
	Stillbirths <sup>1</sup>	 16	
	<b>MDG 5</b>  <p>IMPROVE MATERNAL HEALTH</p> <p><b>“Much less evidence”</b></p>	Training of TBAs	Inconclusive
Maternal mortality <sup>1</sup>		 23	<p><b>Not statistically significant</b></p>
Family planning		n/a	<ul style="list-style-type: none"> <li>• Strong evidence that CHW can effectively provide family planning services (including injectibles)</li> <li>• In Afghanistan, CPR increased by 24-27% after CHWs provided services<sup>11</sup></li> </ul>

1 Lassi ZS (2010); 2 Sazawal S (2003); 3 Bang AT (1990); 4 Theodaratou E (2010); 5 Manandhar DS (2004), Tripathy P (2010); 6 Lassi ZS (2010)  
7 Ratsimbaoa (2012); 8 Kidane G (2000), Sirima SB (2003); 9 NIPORT (2012); 10 Munos MK (2010); 11 Huber D (2010); 12 Walker CL (2010)

## WITHIN MDG 6 MOST EVIDENCE SUPPORTING MALARIA IMPACT ON CHILDREN AND COST-EFFECTIVENESS OF COMMUNITY-BASED DOTS TREATMENT

### CHW role/effectiveness



1 WHO on task shifting (2008); 2 Sazawal S (2003); 3 Wandwalo E (2005); 4 Islam MA (2002); 5 Datiko DG (2010)

2 Also true for other areas



# CHW Training



<http://1millionhealthworkers.org/operations-room-map/>

# What CHWs do

- Pregnancy registration.
- Reporting dangerous signs.
- Remind the women about critical moments.
- Provide information about other topic (nutrition, family planning, ...).

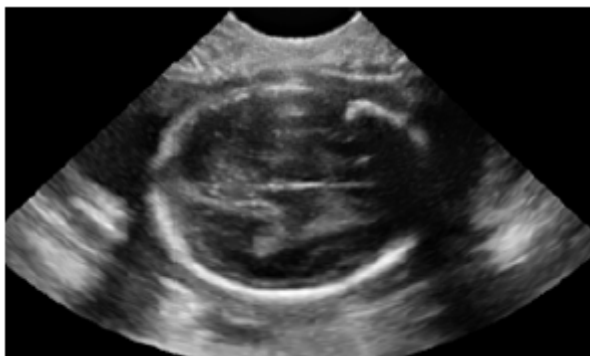


# Remote ultrasound

When it is not possible for a woman to attend to prenatal care, a trained technician visits the woman in her own community, acquires ultrasound scans and sends them in almost real time to gynecologists in big hospitals.

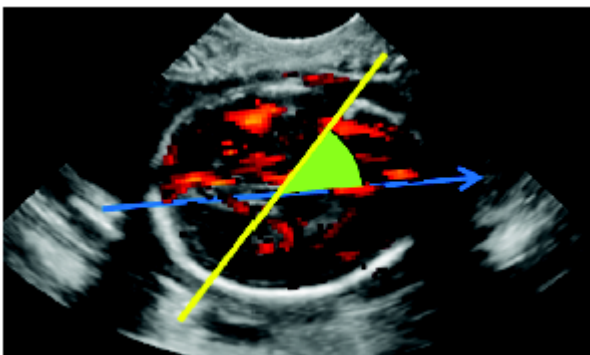


# Mathematical Image analysis

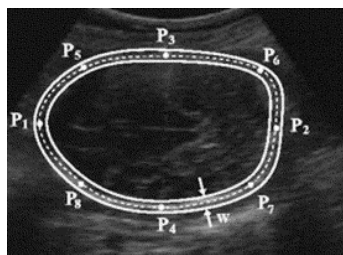
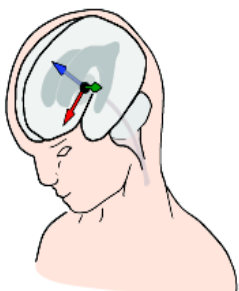


- Gestional age estimation
- Neurosonography  
(lateral ventricles, cerebellum, cisterna magna,...)

Ongoing research...



- Level set.
- Maximum likelihood parametric deformation model.



- Affine Superellipse deformation.

# Thank you for the attention

[www.docmeup.org](http://www.docmeup.org)

[www.aims.edu.gh](http://www.aims.edu.gh)



View from the lecturers' office at AIMS-Ghana