UNIVERSITY OF CAMBRIDGE

simprints
every person counts

Do fingerprint biometrics work in developing countries?

Dan Storisteanu
Research Fellow at the University of Cambridge
Cofounder, Research Director of Simprints

@danstori

dmls2@cam.ac.uk or
dan@simprints.com

The challenge

Over 1.1 billion people are invisible in the eyes of the world

The World Bank 2017

The context

We've evaluated a broad array of biometric technology—including hardware & software—and have been unsatisfied with what currently exists to serve our needs.

- Mark Thomas, CEO

VaxTrac

Can we use biometrics?

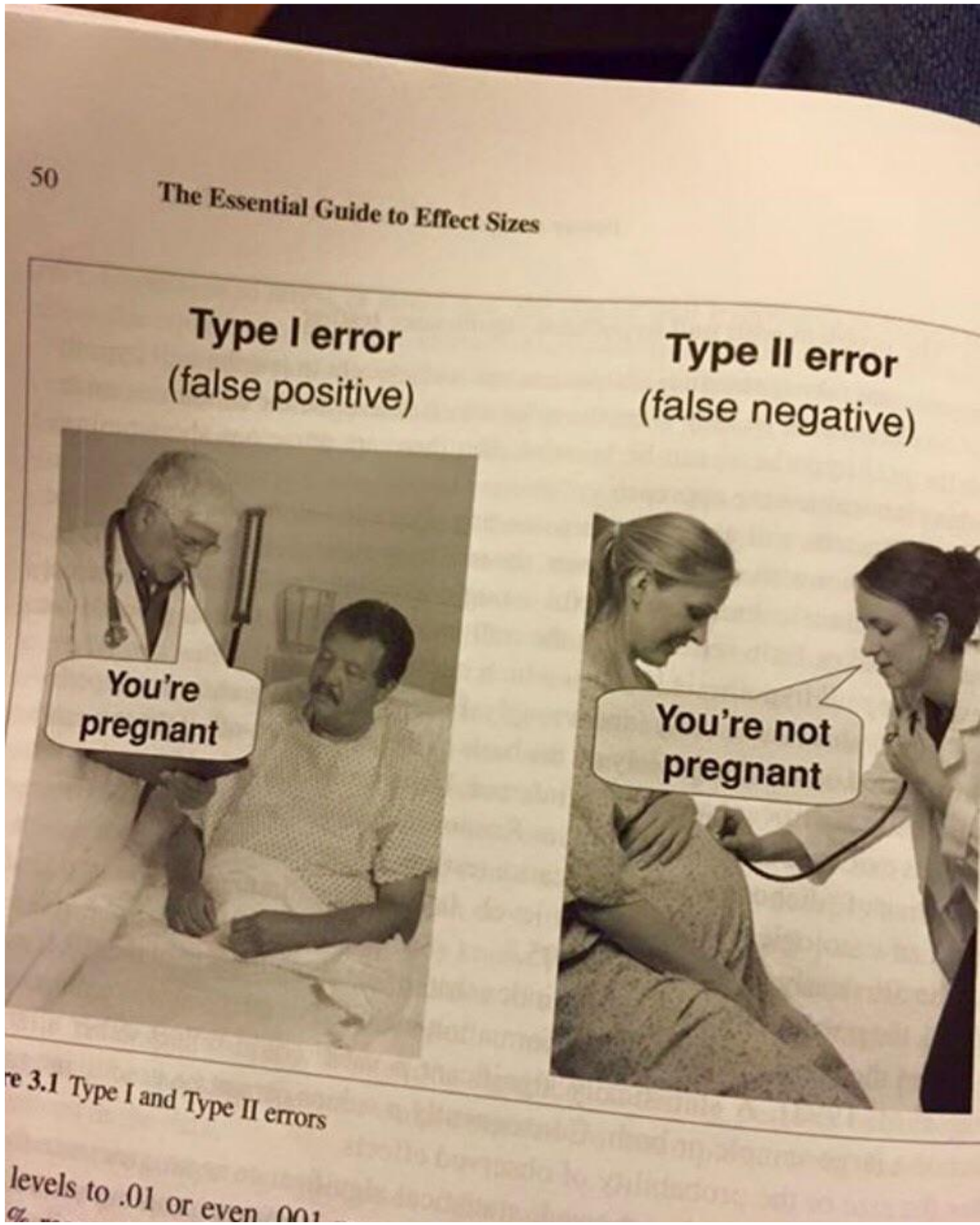
Accuracy
Mobility
Connectivity
Robustness
Interoperability

Storisteanu, D. M.L., Norman, T. L., Grigore, A., & Labrique, A. B. (2016). Can biometrics beat the developing world's challenges?. *Biometric Technology Today*, 2016(11), 5-9.

Accuracy

False rejection
Type I error
Excludes people

False acceptance
Type II error
Mistreatment
Fraud



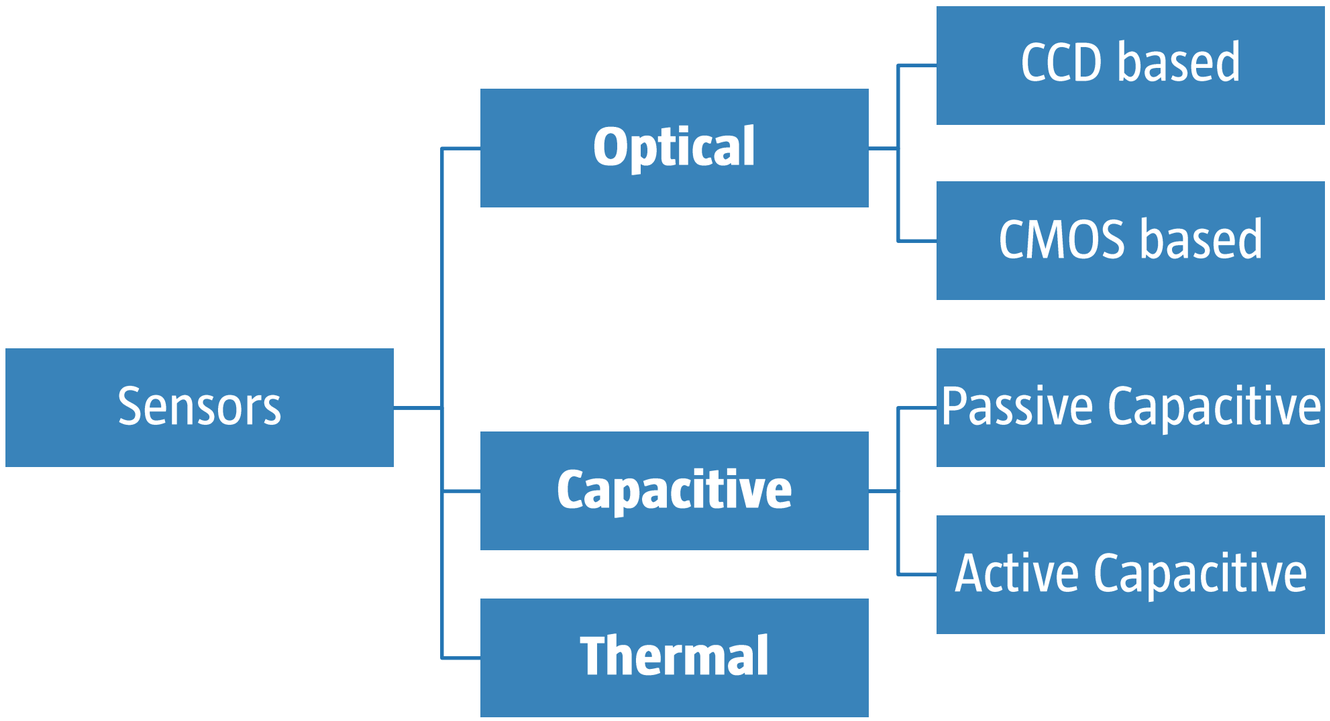
Accuracy: field testing

126,481 images

894 people

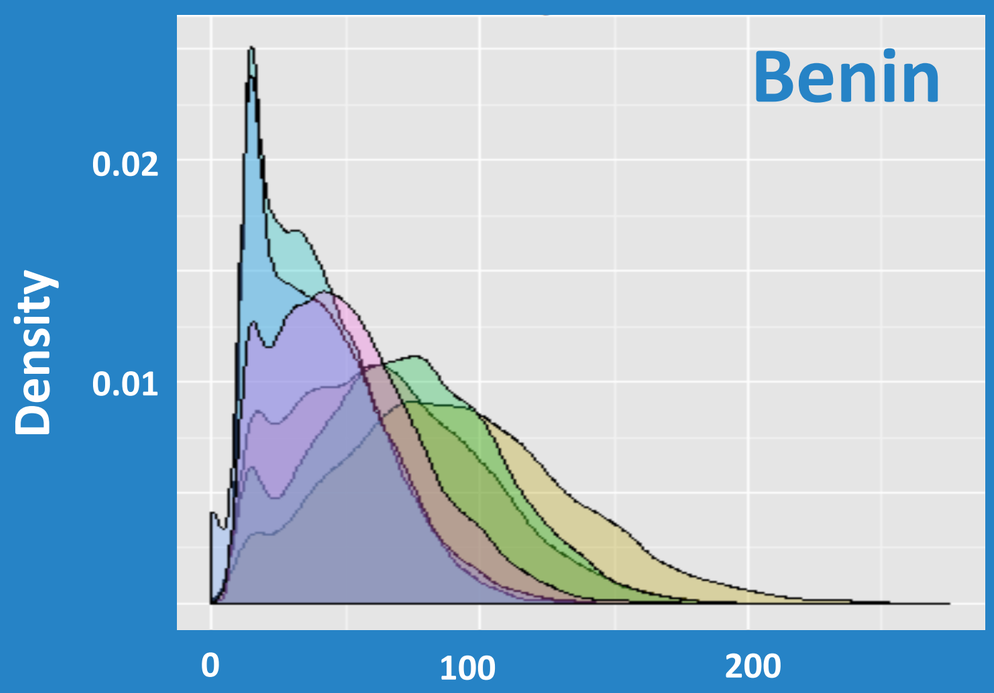
4 countries

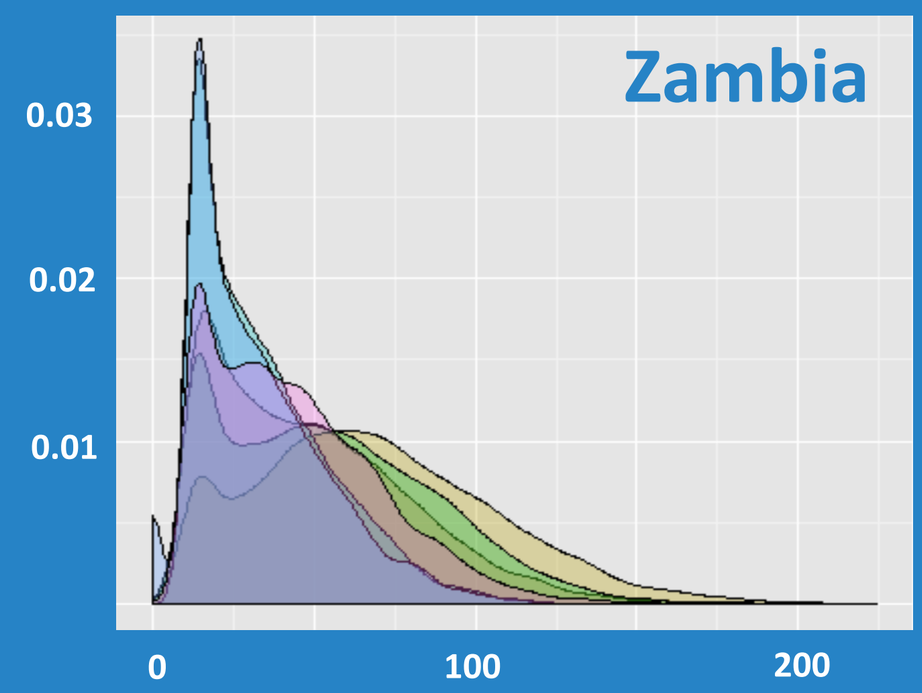
Benin, Zambia, Nepal, Bangladesh

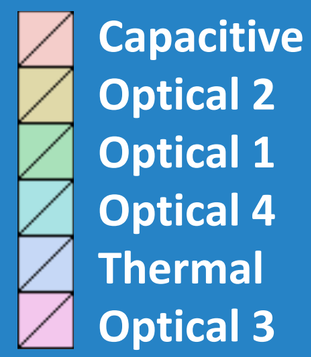


UNIVERSITY OF CAMBRIDGE

Accuracy: Higher error rates





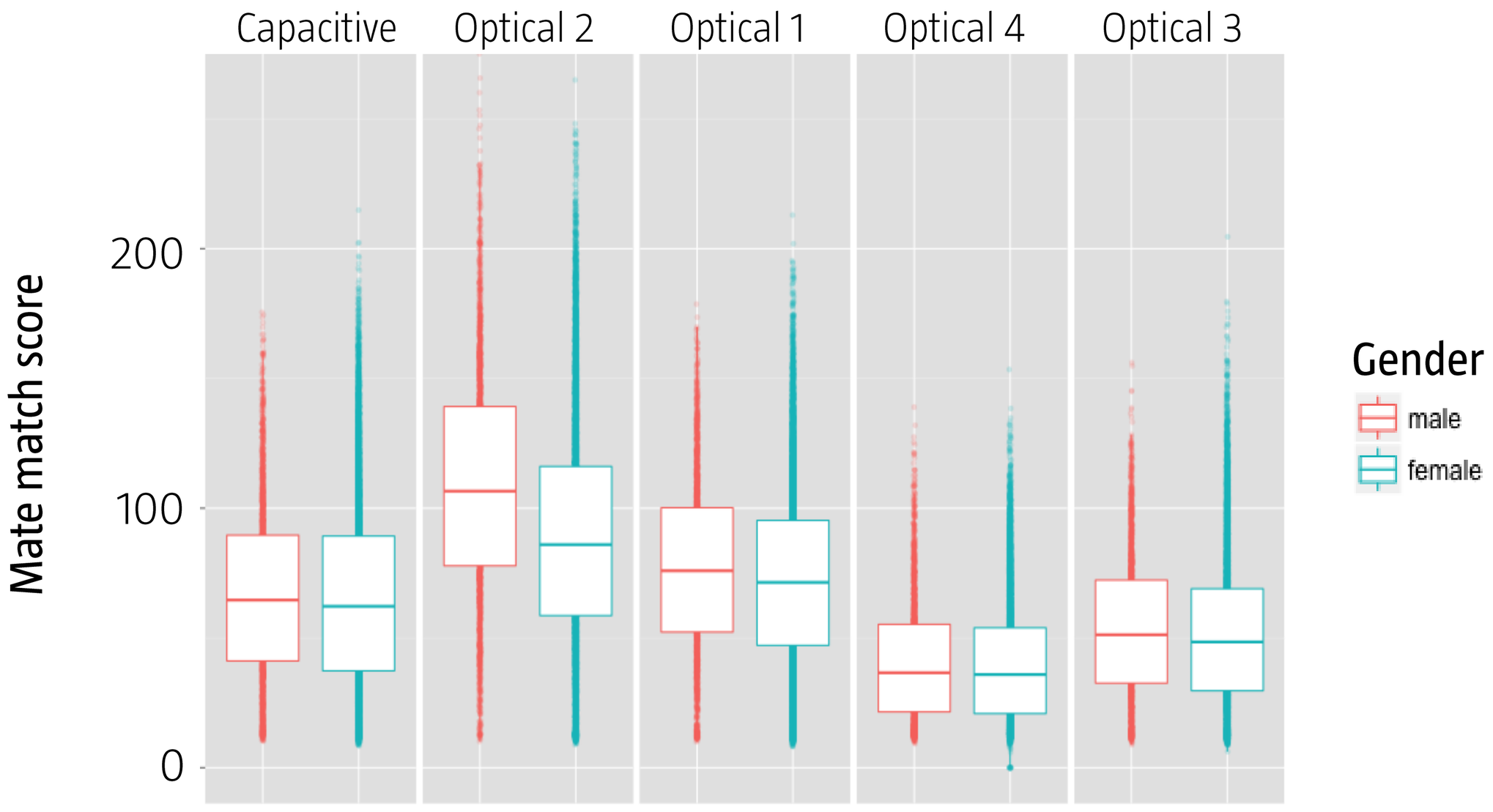


Sensor	EER (%)	FMR1000	FMR10000
Optical 2	3.203782	4.807217	6.302521
Optical 1	5.386353	8.190918	10.36377
Capacitive	6.265532	11.16426	14.40731
Optical 3	7.400109	15.64284	20.46752
Optical 4	12.35851	27.07308	34.06742
Thermal	17.73674	32.47052	39.81209

Sensor	EER (%)	FMR1000	FMR10000
Optical 2	5.499909	9.145857	12.31907
Optical 1	11.53934	20.11284	23.89448
Capacitive	10.38027	23.34459	28.93848
Optical 3	12.67389	24.07591	29.97814
Optical 4	17.78351	36.3299	42
Thermal	20.80781	42.25881	49.82389

Reported values
EER < 1%
FMR1000 < 0.1
FMR10000 < 0.2

Accuracy: Gender bias

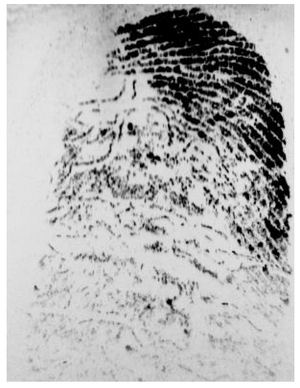


Accuracy: Damaged prints

Undamaged

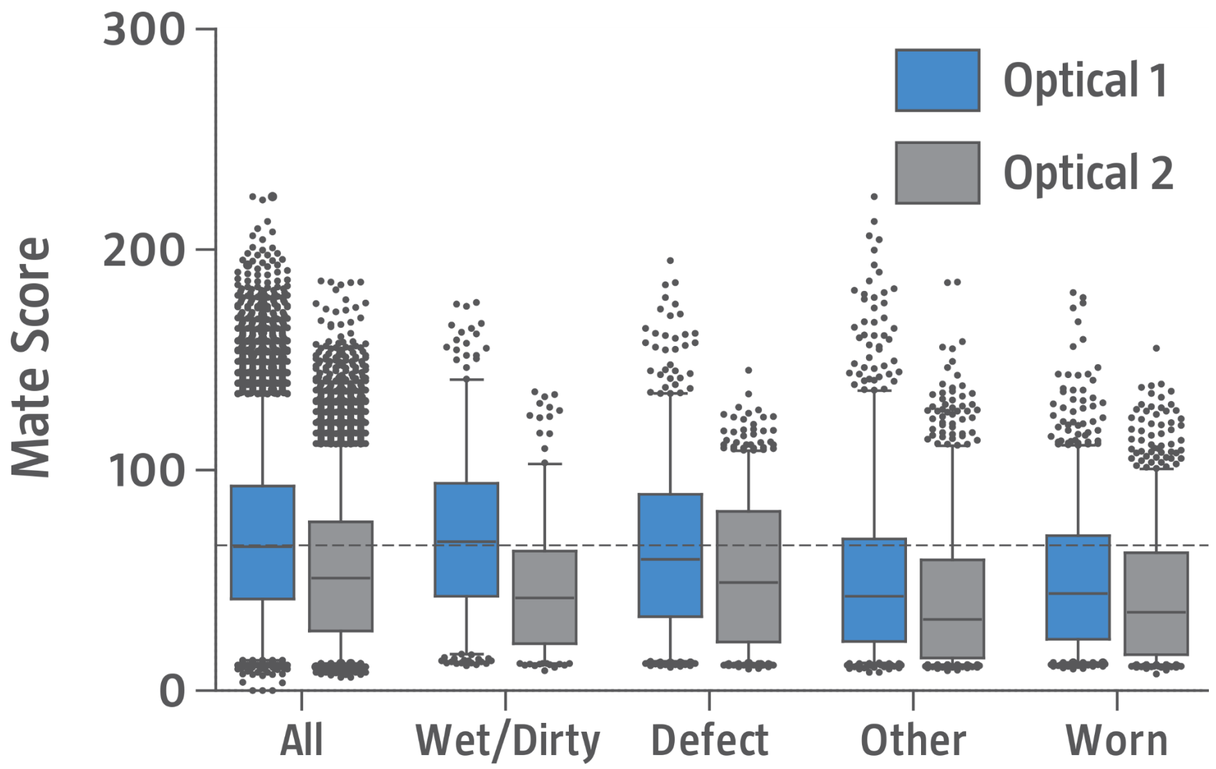
Worn

Defect



Other

Wet



Accuracy
Mobility
Connectivity
Robustness
Interoperability

Error rates significantly higher in all populations

System performance data needed for the specific population

Optical scanners were more resilient to damage and dirt/moisture

Mobility, Connectivity

Mobility, Connectivity

Accuracy
Mobility
Connectivity
Robustness
Interoperability

Ideal solutions are:

- **Battery powered**
- **Wireless**
- **Handheld**
- **Offline compatible**

Robustness

Accuracy
Mobility
Connectivity
Robustness
Interoperability

Ideal solutions are:

- **Water resistant**
- **Shockproof**
- **Dust ingress protected**
- **(e.g. IP65 rated)**

Interoperability

Accuracy
Mobility
Connectivity
Robustness
Interoperability

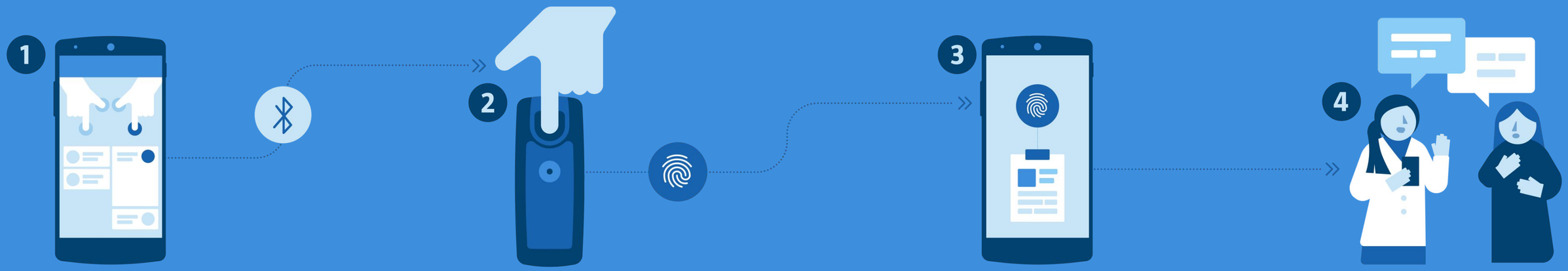
Ideal solutions are:

- **Interoperable**
- **E.g. using NIST/ISO fingerprint templates**
- **Open**

Accuracy
Mobility
Connectivity
Robustness
Interoperability

Summary

Case study: Simprints



Storisteanu, D. M. L. *et al*. (2015). Biometric Fingerprint System to Enable Rapid and Accurate Identification of Beneficiaries. *Global Health: Science and Practice*, 3(1), 135-137.

Universal Healthcare Pilot, Watsi

Future opportunities & challenges

- Global standards
- More data
- More partnerships
- Measuring impact

Thank you

Dan Storisteanu
Research Fellow at the University of Cambridge
Cofounder, Research Director of Simprints

@danstori

dmls2@cam.ac.uk or
dan@simprints.com