

# Field Evaluation of a Camera-Based Mobile Health System in Low-Resource Settings

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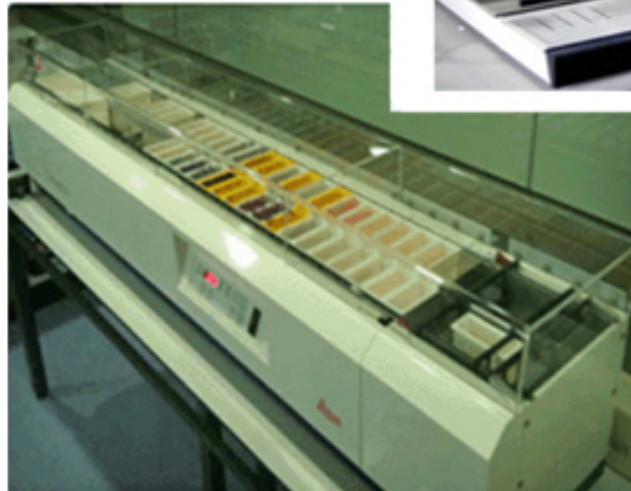
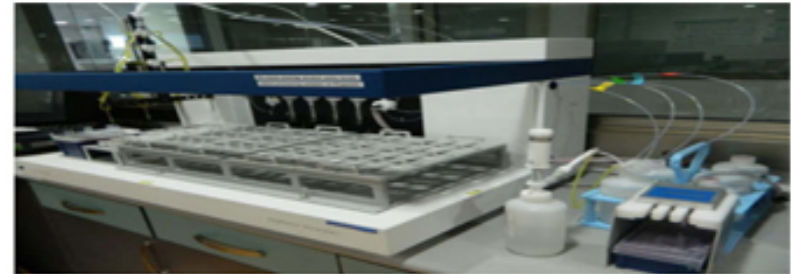


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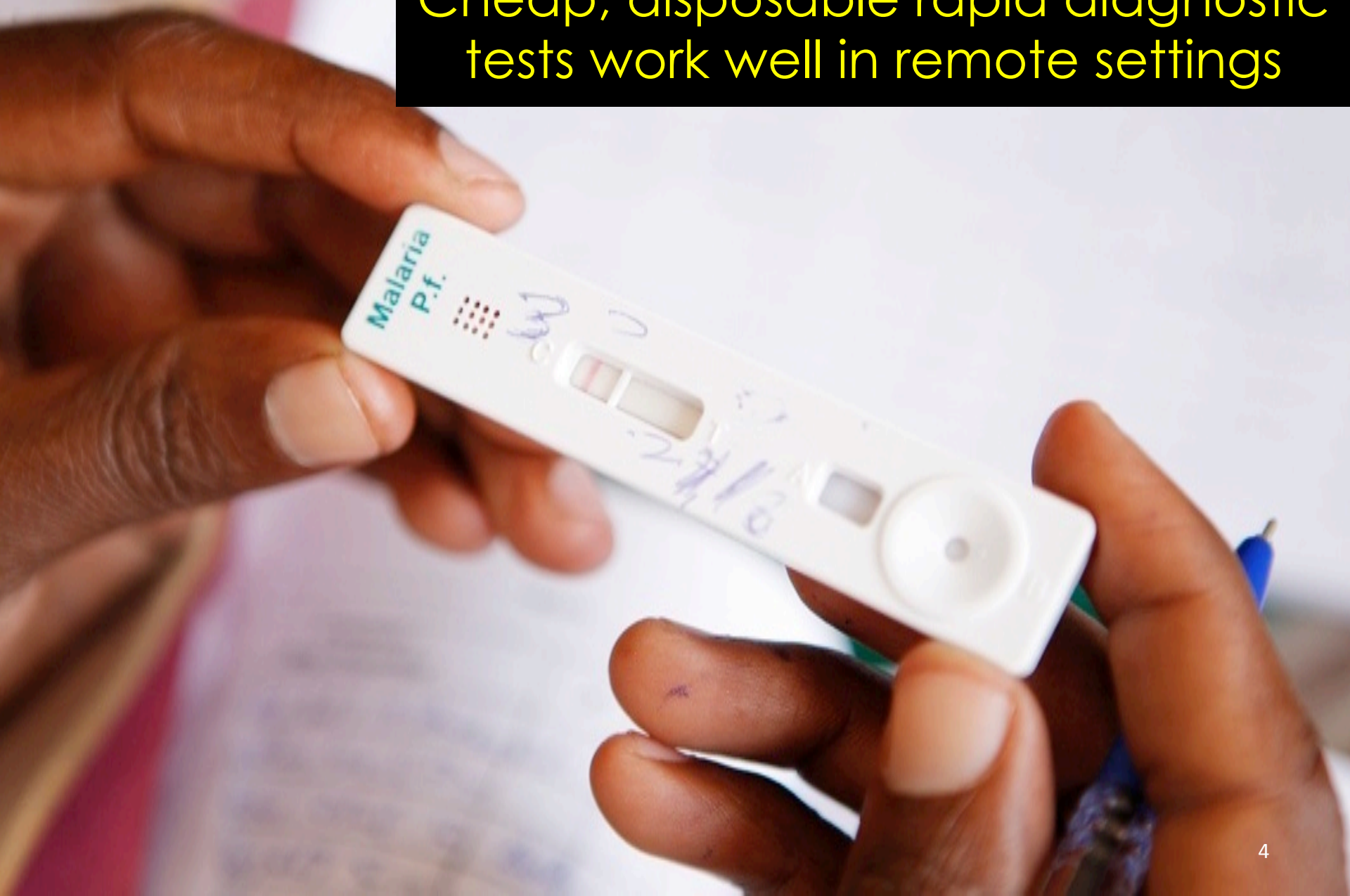
# Traditional diagnostic equipment is inappropriate for point-of-care settings in remote locations



Tests must be cheap, portable, easy-to-use, run rapidly, and not require electricity or refrigeration



Cheap, disposable rapid diagnostic tests work well in remote settings



# It is challenging for health workers to interpret diagnostic tests

- Hundred of different brands and diseases
- Visual interpretation is subjective.
- Lack of training, lack of confidence.
- No system for collecting and reporting test results.



# A mobile camera-based diagnostic test reader

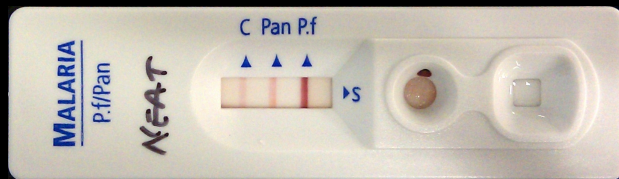
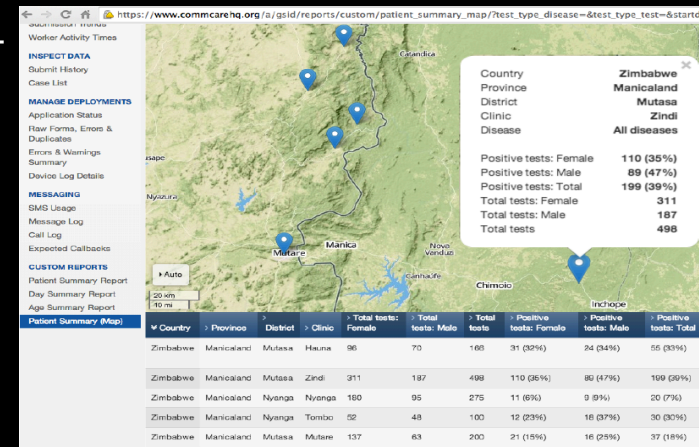


# Algorithm for processing diagnostic tests

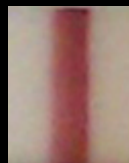


1. Capture image of a diagnostic test

6. Transmit data and captured images to a server



2. Align the image

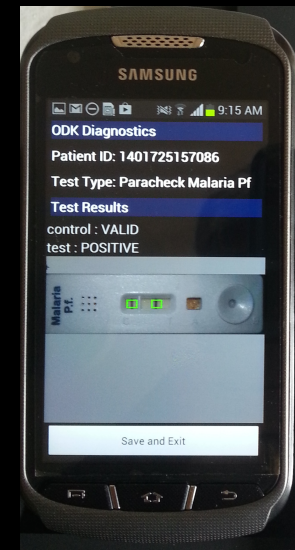


3. Locate fields of interest



4. Interpret test result

5. Output test result



# Field evaluation in Zimbabwe

60 health workers

5 clinical research sites

1 provincial hospital - Mutare

2 district hospitals – Nyanga and Hauna

2 rural health centers – Zindi and Tombo

Diagnostic tests for malaria

15 devices





# Research questions

Q1: What is the impact of the system on patient care routines?

Q2: How well do the human and system diagnoses agree?

Q3: What is the impact of poor infrastructure on system usage and data collection?



# Methodology

60 minute training sessions

8 week deployment

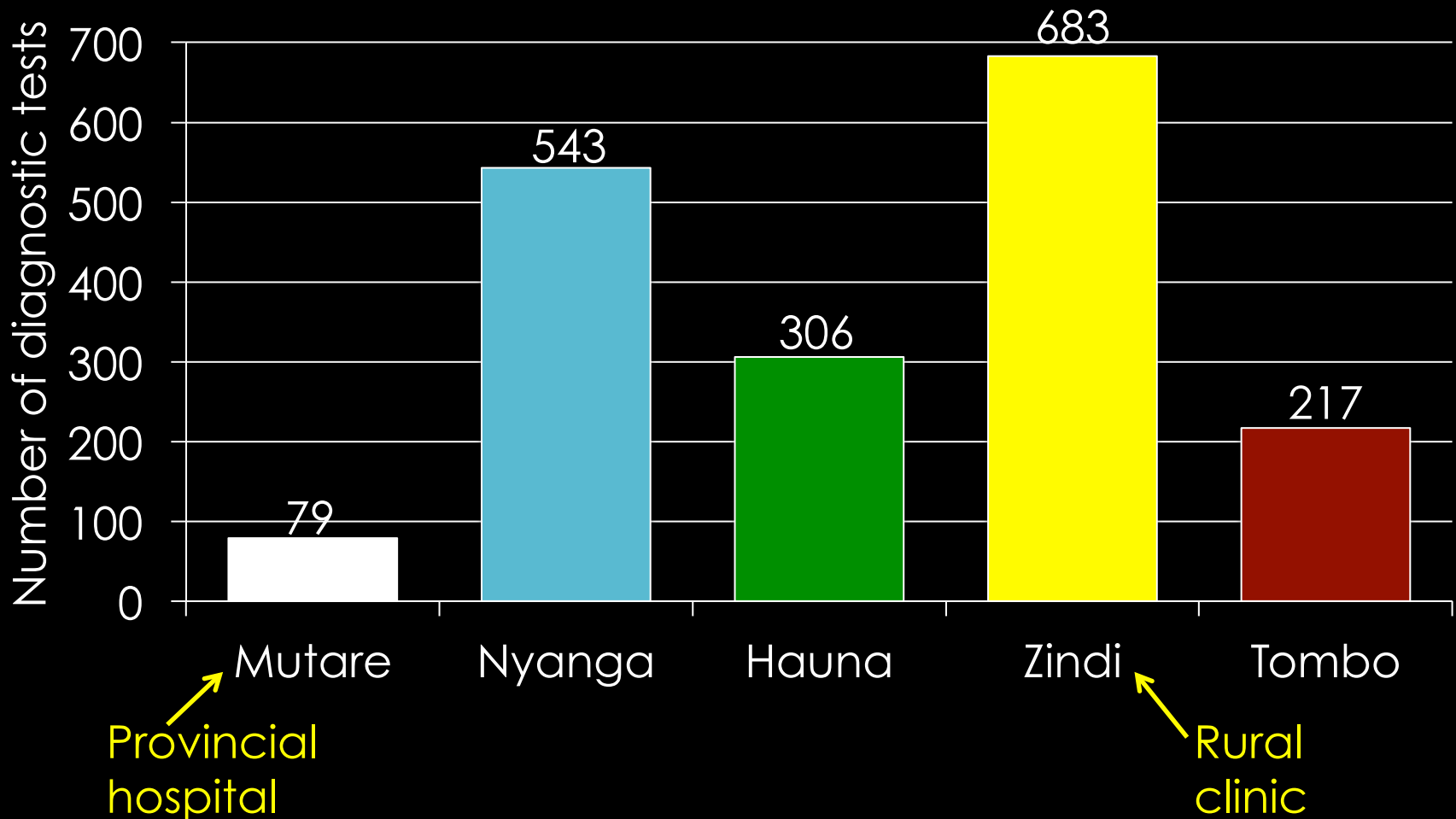
Quantitative data collection

Observational visits after one week and six weeks

Semi-structured interviews

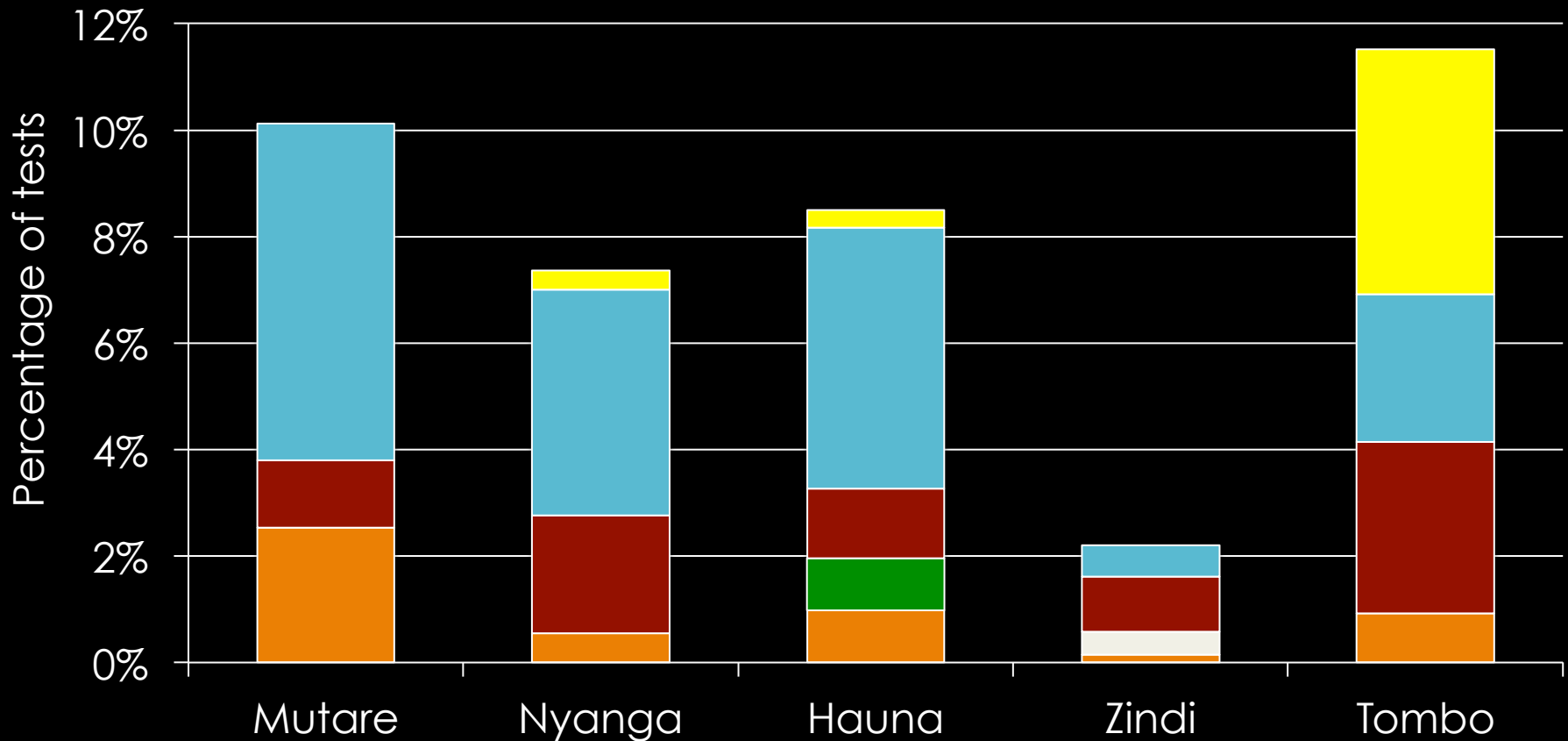


# Q1: Participants captured and transmitted 1828 malaria tests during the 8 week study



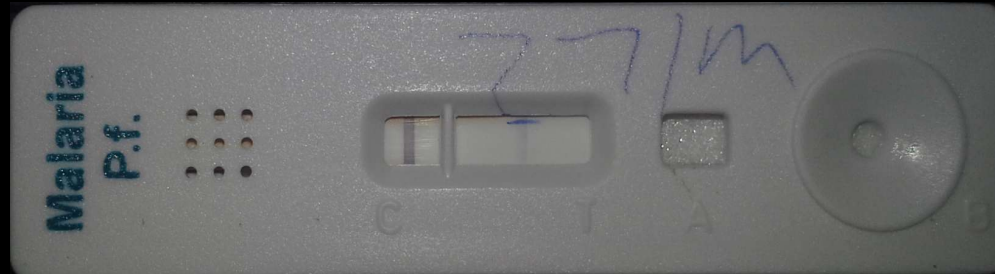
# Q1: 114 tests (or 6.2%) contained user errors.

- Unusable image
- Upside-down test
- Incorrect test selected
- Image is not of a test
- No image captured

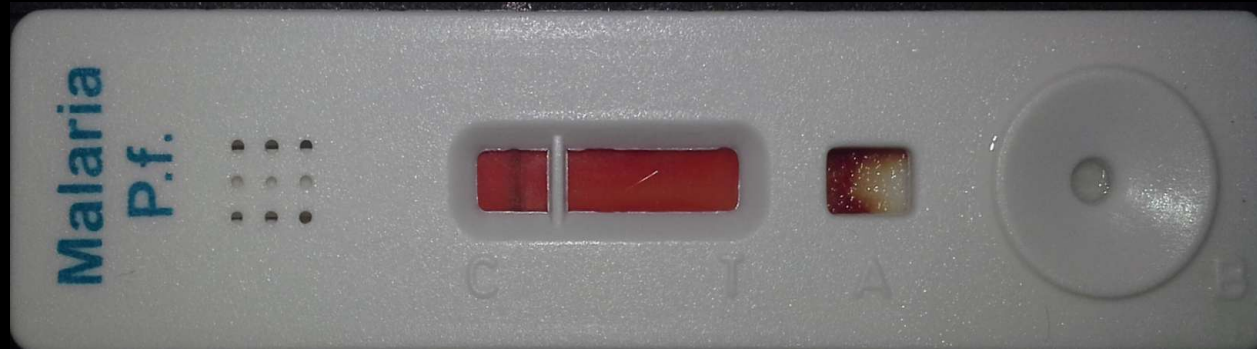


# Q2: Strong agreement between the system's diagnoses and the health workers' diagnoses

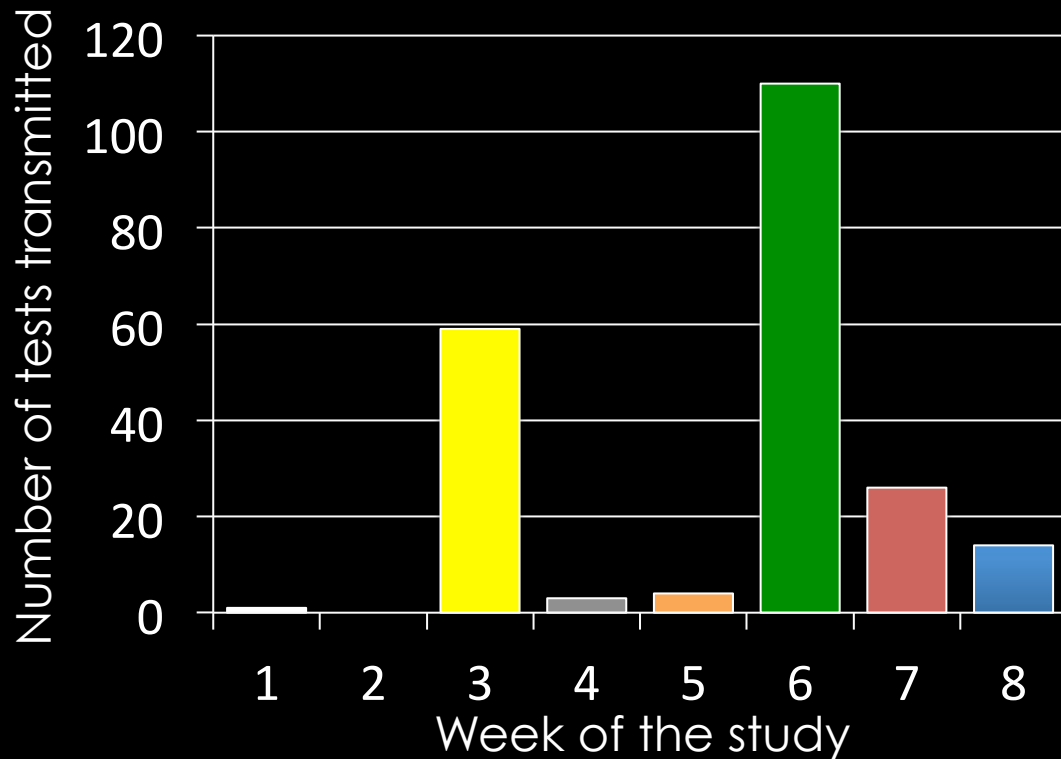
Disagreement in 96 / 1714 tests



The system is useful for supervision and quality control



# Q3: Health workers developed strategies to overcome poor network infrastructure.



Tests transmitted each week by Tombo, the most rural health center

Hauna hospital transmitted 34% of their tests between midnight and 4am (compared to 4%, 2% and 0% by other facilities).

# What do these findings mean?

- The system could aid disease diagnosis in low-resource environments.
- Useful for quality control and data collection
- Provide a second opinion
- Compute the result for untrained health workers
- Planning future deployments that target a wider variety of tests for different diseases



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