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Digitally-Enhanced Rapid Malaria Testing Using Artificial Intelligence (AI) to Support Quality Control with Community Health Workers in Rwanda

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Introduction

- In Rwanda, 55% of all uncomplicated malaria cases seen are managed by community healthcare workers (CHWs).¹
- Quality control tools for monitoring and management of CHW malaria rapid diagnostic test (mRDT) administration, interpretation accuracy, and treatment are **insufficient** and **inconsistent** across Rwanda.²

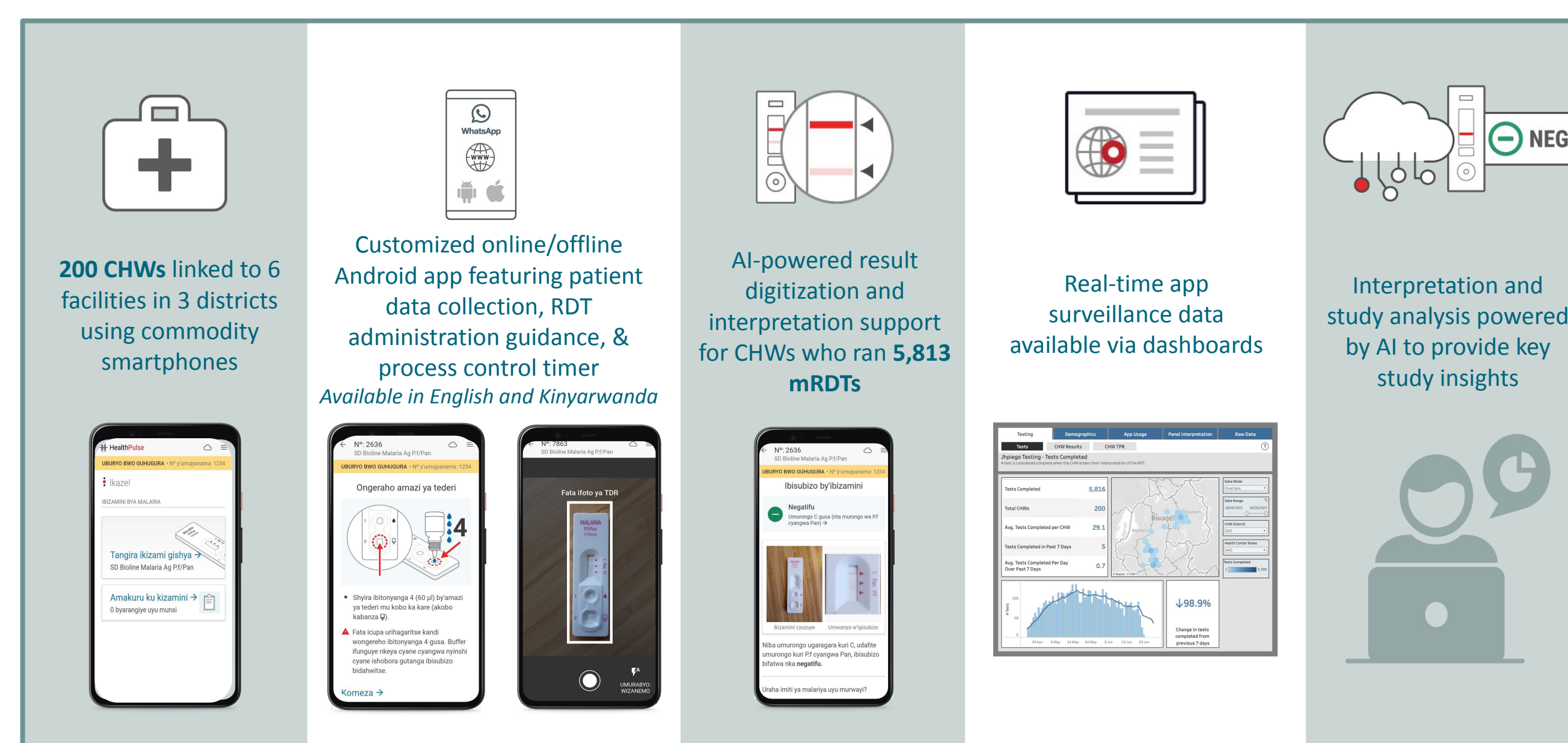
Study Goal

- Determine whether it is feasible and effective to introduce a customized mobile app for CHWs as a quality control tool.

Methods

- 200 established CHWs from across 6 facilities in 3 high malaria burden districts participated in the study using provided Android phones.
- CHWs completed a baseline survey during training, followed by 10 weeks of data collection, and then a final endline survey.
- Mixed methods analysis was conducted for qualitative and quantitative data from the app and baseline/endline surveys.

CHW Malaria Testing Workflow using HealthPulse AI



Conclusion

- The HealthPulse AI app was found to be **feasible, usable, effective,** and **desired** by CHWs.
- The majority of CHWs expressed **confidence** in using mobile apps and shared the benefits of having an app with digital instructions for RDTs.
- The study demonstrated usefulness of the app and AI for **efficient monitoring and surveillance, targeted supportive supervision, quality control,** and as a potential CHW **e-learning and training tool.**
- Remote monitoring** of CHW testing coupled with AI-powered automated review of CHW interpretations identified **9% of CHWs needing support** in their testing activities.
- Identifying and supporting only CHWs who need help can be **time, cost,** and **resource** effective.

Use of an app and AI for **monitoring and quality control** can strengthen public health malaria elimination efforts to:

- Enhance mRDT administration **quality**
- Enable **targeted, supportive supervision**
- Ensure **accuracy** of community diagnostic testing

Results

HealthPulse AI improved mRDT **knowledge, administration adherence, and accurate interpretations.**

Survey responses	Baseline	Endline	% change
Knowledge of the proper time required to read the test result after adding blood and buffer	79.9%	97%	+17.1%
Identification of positive results from very faint visible lines	13%	85.2%	+72.2%

The HealthPulse AI app was **usable** by CHWs.

CHWs indicated that:	Endline
The app was very easy to use	93.0%
The app instructions were clear and easy to follow	99.0%
Using the app saved time compared to entering data in paper registers	93.8%

App provided **proof** of CHW activities and **contributions, built CHW confidence, and enhanced community member trust** in the testing process and results.

"When I use this smartphone application to conduct RDTs, I feel accompanied by an interactive interface that provides me with clear guidance throughout every step of the process." – CHW, Rwanda

"There were instances when a test turned out negative and the client resisted to believe it, saying we may be lying. When you display the results on smartphones, they readily accept the outcome." – CHW, Rwanda

Results continued

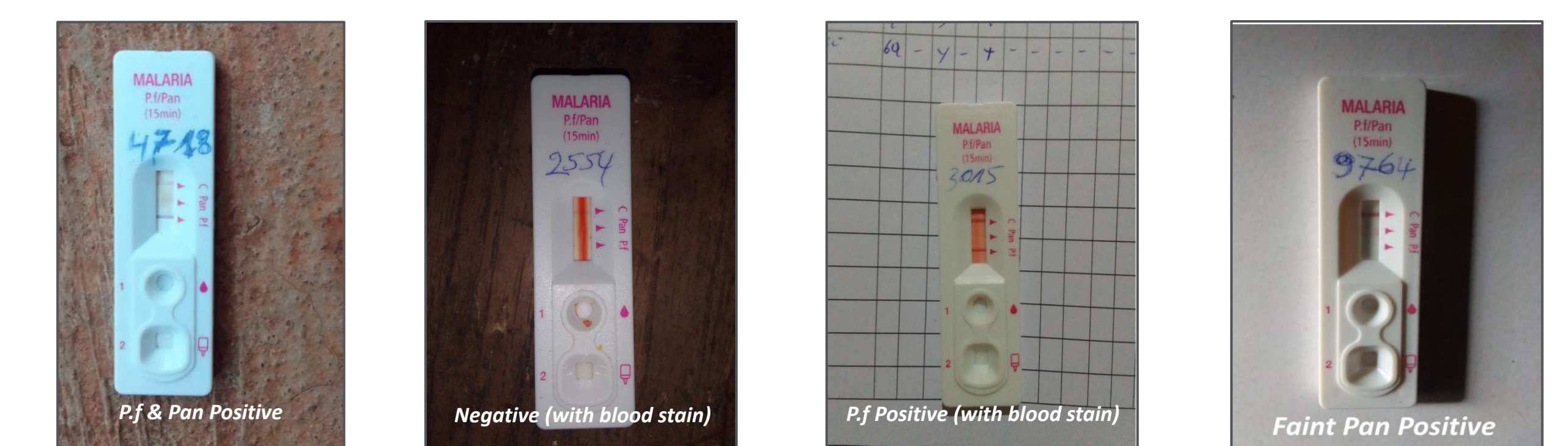
9% of CHWs were identified as potentially needing support in their day-to-day testing activities based on incorrect mRDT interpretations. CHWs identified with interpretation accuracy variance vs. reference AI

Total tests completed by CHW	Number of CHWs		
	Accuracy below 85%	Accuracy between 85% - 95%	Accuracy above 95%
1-10	5	5	14
11-40	11	48	76
40+	2	12	26

AI **exceeded** CHW performance, making it a viable monitoring tool



Example mRDT AI interpretations



Next Steps

- Pursue opportunities to integrate this AI tool for quality control, monitoring, and targeted supportive supervision into **digitization** efforts being undertaken by Rwanda and other countries for malaria control programs.
- Reach out to us.** AI is available for **use at scale** and can be integrated into **any digital platform,** with capacity to support a breadth of use cases and conditions beyond malaria.



2. Rwanda Biomedical Centre. 2022. Rwanda Malaria and Neglected Tropical Diseases, Annual Report July 2021-June 2022.
 3. Republic of Rwanda Ministry of Health. 2023. Rwanda Malaria Programme Mid-Term Review.