

MSc IN BIOINFORMATICS

CONCEPT FOR A RESEARCH TITLED  
titled *Use of a mobile app as a tool for primary diagnosis  
of TB at Bangwe Clinic*

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## 1. Introduction

Over 150 years after the discovery of antibiotics and the promise it gave to the fight against *Mycobacterium tuberculosis*, Tuberculosis (TB) continues to be a leading cause of mortality by infectious diseases globally (Corbett EL, 2003). TB killed 1.3 million people in 2017 alone (WHO, 2018). In Malawi TB prevalence is estimated at 1014/100,000 (Ministry of Health, 2012). In a study, Pieter W. Uys, (Uys, 2007) showed that delays in diagnosis is a major obstacle in the control of TB. In Malawi the NTP has highlighted TB case notification as a focus area in its fight against TB (National TB Control Program, 2012 ). Current primary diagnostic techniques include, among others, sputum smear microscopy, chest radiography, solid media culture, Xpert MTB/RIF. The specificity of sputum smear examination in resource poor countries like Malawi is reported at lower than 50%, highlighting the need for alternative diagnostic tools. While Xpert MTB/RIF has higher specificity and sensitivity values (Van Rie, 2010), it is expensive and not easily accessible in resource-starved settings as is the case in most parts of the country. There is, therefore, a need to develop a cheaper, universally-accessible primary diagnostic technique.

## 2. Purpose of the Research

Digital technologies are increasingly being used in TB treatment (Nsengiyumva, 2018) yet there are not a lot of studies that have been conducted to exploit the use of mobile technology in actual TB diagnosis. The purpose of this research will be to develop an affordable, universally accessible tool for the diagnosis of TB by taking advantage of the ubiquitous mobile technology. Alamar blue dye will be used in conjunction with a mobile app to diagnose TB as an alternative to sputum smear.

## 3. Project Description

### 3.1. Objectives.

The research will address the following objectives:

1. To provide a cheaper, high-throughput TB diagnosis technique
2. To increase access to primary diagnosis to resource-limited populations

### 3.2. Methodology

A sample of patients presenting themselves for treatment at Bangwe clinic will be tested using both the mobile app and the sputum smear technique as primary diagnosis. Both tests will subsequently be referred for microscopy, the gold standard of TB diagnosis, for confirmation. The alamar blue assay using the colorimetric method will be utilized and a mobile app developed in Python will interpret the results. The app will have the option of sending results to a central server using GPRS so that patients can be followed up.

### 3.3. Budget

Item	Cost (MK)
alamar microplates	100,000
Alamar blue reagent	300,000
Smart phone with a basic camera	200,000
Nurse for 2 wks	250,000
Training	20,000
Supervision	50,000
<b>Grand Total</b>	820.000

## 4. References

1. Annelies Van Rie, Liesl Page-Shipp, Lesley Scott, Ian Sanne & Wendy Stevens (2010). Xpert<sup>®</sup> MTB/RIF for point-of-care diagnosis of TB in high-HIV burden, resource-limited countries: hype or hope?, *Expert Review of Molecular Diagnostics*, 10:7, 937-946, DOI: [10.1586/erm.10.67](https://doi.org/10.1586/erm.10.67)
2. Corbett EL, Watt CJ, Walker N, Maher D, Williams BG, Raviglione MC, Dye C. Arch (2003). The growing burden of tuberculosis: global trends and interactions with the HIV epidemic. *Internal Medicine*; 163(9):1009-21.

3. KamranSiddiqi, Marie-Laurence Lambert, John Walley (2003).Clinical diagnosis of smear-negative pulmonary tuberculosis in low-income countries: the current evidence. *The Lancet Infectious Diseases* 3(5):288-96. [https://doi.org/10.1016/S1473-3099\(03\)00609-1](https://doi.org/10.1016/S1473-3099(03)00609-1)
4. Ngwatu, B. K., Nsengiyumva, N. P., Oxlade, O., Mappin-Kasirer, B., Nguyen, N. L., Jaramillo, E., Falzon, D., Schwartzman, K. (2017). Collaborative group on the impact of digital technologies on TB (2018). The impact of digital health technologies on tuberculosis treatment: a systematic review. *The European respiratory journal*, 51(1), 1701596. doi:10.1183/13993003.01596-2017
5. National Tuberculosis Control Program Manual, 7<sup>th</sup> Edition, Lilongwe, January 2012, Ministry of Health
6. Pieter W. Uys, Robin M. Warren,Paul D. van Helden (2007). A Threshold Value for the Time Delay to TB Diagnosis. *PLoS One*. 2(8):e757. <https://doi.org/10.1371/journal.pone.0000757>
7. WHO Global Tuberculosis Report 2018, Document number: WHO/CDS/TB/2018.25