# SmartLtC: Does an Android Smartphone App Increase Linkage To Care in Johannesburg, South Africa

## A randomised controlled trial

# DATA ANALYSIS PLAN

**29 MARCH, 2016**



1. **PURPOSE**

To present the results of the SmartLtC study: Did the study show an improvement in linkage to care. Receiving HIV care and treatment will decrease HIV transmission rates, improve patient health and mortality rates.

2. **RESEARCH QUESTION**

Can a smartphone health application increase linkage to care in newly diagnosed HIV-positive patients in Johannesburg, South Africa: A multi-site randomised controlled trial

3. **OBJECTIVES AND ENDPOINTS**

3.1 **Primary objective/s**

3.1.1. To test whether linkage to HIV care (defined by attendance to a second blood test within 8 months) is improved in the intervention arm compared to the control arm

3.2 **Secondary objective/s**

3.2.1. To compare ART initiation rates between intervention and control arms.

3.2.2. To assess the feasibility and acceptability of receiving laboratory results to a personal smartphone.

3.2.3. To assess secondary effects from improved patient information, including return rates after falling out of care (assessed through routine patient record reviews), patient satisfaction (through face-to-face surveys at the 6-month follow-up visit and end of the study), and rates of additional blood tests (especially CD4 count, viral load).

3.2.4. To assess patient knowledge levels of their laboratory results.

3.2.5. To specifically look at 2 subgroups – men and young adults (18 to 25 years of age), who would particularly benefit from improved linkage to care.

3.2.6. To assess the performance of the app in clients with different levels of education and standard of living, and see if there are differences in clinical and usage outcomes

3.2.7. To evaluate differences in linkage-to-care, HIV-knowledge, adherence to medication (treatment patients only) and reported quality of life between wellness and treatment patients.

3.2.8. To assess the financial and economic costs of providing the SmatLtC smartphone app.

3.2.9. To determine the incremental cost, and cost-effectiveness of ART initiation link to the smartphone app (receiving laboratory results and linkage-to-care) as compared to the standard ART initiation.

3.3 **Statement of null and alternate hypotheses**

The analysis of will include the following test of hypothesis:

$H_0$: $\mu_{\text{Attendance to a second NHLS blood test within 8 months (Control)}} = \mu_{\text{Attendance to a second NHLS blood test within 8 months (Intervention)}}$

$H_A$: $\mu_{\text{Attendance to a second NHLS blood test within 8 months (Control)}} \neq \mu_{\text{Attendance to a second NHLS blood test within 8 months (Intervention)}}$

Acceptance of the $H_A$ will be considered to be a successful demonstration of difference between the intervention and control arms

### 3.4 Primary outcome variable/s

3.4.1. Attendance to a second NHLS blood test within 8 months

### 3.5 Secondary outcome variable/s

3.5.1. Attendance to a second NHLS blood test
3.5.2. Length of time between first and second NHLS blood test
3.5.3. Attendance to a second NHLS blood test within 8 months

## 4. STUDY METHODS

### 4.1 Overall study design

4.1.1. A multisite randomised controlled trial (participating sites: Hillbrow Community Health Centre, Helen Joseph Hospital, 80 Albert Clinic and Yeoville Clinic)

### 4.2 Selection of study population

4.2.1. Newly diagnosed HIV-positive individuals over the age of 18 and not pregnant, receiving HIV care from one of the health facilities participating in the trial

### 4.3 Randomisation and blinding

4.3.1. Patients were randomised through the REDCap system with no blinding

## 5. SAMPLE SIZE

Recruitment for this trial showed that achieving a sample size for any sub-group analysis is difficult to achieve with an app limited to a subset of smartphones in circulation and several other eligibility criteria on age, residence, literacy, and having a smartphone with data. Section 7.1. shows the flowchart of the HIV cases as they are screened and assessed for eligibility, then randomised and followed up. Priority groups of interest to this trial are males and young HIV clients aged 18-30 years, and it is exactly these two groups which are also more difficult to screen for eligibility as they use HCT services to a lesser extent.

The recruitment over approximately 8 months is expected to be able to recruit about 350 individuals. While it would be desirable to recruit a larger sample, as decision was made to stop at a time when sufficient sample is achieved to detect any effectiveness of the app (based on a 20% difference in linkage to care between the intervention and control arm, an 80% power with significance level of 0.05). At this sample size, it will be possible to see any trends in linkage to care in the priority sub-groups (males, youth) between the two trial arms, but the sub-groups will not be large enough to detect a 20% difference with statistical accuracy.

## 6. GENERAL ISSUES FOR ANALYSIS

6.1 **Software to be used for analysis**

STATA

We will use Stata software (version 13.1, STATA Corp, College Station, Tex.) for statistical analysis.

6.2 **Multicenter study data**

This trial is individually randomised but since it is multi-centre it has a clustering aspect which needs to be taken into account in the analysis of outcomes. This clustering is linked to patient population/catchment specificities at the sites as well as facility related characteristics which may differ across the sites. Clustering could theoretically occur within the intervention arm across sites (app training done differently, different information provided the respective field worker despite scripted patient-fieldworker interaction, etc.). However, we believe that the more relevant clustering occurs in both the intervention and control arms, and is an effect of the different sites' patient and service characteristics. We therefore envisage to use a random effects model (sometimes referred to as "random intercept" model - Lee, K and Thompson, S. The use of random effects models to allow for clustering in individually randomised trials. Clinical Trials 2005; 2: 163 – 173). This is a realistic model for any clustering across both treatment arms in which it is probable that the clustering is unlikely to have an impact of the treatment effect.

6.3 **Exposure variable/s:**

6.3.1. A smartphone health application (SmartLink), created by the study team, which provides patients with their CD4 count and viral load, along with explanatory descriptions and HIV/AIDS information.

6.4 **Derived and computed variables**

6.4.1. Derived variable:

- Age - Based on date of birth

6.4.2. Computed variable:

- Length of time between first and second NHLS blood test

6.5 **Data transformations**

6.5.1. Not expected if sample is normally distributed

6.6 **Statistical tests to be conducted**

6.6.1. Descriptive analyses

6.6.1.1. Comparison of means

6.6.2. Inference statistical analyses

6.6.2.1. Pearson's exact

6.6.3. Modeling (random effects to allow for multisite design)

6.7 **Methods for dealing with withdrawals, missing data, outliers**

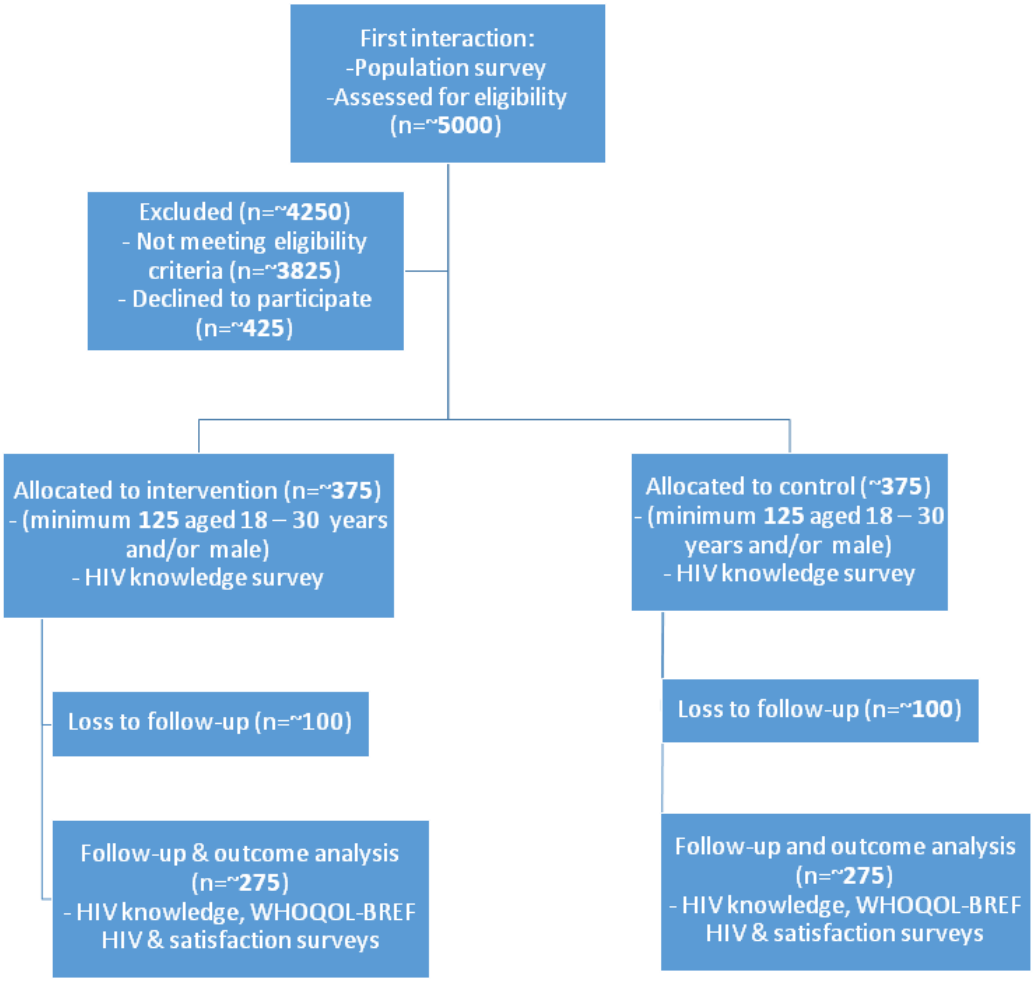
6.7.1. Withdrawals/opt-outs will be considered loss-to-follow-up

6.7.2. As REDCap is used as the data collection tool, minimal missing data is expected. If missing data is found, the study team will contact the study participant by telephone.

6.7.3. Outliers will be identified using STATA and either removed or replaced with average values on a case-by-case basis.

# 7. TABLES, FIGURES AND LISTS

## 7.1 SAMPLE SIZE TABLE




## 7.2 DUMMY TABLES FOR PARTICIPANT DEMOGRAPHICS

| **Characteristic** | **Data** |
|---|---|
| Age (years) | Mean, Standard Deviation, Median, Range |
| Gender | Percentages |
| Highest education received | Mean, SD, median, range |

| | |
|---|---|
| LSM (Socio-economic scale) | Mean, SD, median, range |
| Employment status | Frequency, percent in each status |

7.3 Tests for homogeneity

| **Characteristic** | **Intervention arm** | **Control arm** | **Statistical significance (p value)** |
|---|---|---|---|
| Mean age (SD) | | | |
| Mean education received | | | |
| Mean LSM (SD) | | | |
| Employment status (n, %) | | | |

7.4 Testing $H_0$ of main and secondary hypothesis'

| **Characteristic** | **Intervention arm** | **Control arm** | **Statistical significance (p value)** |
|---|---|---|---|
| Attendance to second blood test within 8 months (n, %) | | | |
| Attendance to second blood test (n, %) | | | |
| Length of time between first and second blood test (SD) | | | |