Contact details operational pilot

Primary Healthcare Innovation (PRIMI) Grant

Western Cape Government FOR YOU

BILL & MELINDA GATES foundation

PERCEPT
FUELLED BY EVIDENCE, PROPELLED BY INGENUITY.

Final report
13 August 2024

Photo by National Cancer Institute on Unsplash

Abstract

This report details one of the streams of work done by the Western Cape Government: Health and Wellness (WCGHW) and Percept[1] under the mandate of a Primary Healthcare Innovation Grant awarded by the Bill and Melinda Gates Foundation (BMGF) to Percept with the intention of improving Community Oriented Primary Care (COPC) in the Western Cape Province of South Africa.

This project aimed to test whether providing free WiFi, where you must log-on using the cellphone number you have with you, while waiting to be seen in a primary healthcare (PHC) facility might be incentive enough to get healthcare users (HCUs) to provide accurate contact details.

The objectives of the pilot included:

- Using a human-centred design approach to develop a richer understanding of the challenges, opportunities, and missing value proposition
- Collect key demographic and HCU data to enable analysis of what archetypes of users this intervention might work for
- Determine appetite for free WiFi for HCUs as well as whether HCUs' phones are WiFi enabled/ HCU know how to use the WiFi functionality
- Test whether users actually engaged with the WiFi offering under real-world conditions
- Test willingness to provide the number of the cellphone the HCU has with them at the PHC facility in order to access WiFi
- Test willingness to provide cellphone number and an identifier (Clinicom number and/or South African identity number (SA ID))
- Understand the reasons why HCUs did or did not access the available WiFi during the pilot
- Verify accuracy of cellphone numbers provided through the WiFi in terms of (1) whether phone rang; (2) whether the HCU answered the phone; and (3) whether the Clinicom/SA ID number was accurately captured by the HCU when they logged onto the WiFi

The pilot was conducted in five PHC facilities, three were situated in the urban metro of Cape Town (Mfuleni, Lady Michaelis and District 6) and two in the Cape Winelands district, both of which are classified as rural facilities. In one of the urban facilities (District 6), the pilot ran for a longer period and the offering was augmented based on the learnings while the intervention was taking place. For the two rural facilities, only the initial survey was conducted to determine appetite for WiFi, no actual WiFi was provided.

The data collection methods used in this pilot were:

- A survey to assess whether patients would be interested in free WiFi
- Provision of WiFi to those who provide verified phone numbers
- Provision of WiFi to those who provide verified phone numbers and a form of identification
- An exit survey to establish HCUs' satisfaction with, and use of, the WiFi provided
- Assessing validity of cellphone numbers provided

[1] https://percept.co.za/

The quantitative data has been analysed using Microsoft Excel™. There is also analysis of qualitative data collected through an initial pilot design workshop and the exit surveys conducted in the facilities at the end of the intervention.

The results from the three urban facilities where the full intervention was conducted show that between 2-4% of adults visiting the clinics decided to make use of the free WiFi. There were 1,849 log-in attempts onto the WiFi, of which 1,371 (74%) provided a verified cellphone number (i.e. they received a one-time pin which allowed them to log onto the WiFi). Mfuleni PHC showed the highest number of WiFi users. Of the 1,371 cellphone numbers provided, 841 (61%) were selected for a 'verification call'. Within these 841, there were duplicates and once these were cleaned up, 673 (49% of 1,371) numbers remained who were then called. On average, 25% of the cellphone numbers were answered by someone. 487 (72%) of the 673 cellphone numbers rang, and of these between 30-47% were answered by someone.

The only comparisons we have are the figures from a previous TB call centre intervention run by the WCGHW. In that intervention, the call centre was able to reach 10-30% of people they tried to reach using either a three or five call protocol (meaning they tried more than once, whereas in our pilot we only called once). This indicates some potentially positive findings from this contact detail intervention as compared to other contact detail interventions.

Key learnings include:

- Factors influencing whether someone provides us with a number, and whether they allow us to use that number, are extremely diverse and centre around three core themes: value, trust, and convenience
- More people have smartphones than assumed. There seems to be widespread access to smartphones to support technology interventions
- Desirability for WiFi in a real-world setting is higher than expected, at over 85% in low income rural settings, and approaching 100% for urban youth
- Real-world engagement with this WiFi was lower than expected due to a number of internal and external factors
- Using a simple OTP mechanism to ensure accurate, current numbers at first capture adds tremendous value
- Close to 50% of contact details collected during this experiment were new to the system; and contact details performed better in real-world contactability tests than historical cohorts' contact details did. This suggests that OTP verification increases the accuracy of contact details harvesting

Acknowledgements

The teams from the WCGHW and Percept would like to acknowledge:

- BMFG as the funders of the research
- The management and staff of District 6 Community Day Centre, Lady Michaelis Community Health Centre, Mfuleni Community Health Centre, De Doorns Clinic and Avian Park Clinic for their engagement with the research and their willingness to let the team conduct research at their clinics
- Clinic volunteers who worked as data collectors for this research
- Matchboxology for their work on solution ideation
- Members of the broader Western Cape Government, and private sector consultants who contributed to the solution ideation workshop
- The healthcare users of our pilot facilities who were willing to engage, provide their cellphone numbers and talk to our data collectors about their experiences with the intervention

Contents

List of figures

List of tables

Acronyms and abbreviations

Acronym/abbreviation	Full term
CAReS	Clinical Appointment and Referral Electronic System
CBD	Central Business District
CBS	Community Based Services
CCT	City of Cape Town Municipality
CHW	Community Health Worker
EHR	Electronic Health Record
EMCI	Electronic Master Client Index
HCU	Healthcare User
NHLS	National Health Laboratory Services
NIDS	National Indicator Data Set
PHC	Primary Health Care
PHCIS	Primary Health Care Information System
PHDC	Provincial Health Data Centre
PIDS	Provincial Indicator Data Set
PMI	Patient Master Index
PREHMIS	Patient Record and Health Management Information System
SPC	Service Priorities Coordination Directorate
SPV	Single Patient Viewer
WC	Western Cape
WCGHW	Western Cape Government: Health and Wellness

Introduction

1

South Africa, and the Western Cape Province specifically, has established clearly that it sees Community Oriented Primary Care (COPC) as the foundation of its health system, as outlined in the provincial goals for 2030.[2] Effective COPC requires the creation and tending of trust between healthcare workers and the community.[3] To build trust, a health system must find ways to connect and communicate with its community.

When we are connected, the people and communities we serve can tell us what they need and value, so we can design a health system that is responsive to their needs. Regular connection and communication between the system and its users also allows us to show users what we have to offer, bringing innovative and creative possibilities to pressing problems.

While there are many ways to connect with people, traditional methods like telephone calls and messaging remain very important.

Throughout this report, where you see 'we' or 'us', we are referring to the Western Cape Government: Health and Wellness (WCGHW) health system, and the individuals who create policies, build solutions and deliver healthcare services within it. Where we talk about the population, communities, healthcare users or patients, we are referring to all those the WCGHW system is meant to serve.

The Western Cape health system, as any other in the country, is pressed by many confluent challenges, ranging from budgetary pressures to high patient loads. These have implications for the client experience as well as demanding new efficiencies to be introduced to better meet this need.

Being able to contact healthcare users consistently and predictably could support a more efficient and effective delivery of healthcare to users. However, to achieve this, the health system must have accurate contact details (cellphone numbers) for its users. For some disease areas (like HIV and Tuberculosis), healthcare users are used to receiving information and follow ups telephonically from the health system, but this has mostly been limited to routine program regulated follow

[2] Mash et al., "A Framework for Implementation of Community-Orientated Primary Care in the Metro Health Services, Cape Town, South Africa."
[3] Marcus, *COPC- A Practical Guide.*

ups aimed at keeping people in treatment and well. However, contacting healthcare users for more than just treatment completion check-ups and/or follow up of test results could provide an opportunity to build connections and trust that delivers value to users.

Accurate contact details could, therefore, enable regular communication between the healthcare system and its users. But, realising the potential of patient contactability requires up-to-date contact details - an age-old problem for health systems both locally and internationally.

This pilot project aimed to test whether providing healthcare users with free WiFi while waiting in a clinic queue might be incentive enough for them to provide an up-to-date, and accurate contact number to the health system.

Background

2

Challenges with contactability

Collecting and maintaining patient contact details is crucial in any health system to ensure the system and its users are able to communicate and connect regularly and with ease. The Western Cape Government: Health and Wellness (WCGHW) currently has many of the key components of an electronic health record (EHR) system. This has been instrumental in many of the WCGHW's gains in health outcomes and service delivery provision over the past years. However, even with this electronic system, it has remained a challenge to collect and maintain a database of up-to-date contact details for Western Cape (WC) healthcare users (HCUs). The reasons range from: frequently changing cell phone numbers, contact details not being updated at reception and/or contact details being entered in one system and not automatically being updated in the patient master index (PMI) system.

The key challenges can be crudely delineated into challenges relating to:

- The record keeping of contact details,
- The interoperability of records and record keeping systems, and
- Challenges related to the recording of contact details from patients when their details change.

In the first report from this work (released October 2023), these challenges are discussed in more detail. In the October 2023 report we also outline the various activities and interventions the WCGHW has put in place to try and improve the accuracy of patient contact details.

This report focuses on challenges regarding the **recording of updated patient contact numbers in the system**. Specifically, ensuring that there are regular opportunities for HCUs to update their contact number(s), and that these updates are accurately and efficiently recorded in all databases.

This report outlines (1) how the **problem statement was defined**, focusing on the friction points preventing patients from sharing accurate contact details (or these being recorded appropriately). How this problem statement then led the team to (2) **solution ideation** through workshops and engagements, and (3) the **eventual selection** of WiFi provision as a potential solution to test. The report then (4) **describes the results** of the pilot and (5) the **key insights and learnings**. The report concludes with (6) **recommendations**.

Solution ideation and development

3

To understand the complex and challenging problem of gathering accurate patient contact details, our team used several novel approaches. Four key strategies are outlined below.

Align before you design: the WCGHW and supporting partner teams connected around the challenge without any pre-existing commitments or plans as to how it should be addressed. All early activities including ideation and strategy were co-developed from scratch. This approach ensured alignment as a foundational feature of the work. Key stakeholders convened in a one-day workshop to leverage collective wisdom on why the health system struggles to collect and keep accurate contact details for its users. A human-centred design approach and expert facilitation were used to maximise workshop value. Workshop attendees included those at the coalface of service delivery, community representatives, policy and service design managers and private sector representatives with experience of collecting client contact information. This workshop and its attendees ensured that the problem was understood from many different perspectives and that the potential solutions discussed would address the reasons uncovered, and therefore have a greater chance of success.

Plan big, start small: recognising that no single initiative can solve the contactability issue in isolation, we aimed to balance ambition with focus. While the project centred on improving contact details, it was positioned within a broader context of related opportunities and challenges. This juxtaposition of a narrow project focus with a wider strategic alignment enabled integrated decision-making from the start, allowing the team to concentrate on the immediate problem without losing sight of the larger goals. It also ensured buy-in from other key players in the health system, as the project was responsive and conceptualised with them in the room.

An emergent approach to work: we adopted a dynamic, iterative approach involving a small team of high-judgement individuals. Regular check-ins allowed us to adjust plans in real-time based on learnings from each work sprint, avoiding overcommitment to unproductive tasks. This method surfaced valuable insights and opportunities that might otherwise have been missed.

Fill gaps before duplicating work: previous efforts in this area had primarily focused on systems, technical domains, staff, and processes. Our analysis revealed a gap in addressing human behavior and human-centred design. We decided to concentrate on the behavioral aspects influencing the provision and collection of accurate contact details. To this end, we engaged experts in human-centred design and behavioral sciences to explore what would motivate HCUs to provide accurate contact details and consent to their use.

Workshop

We initiated background work and partnered with Matchboxology, a human-centred design firm, to conduct an inclusive, high-quality workshop. This workshop aimed to explore the theme comprehensively and generate actionable potential solution prototypes. The project team selected one prototype to develop further, with other prototypes considered for future work or referred to other relevant teams.

The workshop took place in January 2024. The human-centred design workshop was facilitated by Matchboxology at Bellville Health Park in Cape Town. The workshop was well attended, with representation from both the public and private sectors, including rural and metro areas. To maximise value, attendees received preparation packs and were surveyed beforehand to inform them on the day's design. Established human-centred design methodologies were employed. Detailed information on the workshop is available in the February 2024 report.

The workshop yielded rich insights from all stakeholders regarding contact details and contactability. Three key themes emerged: value, trust, and comprehensive system consideration.

1. **Value:** for individuals to provide accurate contact details and consent to their use, there must be a clear value proposition for them. Historically, this aspect has been underexplored. The workshop highlighted that initiatives lacking a patient-centred value proposition are unlikely to achieve sustained success.
2. **Trust:** trust is crucial. Individuals are unlikely to provide accurate contact details if they do not trust that their information will be used respectfully and confidentially. Issues of privacy and discretion were significant concerns.
3. **Comprehensive system consideration:** the system must facilitate the easy provision, capture, storage, and use of accurate contact details. Solutions that add complexity or burden to already overwhelmed staff, users, and systems are unlikely to be effective or sustainable.

An in-depth analysis of the workshop outcomes revealed 11 potential solutions for prototype development. These ranged from implementing "read-back" rules for administrative clerks to expanding touchpoints for patient convenience and offering self-service options to enhance the value proposition for patients. Further details on these prototypes and additional workshop learnings can be found in the associated report from February 2024.

Intervention selection

Each of the 11 prototypes underwent a rigorous selection process to determine the final project for development and experimentation. The selection process included discussion sessions, anonymous voting, open forum voting, and scoring based on agreed criteria.

Prototypes were favored if they:

- Did not add additional burdens to existing staff or systems
- Offered value to patients, not just the system
- Were feasible to develop and pilot within the allotted timeframe

Based on these criteria, the project team selected the provision of free WiFi for further development.

The central question was: **"Would patients provide accurate contact details in exchange for free WiFi access in our healthcare facilities?"**

Further refinement of this question and the experiment design informed by it are discussed in subsequent sections of this report. The other prototypes remain available for future development, pending lessons learned from this activity and related work, and emerging opportunities.

Figure 1: Breakdown of WiFi intervention

Offering **FREE WIFI** to all patients in the queue for your phone number.

What is it?

A way to make waiting for service a little less painful by making X hours of free wifi in the facility waiting area available to patients via a sign in splash screen which asks for a name and/or ID number and phone number to receive the access code which unlocks wifi access.

How would it work?

Informed by the queue marshall and/or a prominent facility poster, health seekers at facilities would be **invited to enjoy access to X hours of free wifi** while waiting for services. The splash screen asks for a phone number which triggers an sms of the unique access code and also **serves as verification of the number**.

Why would it work?

- Almost all clients access WhatsApp and/or social media via their phones and **data free internet connectivity is a natural want**—especially when faced with a long wait for services.
- The **splash screen gathers name and phone number** which allows an automated, digital **back-end verification into the system**. The clerk can then **confirm the wifi access phone number is the patient's number** when the patient checks in for their file.

What would it solve?

It efficiently **automates the existing human system** of phone number data capture and allows the system to **update phone numbers in real time** based on client presence via a convenient and appreciated interaction.

Methodology

4

Pilot design

Once the team aligned on trialling free WiFi as an intervention, the team set to work to determine how exactly the pilot would work. We had a set of questions we wanted this pilot to answer that were connected and cohesive right from the start:

- Ability and desirability to connect
- Real-world engagement
- Correlation between numbers we get in the pilot and the existing numbers for these HCU in the PMI
- Contactability: were the numbers given during the pilot accurate and working

The intervention was therefore designed to answer each of these questions through the phases of the experiment. While the process and approach were fixed (agile sprints with in-project adjustments), the outcomes (i.e. what and how we were measuring 'success') were not. This allowed us to learn, adapt and iterate during the pilot, which increased the learnings generated.

The initial plan was to run the following phases in District 6 and Lady Michaelis CDCs concurrently, and then repeat the pilot in Mfuleni afterwards:

- **Phase 1:** run an initial survey to determine demographics at the clinic, reason for coming to the clinic, ability to access WiFi on personal cellphone and interest in accessing free WiFi while waiting at the clinic. This was done using a Microsoft form, with data collectors asking HCUs the survey questions and inputting the results in real time on the Microsoft form.
- **Phase 2:** offer HCUs waiting in the clinic queue access to free WiFi. In order for them to use the WiFi, they must connect to the network and let the network open a pop-up window, and then it asks for a cellphone number. The number provided is then sent a SMS with a one-time pin (OTP) that the HCU must type into the browser to activate the WiFi. This acted as a 'verification' check that the number provided is for the cellphone the HCU had with them at the clinic.
- **Phase 3:** same as phase 2 but now in addition to cellphone number, the HCU must also provide a unique identifier (South African ID number or their Clinicom number).
- **Phase 4:** add a 'booster' to the website that explains to HCUs why we are asking for this information (and why it is in their interest to share an accurate cellphone number).

However, given the agile nature of this experiment as well as the short timeline, some changes were made in process and design. All facilities conducted phase 1 concurrently and prior to the WiFi being introduced. For the rest of the experiment, the experiment design agreed on was as follows:

The experiment started in Lady Michaelis and District 6 CDCs

- **Phase 2:** offer HCUs waiting in the clinic queue access to free WiFi. In order for them to use the WiFi, they must connect to the network and let the network open a pop-up window, and then it asks for a cellphone number. The number provided is then sent an SMS with a pin-code that the HCU must type into the browser to activate the WiFi. This acted as a 'verification' check that the number provided is for the cellphone the HCU had with them at the clinic.
- **Phase 3:** the HCU needed to also add an identifier number as a compulsory field, to access the WiFi (initially Clinicom numbers were used, with facilities being moved to ID numbers as it became clear HCUs couldn't always access their Clinicom numbers).
- **Phase 4:** the HCU needed to also add their date of birth along with their cellphone number. A short 'terms and conditions' drop down was also added to explain why we needed this information and for HCUs to agree to give their personal information.

Once this was complete in these two facilities, the team then moved onto Mfuleni, where the experiment differed slightly as the learnings from District 6 and Lady Michaelis were used to iterate the intervention in Mfuleni for maximum learning:

- **Phase 2:** offer HCUs waiting in the clinic queue access to free WiFi. In order for them to use the WiFi, they must connect to the network and let the network open a pop-up window, and then it asks for a cellphone number. The number provided is then sent an SMS with a pin-code that the HCU must type into the browser to activate the WiFi. This acted as a 'verification' check that the number provided is for the cellphone the HCU had with them at the clinic.
- **Phase 3:** the HCU needed to also add their South African ID number as a compulsory field, to access the WiFi.
- **Phase 4:** team simplified the log-in page (one less step before accessing WiFi) to make access smoother.

The team also went back into District 6 and added the SA ID number back in and simplified the log-in page to see if that would increase WiFi uptake.

At each facility, the pilot was run for four days per phase (data collection phases were four hours and were done in the morning when the clinic was busiest). Each clinic had paid clinic volunteers for the first four days of roll out who helped people use the WiFi. The volunteers explained the WiFi restrictions to the HCUs:

- Only 30 minutes-1-hour on WiFi
- Speed was throttled by contention ratio, meaning as more users logged on, data-intensive uses like video streaming became more challenging
- 25 users at a time, next user allowed when first user logs out or has their 30 minutes used up

Analysis plan

The 'contactability' of the HCUs who join the WiFi and provide their cellphone numbers is core to answering the question of whether free WiFi is a sufficient incentive.

The numbers collected through the WiFi log-ins were called only once, during working hours to determine if they would (a) ring (b) someone would answer the phone.

An exit survey was run both in the facility to determine the perceived value of the intervention and for those who were called, they were also asked the exit survey questions.

Site selection

To adequately examine the core question whether free WiFi access would result in HCUs providing accurate contact details; it was important to consider the locality (i.e. within a residential area or in a busy business area); and the validity of existing

assumptions around demographics. At the time of the experiment's design, there was a widely held (assumptive) view within the WCGHW that people from lower socio-economic groups were less likely to have smartphones and therefore could not access interventions such as WiFi. The associated implication for policy makers is that interventions that are technology dependent are thus not accessible to these groups and subsequently not prioritised. Noting this experiment is fundamentally technology dependent, it was important to test this long-standing assumption. Furthermore, it is widely accepted that HCUs do not routinely use the PHC facility close to their home (for assorted reasons) and may choose to access sites some distance to where they live making locality an important consideration. Even though the WCGHW policy allows clients to access any PHC facility of their choice, irrespective of where they live, clients are often still hesitant to provide their accurate contact details when presenting for a visit to a facility outside of their area or provide false information when doing so. It was, therefore, important to understand if clients accessing care outside of their residential area were more/less likely to share accurate contact details when using free WiFi.

Three WCGHW PHC facilities were purposively selected based on a) relative socio-economic location, and b) location within a residential area or central business district (CBD). Each selected facility is discussed according to the criteria.

District 6 CDC

District 6 Community Day Centre (CDC) is a large PHC facility located within Woodstock, in the Western sub-district of Cape Town on the border of the CBD. It serves areas of Woodstock, Salt River and residential areas inside and on the periphery of the CBD. The facility also services a substantial number of HCUs who work in the CBD but live outside of it. Importantly, clients accessing care from areas further outside of the city often come from lower income areas, compared with those who live within the immediate proximity of the facility. Noting the heterogeneity of clients accessing care from both low- and high-income areas, it satisfied both primary inclusion criteria.

Lady Michaelis CDC

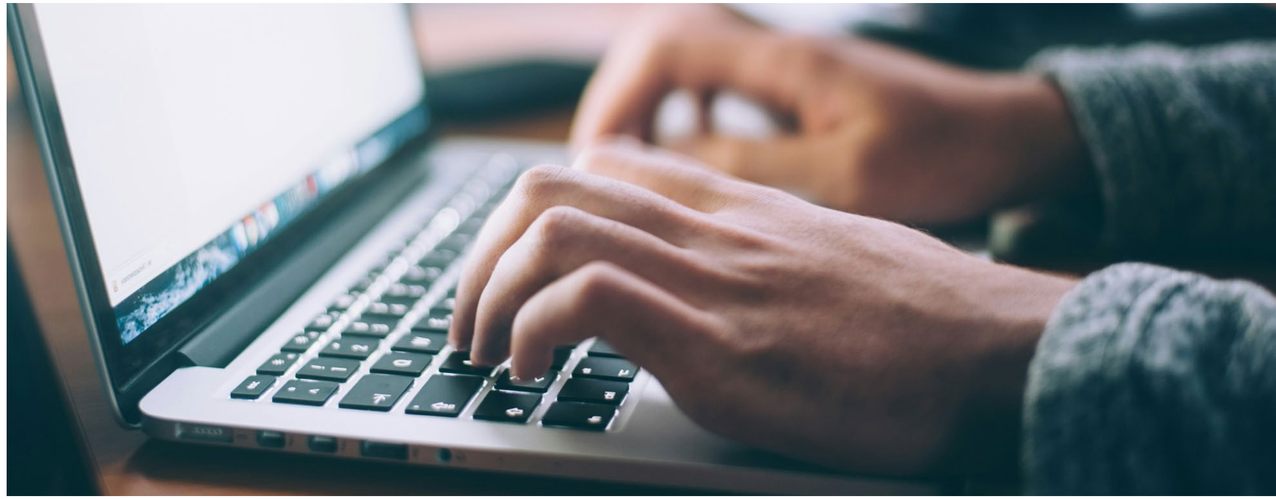
Lady Michaelis CDC is in Plumstead, a residential area in the Southern sub-district of Cape Town. Plumstead is considered a mid- to upper-income area. Whilst Plumstead is well serviced by public transport routes, it remains a residential area. Lady Michaelis CDC provides a wide range of PHC services, and its catchment population was older - reflective of the community living in Plumstead.

Mfuleni CDC

Mfuleni CDC is a residential facility located in Mfuleni, in the Eastern sub-structure of Cape Town. Mfuleni is considered a low- to middle-income area with relatively high unemployment rates. The facility provides a wide range of PHC services and sees a high number of adolescents and young adults.

The range of facilities selected allows for comparison across socio-economic and residential/CBD locality.

The first phase of the pilot, which was an initial survey, was also run in two rural primary healthcare clinics: Avian Park and De Doorns clinics in the Cape Winelands district. The rest of the pilot was not run in these facilities due to time and resource constraints, but it would be valuable to do so given the high appetite for WiFi found in responses to the survey.



Findings

5

This section is split into two parts: first the findings from the pilot in terms of whether free WiFi is sufficient motivation for HCUs to provide their accurate contact details to the health system. The second part highlights some of our findings in terms of running a pilot like this and learnings for other technology-dependent interventions.

Results from the experiment

Phase 1

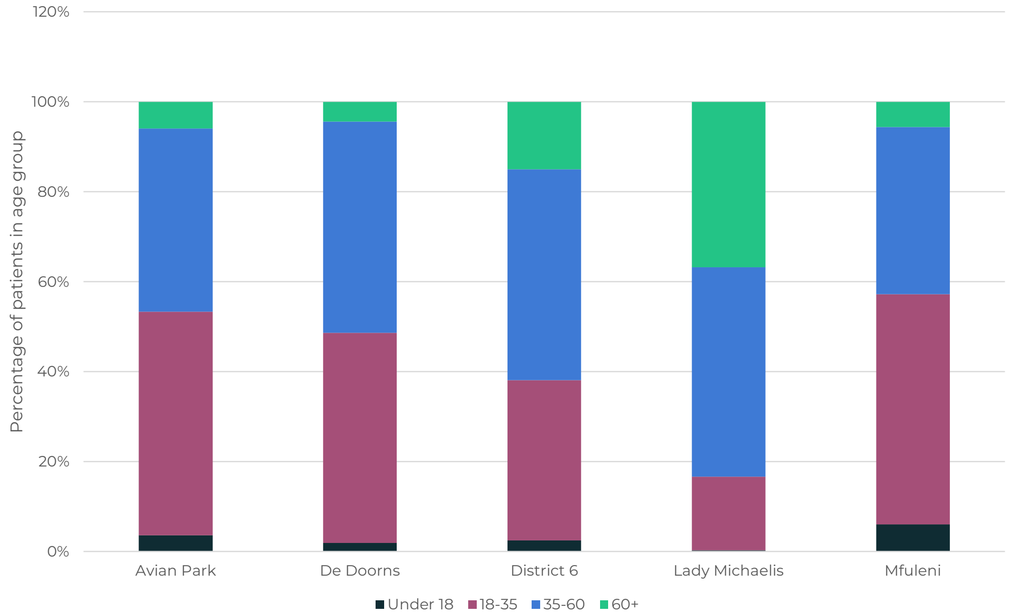
All facilities rolled out phase 1, which was a survey to determine interest and appetite for WiFi run over four consecutive days in each facility. Table 1 shows the total number of individuals (adults) surveyed per facility over the four-day period, and the average HCUs in each facility who were questioned (where the average daily headcount during the survey month was used as the denominator). The total number of HCUs who completed the survey was 2,395 over the five facilities, which meant that the data collection team reached approximately 42% of those attending the clinic. Mfuleni had the most survey respondents at 676 individuals, but this translated to the lowest percentage of HCUs questioned because Mfuleni is a very busy facility with a high daily headcount. Avian Park clinic, one of the rural facilities, showed the highest percentage of HCUs reached with the survey, at 71%. Part of this positive engagement achievement was because the HCUs are well known to the facility, and it was easier for the data collectors to establish trust and administer the survey.

__Table 1:__ HCUs surveyed in phase 1 across the five pilot facilities

PHC facility	Number questioned over 4-day period	Average headcount per day in survey month	Percentage HCUs reached per day
Avian Park (rural)	437	153	71%
De Doorns (rural)	411	233	44%
District 6	553	409	34%
Lady Michaelis	318	238	33%
Mfuleni	676	561	30%
Total	**2395**	**1594**	**Average: 42%**

The two rural sites had a younger population, but this did not make them any more interested, willing or able to use WiFi – which was a surprising finding. Lady Michaelis had a slightly older population of respondents, due to the socio-economic status of its catchment population as discussed earlier in this report. In all the sites, 70-80% of the respondents were women. This is in line with what is viewed as common gender demographics presenting at a clinic. The rural clinics had a slightly higher percentage of women, which is fitting with what we know about men needing to work in the city, so women are left at home to run the household and look after the family.

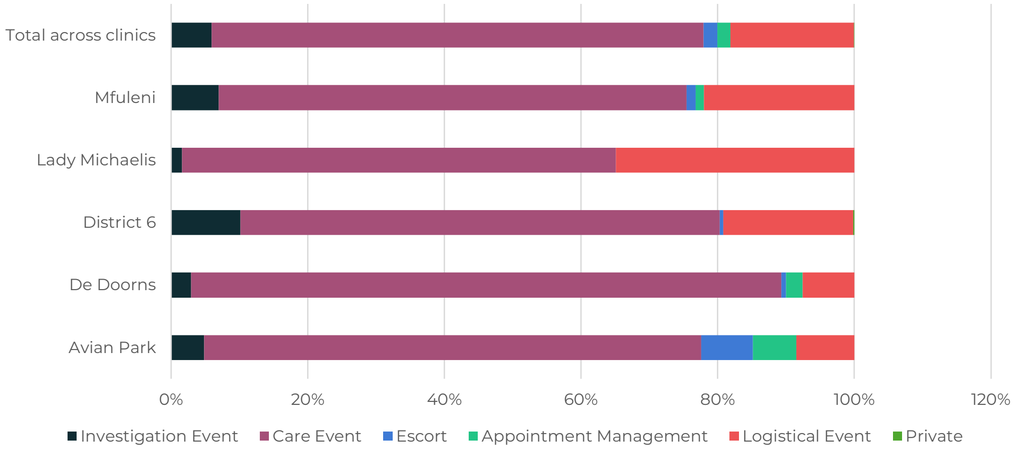
Figure 2: *Demographics of survey respondents*



The survey also showed that most (60%) people at the clinics had an appointment (see Figure 3). This may be sampling bias since the surveys were done in the morning – and it is possible that walk-ins arrive later in the day. Those with appointments are also more likely to have already given an accurate contact number to the PHC facility to facilitate appointment bookings and reminders.

Those with appointments also tend to have shorter waiting times, and therefore free WiFi may not be sufficiently motivating.

Figure 3: *Reason for visits across clinics*



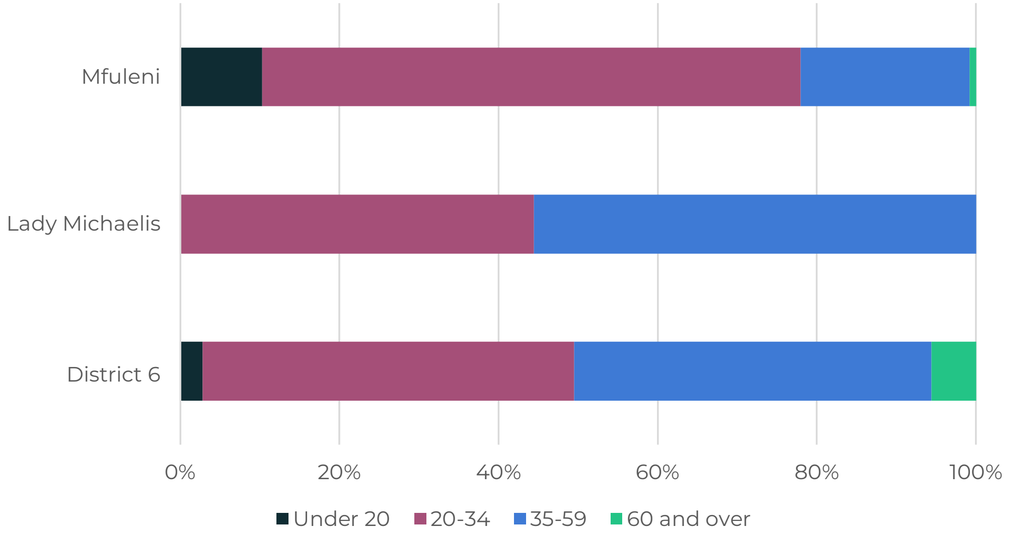
From the survey, over 80% of respondents recorded being interested in having access to free WiFi in facilities while they wait. Most had a cellphone that was WiFi enabled, the greater stumbling block was knowing how to connect to the WiFi.

Is free WiFi enough to get accurate contact details and identifiers?

Free WiFi was rolled out in the three urban PHC facilities. The volunteers observed that most people managed to log onto the WiFi without too much trouble. Those with older models of cellphones found it a bit trickier.

Figure 4 shows the age breakdown of those who accessed the free WiFi. Of 1,371 registered users, 1,197 had to provide an ID number or date of birth, of these 1,009 had ages between 16 and 100 and were counted as valid. Mfuleni has the youngest user base, and Lady Michaelis the oldest.

Figure 4: Demographics of WiFi users



By the end of the pilot, 1,371 phone numbers were collected via HCUs accessing the free WiFi (see Table 2). The pilot in District 6 ran the longest, and all the improvements made to the pilot along the way were rolled out in District 6. Usage was much greater in Mfuleni. Contributing to this could be that the population in Mfuleni come from a different socio-economic background to the other two facilities, perhaps due to a greater marketing effort from staff at the facility evidenced by them printing their own 'how to use WiFi' guides made by volunteers. We also calculated the average number of daily adult HCUs who accessed the WiFi - this was highest at Mfuleni at 10%, and lowest at District 6 with only 2% of adults waiting in the clinic queue for a consult accessing the WiFi.

Table 2: Cellphone numbers collected during the pilot

Clinic	District 6	Lady Michaelis	Mfuleni	Total
Total unique phone numbers collected	234	92	1,045	**1,371**
Days network was active	39	12	25	**76**
Average unique phone numbers collected per day	6	8	42	**56**
Percentage of potential patients using WiFi	2%	4%	10%	**Average: 5**

In phase 3 of the pilot, the HCU had to also provide a unique identifier to access the WiFi. Initially folder number (also known as Clinicom number) was used as an identifier, but we found that some patients did not know their folder number, so in the next iteration that was run in District 6 only, we switched to asking them to provide their SA ID numbers, rather. In District 6 we saw a huge drop when we introduce a required identifier, suggesting that people either do not want to share their identifier, or do not have it. The drop was reduced slightly when the identifier changed from folder number to ID number but was still substantial.

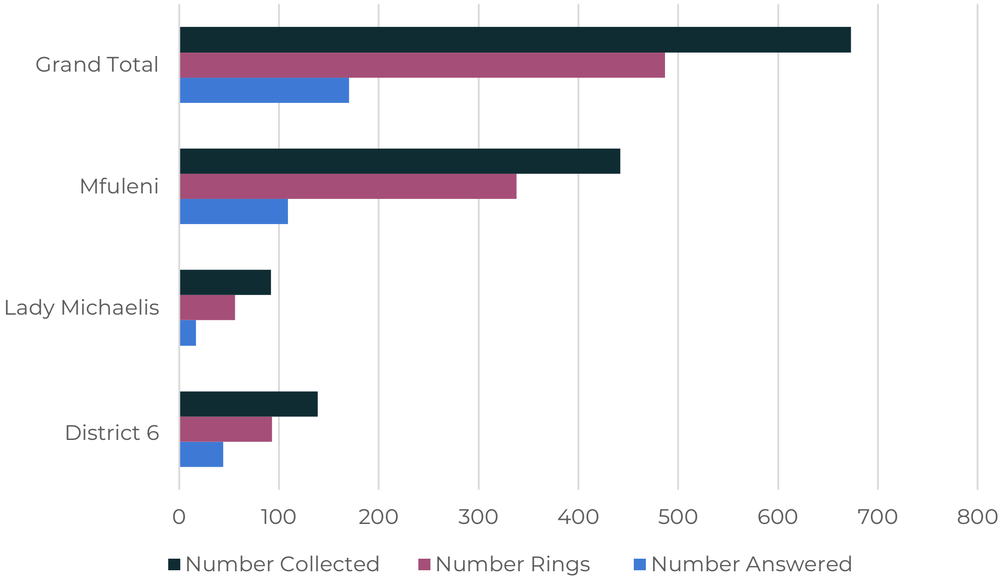
The switch to ID numbers instead of folder numbers was not trialled in Lady Michaelis. In Mfuleni, we found that log-ons increased when the identifier was added, but this coincided with simplifying the log-in in other ways, so it could be unrelated to the identifier. The simplified log-on was part of phase 4 of the pilot. We introduced a simpler one step log-in, which resulted in a slight increase in users per day at both sites where this was trialled (District 6 and Mfuleni).

Results of contactability tests

We tested contactability of 841 numbers (data collection at Mfuleni and District 6 continued for a further week after contactability testing began which is why not all numbers were tested). After duplicates were removed, 673 numbers remained: 442 from Mfuleni, 92 from Lady Michaelis and 139 from District 6.

For all the clinics, at least 60% of collected numbers rang. For Mfuleni, nearly 75% of the numbers called rang. In total 487 numbers rang. Between 32% (Mfuleni) - 47% (District 6) of the numbers that rang, had someone who answered the phone. Number of patients whose numbers were collected, rang, and answered are shown in the cascade below.

Figure 5: *Contactability cascade*



This data on the number of calls that both rang and were answered is the most important finding from this pilot, as it tells us whether the contact details collected through the intervention result in better contactability than existing interventions.

The only comparisons we had were the figures from the WCGHW's previous TB call centre, which was able to reach 10-30% of people they tried to reach, using either a three or five call protocol (where they try up to five times to call the number). For our pilot, across all clinics, 25% of collected numbers answered after just one call.

This is a promising finding because on a less stringent protocol, we are achieving similar or better contactability than was achieved with status quo. In addition, there seemed to be durability of contact details from confirmation at the start of the trial to calling clients. This is an important finding considering the assumption that users change their phone numbers frequently. However, sampling bias, and the small scale of our pilot, may mean that the data is skewed. In addition, we find that **verifying numbers provided through a one-time pin (OTP) resulted in a high rate of numbers that ring (>60%), suggesting this could be a useful addition in the bouquet of interventions available for solving this tricky problem**.

Key insights and learnings

Key insights

- More people have smart phones than assumed. There seems to be widespread access to smartphones to support similar technology interventions
- We saw increased ability to use the WiFi in younger age groups
- Desirability for the WiFi approached 100% for younger adults with devices
- Despite this, the actual usage of the WiFi was lower than anticipated during the pilot: this remains an unanswered question
- 40-50% of the numbers collected are new to the system – this is a very significant finding, indicating that OTP-boosted self-provision of contact numbers is effective at harvesting new, valid contact details
- Higher real-world contactability than the system has previously achieved was achieved using numbers harvested and verified through OTPs
- This might indicate opportunities to continue and evolve the WiFi offering (even with low engagement), and/or to develop other OTP-boosted approaches

Technology learnings

The clinic networks utilised a combination of hardware and software components to provide secure and managed WiFi access while collecting patient information during signup. The primary components included OPNSense for firewall and network security, Ubiquiti Access Points (AP) for client connectivity, MySQL for data storage, RADIUSdesk for authentication and accounting, Twilio for SMS services, Django for the Application Programming Interface (API) framework, and Amazon Web Services (AWS) for hosting.

When deciding on the equipment and software to use, consider the following factors:

- **Backhaul link:** to avoid over-saturation and an unpleasant user experience, it is important to rate limit user speed based on the capacity of your internet link.
- **Capacity:** ensure the devices can handle the expected number of concurrent users. The AP should support the maximum number of devices that may connect simultaneously. The firewall hardware also needs to be capable of rate-limiting these devices, authenticating them, and processing the data they generate. These features are directly linked to the RAM and CPU capacity of the devices.
- **Scalability:** choose solutions that can scale with your network's growth, both in terms of hardware (more APs, larger firewalls) and software (ability to handle more API requests). With an increased number of users, there will be more bandwidth consumed, and thus you will need a backhaul capable of providing this, and your firewall will need the processing power to handle the increased data flow.
- **Compatibility:** ensure all components can work together seamlessly.
- **Local market limitations:** in the South African market, availability and support for certain network devices is limited. For example, it is difficult to source a firewall locally unless you import it.
- **Cost:** networking equipment is expensive, especially high-end equipment that can sustain large numbers of concurrent users.

Two issues came up during data collection that resulted in delays and the need to purchase more equipment to ensure the WiFi was stable enough:

- **Power outages:** our devices were old computers using hard drives, so power cuts resulted in hard drive corruption twice. To mitigate this, we installed an inverter to ensure the devices did not suffer from power cuts.
- **Remote access:** remote access to the network was not set up, so each time there was an update to the captive portal, it required a physical site visit. This can be avoided by installing a Raspberry Pi or a similar device with remote desktop software to easily connect to the network and update the firewall. Alternatively, if the firewall has enough resources, you could run an OpenVPN server on the firewall and update the captive portal via SSH.

Recommendations

6

Cohesive strategy on outsight

There is value in developing a cohesive strategy and framing it at the outset of intervention design. This enables later adjustments to be made while still serving the underlying strategic goal. This approach should be key when engaging in operational research with partners, and formulating a cohesive strategy should be a requirement before commencing research.

Promote technological interventions to users

Technology embedded interventions directed at users should be promoted. We have found sufficiently widespread smartphone access and interest to support this. The uptake of WiFi in the form used in this experiment was not sufficient in clinics for it to be scaleable, but introductions of other technological interventions such as a potential WiFi 2.0 intervention should be considered for appropriate scale-up.

Align before you design

The “align before you design” approach is valuable and has substantial implications to guide how we engage with partners to merge expectations and optimise relationships. Consider utilising the findings of this work as the model to guide how Memoranda of Understanding between WCGHW and partners should be constructed.

High quality partnerships

Investing in high quality partners to fill in-house gaps (i.e. Matchboxology for human-centred design) is valuable. Policies setting out how partnered research is conducted should include that in-house gaps will be assessed and where gaps are identified, suitable external partners will be considered.

Embrace agile ways of working

Agile, iterative work with compact high-judgement teams are effective. However, they require a team that meets regularly, has a cohesive strategy guiding it, and is aware of the team’s gaps. Agile ways of working allow for quick adjustments but have to be kept in line with guiding objectives to achieve measurable research outcomes.

Embracing findings as key successes

Framing ANY outcome, even if the pre-stated objective has not been achieved – as long as we learn something – as success frees teams to be bold and effective. Outcomes should be embraced as learnings that form the foundation for future interventions, and these learnings should be measured as successes.

OTP collection efficacy

The OTP mechanism provides the only dataset of numbers we objectively know are real, active and current. WCGHW should consider contactability experiments to more formally assess contactability on conventional number sets versus OTP boosted sets.