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## **Evaluation of the On Cue Compliance Service Pilot**

Testing the use of SMS reminders in the treatment of Tuberculosis in  
Cape Town, South Africa

bridges.org

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Prepared for the City of Cape Town Health Directorate and the International  
Development Research Council (IDRC)

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## **Executive Summary**

Tuberculosis (TB) is an increasing public health problem in South Africa, where one of the most alarming TB epidemics in the world is being faced. Cape Town has one of the world's highest incidences of TB due to socio-economic and climatic factors, and the prevalence of HIV/AIDS. The usual method of treatment is a six (or eight) month course of drugs, given by the directly observed therapy system (DOTS), in which patients are watched ingesting all their tablets. DOTS has been shown to produce the best results for adherence, but places a heavy burden on the health service, and on the patient. It follows that the health service is keen to investigate alternative, cost-effective methods for enhancing patient adherence to their treatment regimes.

This evaluation looks at a project led by On Cue, a small company based in Cape Town, which sends Short Message Service (SMS) messages to patients via mobile telephones, reminding them to take their TB medication at pre-determined times. The Compliance Service aims to provide an affordable solution to improve patient adherence to TB treatment and reduce the associated costs of the DOTS system for both patients and clinics. This evaluation report presents the lessons learned so far to inform decision-making about future rollout of this system, as well as other uses of cellular technology in the healthcare sector.

### Methodology

The evaluation set out to (1) determine the effect that the use of the Compliance Service had on TB cure rates and treatment completion rates; (2) identify and describe any related social and economic impacts that may result from the use of the technology in this context; and (3) conduct an assessment of the Compliance Service in terms of whether, and how, best practice principles for project management have been implemented. The evaluation involved three groups of key stakeholders: patients receiving the Service, clinic staff, and TB experts and managers at the City of Cape Town Health Directorate. The project evaluation combined quantitative and qualitative data collection. Information was collected from patient records, background documents and reports, clinic visits, and structured interviews of patients and staff through the use of questionnaires.

Cure and completion rates were determined from an examination of 221 patient records and compared to those for the clinic as a whole. The bridges.org *Real Access/Real Impact* framework was used to examine the social and economic impact of the Compliance Service on patients and the health service. The *Real Access* criteria used to shape this evaluation were: physical access to cellular technology; appropriateness of cellular technology to health care in this context; cost impact: patient costs; cost impact: health service costs; capacity issues around using the Compliance Service; privacy and data protection; integration of the Compliance Service into daily routines; patient support and enthusiasm for the Compliance Service. The evaluation looked at how the project has been conducted in terms of: doing some homework and starting with a needs assessment; implementing and disseminating best practice; ensuring ownership, getting local buy-in, finding a champion; setting concrete goals and taking small achievable steps; critically evaluating efforts, reporting back to clients and supporters, and adapting as needed; addressing key external challenges; making it sustainable; and involving groups that are traditionally excluded on the basis of age, gender, race or religion.

### Findings

The main finding of this evaluation is that the Compliance Service has potential as a cost-effective system that would be appropriate to complement DOTS in Cape Town clinics and beyond. However, a number of obstacles to the use of the Service have been identified, which need to be overcome in order to make this system work effectively.

The project management issues are so inherently intertwined with the technology that it is difficult to separate them. Project implementation clearly limited the effectiveness of the Compliance Service, but it is not a reflection on the usefulness of the technology itself. To the contrary, the Service has potential to provide more choice in the care of TB and greater convenience for the patient. However, the problems encountered underline the limitations of the Service and imply there are important conditions for its success.

Mobile phones and SMS have proven to be effective tools in the context of health care in South Africa in terms of accessibility, appropriateness and cost. But healthcare workers cannot rely on the technology alone to solve the problem of patient adherence. Both patients and healthcare workers liked the Service and were able to use cellular technology effectively. Yet a significant number of patients interviewed were not using the Service as instructed. The Compliance Service showed rates for TB cure and completion similar to those of clinic-based DOTS at the clinic. But they could not be used to gauge treatment adherence levels due to poor implementation procedures used in the pilot.

A number of obstacles to widespread rollout exist. Monitoring for treatment adherence is a problem where patients are not seen daily (as they are with DOTS). An overall lack of ownership of the project at the clinic limits the proactive participation of the staff, and no one on-site takes responsibility for ensuring the Service is implemented effectively. A lack of regular feedback and interaction between the City, On Cue, and the clinic creates a "disconnect" that hinders success in a number of ways. A number of practical implementation issues limited the effectiveness of the pilot. Clinic staff schedules are tight and many staff members feel that they are over-worked. City and clinic bureaucracy limits the add-on functionality that would expand the usefulness of the Compliance Service. Issues of privacy, data protection, and security will affect the widespread use of technology in healthcare in Africa over the long-term.

### Recommendations

In our view, the Compliance Service pilot should be re-implemented and re-evaluated, leveraging on the lessons learned in this initial evaluation. The renewed pilot should be conducted according to clear, written procedure for running the Service, and recording data derived from it. The criteria for patient selection must be clearly defined. Patients must be educated such that the healthcare worker is satisfied they will remain adherent if selected for the Compliance Service. And to improve adherence levels, a purposeful effort is required to monitor adherence on the few opportunities healthcare workers have to see patients on the Compliance Service.

In the interim, the Compliance Service should be continued for those currently enrolled; given the level of enthusiasm for the Service, a return to clinic-based DOTS may have a negative impact on patients that are currently using the Service successfully. However, it would be advisable to recall these patients and remind them of what they should do upon receiving an SMS reminder. Scaling up will depend on the ability of On Cue to address the obstacles outlined here, but there is no reason that this could not be done.

### Conclusion

The Compliance Service pilot has produced treatment outcomes in line with those reported for the clinic, but contrary to expectation, they were no better. However, these results are tied to the way in which the Compliance Service was implemented, and because there were many shortcomings in implementation, these treatment outcomes are not valid to judge the effectiveness of the system itself.

The technology works and it is effective. And on face value, it also provides a more cost-effective treatment option, both for the health service and patient. The convenience of TB treatment for the patient is also greatly improved. But, the Compliance Service is only a viable option if adherence levels are at least those of clinic-based DOTS. The evaluation has shown that implementing the Compliance Service involves a trade-off between the

gains made on cost and convenience and the losses from having to put extra efforts into getting to know, and monitor self-supervised patients. This technology is not a silver bullet to solve the problem of patient adherence: it is all down to the way in which it is implemented.

We believe that if the Compliance Service were re-implemented and re-evaluated, leveraging on the lessons learned in this evaluation, treatment outcomes would be improved. The findings presented here highlight the most important areas requiring attention, and starting over should not be difficult, provided sufficient thought is put into the process. Key to the success of the Compliance Service is an understanding of where the use of the technology ends and care giving begins. The Compliance Service could be a valuable enabler of the TB Control Programme but getting that fit right is all important.

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- Annex 2. The bridges.org Real Access/Real Impact criteria
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- Annex 7. Results of a survey of health worker satisfaction with the Compliance Service
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## 1 Introduction

*Tuberculosis* (TB) is a grave public health problem in South Africa, where one of the most alarming TB epidemics in the world is being faced. The World Health Organisation (WHO) categorises South Africa as one of the 22 "high burden" countries for TB. Although detection rates for the disease are satisfactory, the national figures for successful treatment of TB remain way below target.<sup>1</sup>

The highest incidence of TB is in the City of Cape Town: 678 cases per 100,000 people were reported for 2003.<sup>2</sup> This is due to socio-economic and climatic factors, and the prevalence of HIV/AIDS. Cape Town's winters are cold and wet, and this poses a health hazard for people living in so-called "informal settlements". In these very poor communities, large numbers of people live in close proximity in wooden shacks, many of which are built below the waterline and flood during winter. Under these conditions, people are more prone to contracting TB. Free medicine is available, but TB patients have to follow a strict treatment regime (at least four tablets, five times a week for six months) and often do not adhere to their instructions.

Non-compliance with TB treatment is exacerbating the high incidence of TB and causing problems for the local, overburdened, healthcare service. Precious medicines are wasted when people do not take their medication, and non-compliance encourages drug resistant strains of the TB bacterium to develop. The internationally accepted method of giving treatment is the directly observed therapy system (DOTS), in which patients are watched taking all, or most, of their doses. But DOTS places a significant burden on the already over-stretched local health services. And in many developing countries, the DOTS system requires patients to travel to clinics, resulting in absenteeism from work and increased travel costs.

This report looks at a project led by On Cue, a small company based in Cape Town. On Cue's Compliance Service sends brief text-based messages -- called "Short Message Service" (SMS) messages -- to patients via mobile telephones, reminding them to take their TB medication at pre-determined times. It aims to provide an affordable solution to improve patient adherence to TB treatment and reduce the associated costs of the DOTS system for both patients and clinics. The Compliance Service has been piloted in a clinic in Cape Town, in order to demonstrate the viability of the service and its potential to improve TB treatment outcomes. The pilot has run since January 2002. On Cue has worked in partnership with the City of Cape Town Health Directorate to conduct the pilot. Should positive results be demonstrated, this evaluation is expected to lead to the rollout of the system across Cape Town, and to catalyse further field trials (including for HIV/AIDS treatment).

Bridges.org was engaged as an outside consultant to conduct an independent evaluation of the Compliance Service pilot in Cape Town. The bridges.org evaluation looked at the Service's effect on TB compliance by measuring cure and completion rates of patients on the pilot. It investigated the related social and economic impact of the use of the Compliance Service on the clinic, its staff, and patients, and also examined the project management practices used in implementation of the pilot. Both qualitative and quantitative data were collected during clinic visits and interviews conducted in June to September 2004.

This evaluation report presents the lessons learned in this project to inform decision-making about future rollout of this project, and to explore the potential of mobile phones and SMS in healthcare. It is also intended to provide resource materials for planning and

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<sup>1</sup> "Global Tuberculosis Control: Main Findings" WHO, 2004,  
[http://www.who.int/tb/publications/global\\_report/en/](http://www.who.int/tb/publications/global_report/en/).

<sup>2</sup> "Cape Town TB Control Programme Report", City of Cape Town Health Directorate, 2003.

implementing future steps in the Compliance Service project or related initiatives. This report was prepared for the City of Cape Town Health Directorate and the International Development Research Council (IDRC). However, it has been written with a wider audience in mind, including: the development aid community, future donors, technology companies, research and development organisations, government bodies, non-governmental organisations (NGOs), and healthcare practitioners working in the field of Tuberculosis and other diseases, where treatment compliance is a concern.

## 2 Background on the treatment of Tuberculosis

### 2.1 Tuberculosis: a worldwide problem

Tuberculosis is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*. It primarily infects the lungs but can also infect other organs. TB is a global problem of startling proportions, causing around two million deaths per year. And although some developed countries have seen an increase in recent years, over 95% of cases are found in the developing world.<sup>3</sup> Nine of the 22 countries in sub-Saharan Africa accounted for 80% of global TB in 2002.<sup>4</sup> And over 300 per 100,000 people have TB across the Southern African region, due in large part to the high prevalence of HIV/AIDS.<sup>5</sup> South Africa has both a high burden of TB (meaning the total number of people requiring treatment is high), and high incidence rate (the number of new cases per 100,000). TB is considered a priority disease for the South African health service. It follows that new, affordable methods for combating TB are needed to bolster existing efforts at controlling the disease.

A number of international health organisations support TB control programmes, foremost of which is the World Health Organisation (WHO), with an entire department dedicated to combating the disease. The WHO "Stop TB" department supports a global TB control programme based on the Millennium Development Goals (MDGs). The MDG targets are to detect 70% of new smear-positive patients and successfully treat 85% of them by 2005, and to halve TB prevalence and deaths rates by 2015 (as compared with 1990).<sup>6</sup> Most countries with a high incidence of TB devise national TB control programmes based on the recommendations of the WHO, and aim to meet the WHO's targets for curing the disease.

Typical symptoms of TB are a persistent dry cough, fever, night sweats, chills, fatigue, weight loss, and/or appetite loss. TB is spread through the air, but not everyone who is exposed to the bacterium develops the disease, and of those that do develop the disease, not all are infectious. A number of people have latent TB where, although they carry the microbe that causes it, they may never develop the disease, do not feel sick and do not transmit it to others.<sup>7</sup> Conversely, people with active, pulmonary TB are highly infectious.

Groups most at risk are those suffering from physical and psychological stresses, such as unemployment, poverty, homelessness and those in institutional settings. In sub-Saharan Africa, people who are immuno-compromised present the biggest challenge for healthcare services, where TB is associated with HIV/AIDS. Because the immune system of HIV+ people is compromised, latent TB has a greater chance of developing into the active disease. In fact, HIV+ people are 800 times more likely to develop active TB, and HIV is the leading factor in the progression of latent TB to active TB. As such, HIV+ people with active TB are said to have an "AIDS-defining condition", and TB is the most common

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<sup>3</sup> For more information see [http://www.redcross.org/article/0,1072,0\\_440\\_1744,00.html](http://www.redcross.org/article/0,1072,0_440_1744,00.html).

<sup>4</sup> For more information see <http://www.results.org/website/article.asp?id=955>.

<sup>5</sup> For more information see [http://www.who.int/tb/publications/global\\_report/2004/annexes/en/](http://www.who.int/tb/publications/global_report/2004/annexes/en/) see Annex 5.

<sup>6</sup> For more information see <http://www.undp.org/mdg/Millennium%20Development%20Goals.pdf>.

<sup>7</sup> "TB Facts for Health Care Workers: Identification of Persons with TB Infection and Disease", Centers for Disease Control and Prevention, January 14, 1999, <http://www.thebody.com/cdc/tbfacts/id.html>.

cause of death in AIDS patients globally.<sup>8</sup> Diagnosis of TB in HIV+ patients (who's HIV status may not be known at the time), often relies on recognition of atypical presentations of the disease (where the patient has unusual symptoms), and high rates of extrapulmonary TB.

Multi-drug-resistant TB (MDR-TB) is on the increase and strains resistant to all major anti-TB drugs have emerged. MDR-TB is a "man-made" problem, caused by patients not adhering to their treatment regimes, health workers prescribing the wrong treatment regimes, or because the drug supply is erratic.<sup>9</sup> Alarming, one MDR-TB strain is resistant to the two most powerful anti-TB drugs. Although MDR-TB is treatable, it requires extensive chemotherapy (up to two years of treatment), that is often prohibitively expensive (more than 100 times more expensive than treatment of drug-susceptible TB), and is also more toxic. Poorly supervised or incomplete treatment of TB is a serious problem, largely because once MDR-TB has developed, patients infect others with the same, difficult to treat strain. Indeed, from a public health perspective, poorly supervised or incomplete treatment of TB is a disastrous scenario. Consequently, WHO and its international partners have formed the "DOTS-Plus Working Group", which develops global policy on the management of MDR-TB, and facilitates access to second-line, anti-TB drugs for approved projects.<sup>10</sup>

## 2.2 How TB is detected, treated and controlled

The best cure results are seen when TB is treated without delay. Control of TB relies on the early detection and treatment of people with infectious forms of the disease. To facilitate this, the TB vaccination is given. It contains a live attenuated (weakened) strain of *Mycobacterium bovis*, which causes the recipient's immune system to build resistance to the disease.<sup>11</sup> Contrary to common belief, the vaccine does not prevent TB on its own; there are many other influences on immunity, including a family history of TB, or the patient being HIV+.

A tuberculin skin test is commonly used as an initial test to determine exposure to TB. Previous exposure to TB causes a reaction to develop within 2 days, usually causing a firm red bump at the injection site. The reaction is graded according to the appearance and size of this bump, which depends on the immune system. The tuberculin test provides a rough indication of exposure to TB, but to detect the disease with certainty, a smear test is carried out. Here, the patient produces sputum from the lungs which is sent off to a lab to be tested for presence of the bacterium. Those that carry it are said to be "smear positive". For HIV+ patients sputa tests are not as helpful due to increased rates of smear negative pulmonary TB and a greater frequency of extrapulmonary forms of the disease, making TB more difficult to detect.

The standard treatment regime for TB involves four drugs (or five for patients that had TB previously) administered via the directly observed therapy system, or DOTS, over a six-month (or eight-month) period.<sup>12</sup> Tablets are taken once a day with food and liquid to prevent any queasiness. The total number of tablets per day depends on the patient's weight, but is still at least four, and they are large. Tablets are taken on week days only, with a 2-day break at weekends.

After two months of treatment, new cases are usually reduced to two drugs per day, depending on the patient's progress. Re-treatment cases (where the patient had TB previously) are given injections of the antibiotic "streptomycin" at the beginning of treatment, and the regime is stepped down at two months, from five to four drugs per

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<sup>8</sup> "The Deadly Intersection Between TB and HIV". National Center for HIV, STD and TB Prevention, Divisions of HIV/AIDS Prevention, <http://www.cdc.gov/hiv/pubs/facts/hivtb.htm>.

<sup>9</sup> For more information see <http://www.who.int/mediacentre/factsheets/fs104/en/>.

<sup>10</sup> For more information see [http://www.stoptb.org/Working\\_Groups/DOTS\\_Plus/default.asp](http://www.stoptb.org/Working_Groups/DOTS_Plus/default.asp).

<sup>11</sup> For more information see [http://www.who.int/vaccine\\_research/diseases/tb/vaccine\\_development/bcg/en/](http://www.who.int/vaccine_research/diseases/tb/vaccine_development/bcg/en/).

<sup>12</sup> The anti-TB drugs are: isoniazid, rifampin, pyrazinamide, ethambutol or streptomycin.

day. HIV+ patients are given the same drugs plus "Bactrim" once a day to reduce the chances of contracting pneumocystis carinii pneumonia, a type of pneumonia that is common to HIV+ patients. Patients are closely monitored, especially in the first few weeks, for adverse affects to the medication, complications, and non-adherence to their treatment regime. For patients who tested smear positive at the beginning of their treatment, those that produce negative sputa before the end of treatment, and at the six-month mark, are considered cured of TB.

The impact of TB control programmes are measured by a number of indicators. Those commonly used are *cure rate*, which is the percentage of smear-positive patients that were shown to be smear-negative at the end of treatment and at least on one other occasion (each test being at least a month apart), ideally at 2 – 3 months into treatment. The *completion rate* is calculated from patients that have completed the full course of treatment but do not meet the criteria for "cured". And the *treatment success rate* is the sum of patients that were cured and completed as a percentage of the total registered in the cohort (a term that refers to a group of patients registered with the disease over a defined time period).<sup>13</sup> The WHO and International Union Against TB and Lung Diseases set targets for these indicators, and statistics are calculated for each TB clinic to determine case findings and treatment outcomes. These statistics are essential for adapting TB control programmes to changes in factors that impact on the spread and containment of the disease.

### **2.3 The issue of patient adherence to treatment regimes**

Patient adherence is one of the greatest determining factors in the control of and is also one of the most elusive. Because the bacterium is particularly resistant to drugs, it must be treated by a sustained bombardment of antibiotics over a relatively long time period. For most bacterial infections, antibiotics are taken for no longer than a week, but TB treatment requires a minimum of six months, and so it is not surprising that non-adherence is a problem.

There are many consequences of poor treatment adherence. The patient will likely suffer prolonged illness and disability, and because they remain infectious for longer there is a greater chance of transmitting the disease to others. Poor adherence also results in the development of multi-drug-resistant TB strains, which are more difficult to treat, placing extra burden on the healthcare service and leading to a higher death rate. Many healthcare workers try to predict which patients are more likely to adhere to their medication, but studies have shown they are only right on average 50% of the time.<sup>14</sup>

There are many reasons for poor adherence, including the personal and social characteristics of patients and the healthcare workers treating them; cultural beliefs on both sides; the infrastructure supporting the healthcare system; and the extent of the patient's knowledge and perception of the disease.<sup>15</sup> There is evidence that a good, trusting relationship between patient and healthcare worker is key to obtaining good adherence levels.<sup>16</sup> The healthcare worker needs to know the patient sufficiently to understand the reasons behind non-adherence (which can be diverse), and must get the patient's buy-in to complete the course of medication in the correct way. If this is done, putting measures in place to enhance adherence is much easier. For example, long waits at the clinic can demotivate patients; this can be solved by scheduling appointments. And for working people with no sick leave, TB clinics can stay open after working hours.<sup>17</sup>

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<sup>13</sup> For more information see: [http://www.who.int/publications/global\\_report/2004/en/methods.pdf](http://www.who.int/publications/global_report/2004/en/methods.pdf).

<sup>14</sup> Ibid.

<sup>15</sup> "Improving Patient Adherence to Tuberculosis Treatment". Center for Disease Control and Prevention, 1994, [https://www2.cdc.gov/nchstp\\_od/piweb/tborderform.asp](https://www2.cdc.gov/nchstp_od/piweb/tborderform.asp).

<sup>16</sup> "Compliance in Health Care", Haynes RB, Taylor DW, Sackett DL, *Baltimore: The John Hopkins University Press*, 1979.

<sup>17</sup> "TB Facts for Health Care Workers: Identification of Persons with TB Infection and Disease", Centers for Disease Control and Prevention, January 14, 1999, <http://www.thebody.com/cdc/tbfacts/id.html>.

The WHO recommend DOTS be used to treat TB in all countries with a treatment completion rate of less than 90%. Fundamental to DOTS is the patient ingesting medication in front of a trained care giver, but surrounding this is a compliment of services geared toward achieving patient adherence. Not least is will be to address the inconvenience to the patient of taking their medication via DOTS, especially if the patient has to make a daily visit to a clinic. Any treatment option that is both convenient to the patient and maintains adherence levels will be looked upon favourably by health authorities.

## 2.4 Tuberculosis in South Africa

South Africa reported 215,120 cases of TB in 2002, which represents 557 per 100,000 people and TB treatment cost the South African Government an estimated USD 300 million in 2003.<sup>18</sup> The incidence of TB and HIV dual infection is one of the highest in the world and the age distribution of new cases reported in South Africa (where a large number of young and middle-aged adults contract TB) is typical of a population in which there is a high prevalence of HIV/AIDS. For example, over the last 6 years, there has been a 190% increase in registered deaths in females between the ages of 20 and 49 years old, which is largely attributable to HIV/AIDS.<sup>19</sup> MDR-TB strains are a problem, costing the South African Government an average USD 3400 per patient to treat due to the higher cost of drugs needed to treat them.

TB case detection rates are good for South Africa, but treatment success rates remain unacceptably low. In 2001 (the latest national figures available), the national treatment success rate was 65% , due to high default rates, death (7%), and failure to follow-up with patients who transfer to other clinics. This figure is largely due to the latter, according to the WHO, such that patients are effectively "lost to the system" and the outcome of their treatment is unknown. To address this, the Minister of Health launched a new strategic plan for TB control in 2002. Provincial control programmes followed, together with investigations started in 2003 into the reasons why so many patients "disappeared" before the end of treatment.<sup>20</sup> Efforts to solve this problem include each province developing electronic TB registers, the standardisation of which is being coordinated by the State Information Technology Association (SITA).

NGOs, both local and international, play a key role in combating TB in South Africa. Some are supported financially by international aid organisations such as the United Kingdom's Department for International Development (DFID), the Belgium Government, and the United States Agency for International Development (USAID). Local health authorities frequently form partnerships with these organisations, as well as universities and other government departments, to tackle TB. The private sector also treats TB patients, (including private clinics and hospitals, as well as some companies with a large workforce), but only services a small proportion of the population. In 2002, the "Global Health Fund to fight AIDS, TB and Malaria", a global funding agency launched by the United Nations, gave over USD 24 million to South Africa to fight the disease.

## 2.5 TB in the Cape Town metropolitan area

Control of TB in the City of Cape Town is the joint responsibility of the Provincial Administration of the Western Cape and the Local Authority (hereinafter the "City"). The City's TB Control Programme has the following objectives: to reduce TB mortality and morbidity; prevent the development of MDR-TB; and accurately measure the Programme's performance. It has a short-term goal of reaching the WHO performance target of 85% cure rate for all new, smear positive patients.<sup>21</sup>

<sup>18</sup> For more information see [http://www.who.int/tb/publications/global\\_report/2004/annexes/en/](http://www.who.int/tb/publications/global_report/2004/annexes/en/).

<sup>19</sup> "Unabated rise in the number of adult deaths in South Africa", Bradshaw, Laubscher, Dorrington, Bourne, Timaeus, 2003.

<sup>20</sup> For more information see [http://www.who.int/tb/publications/global\\_report/2004/annexes/en/SouthAfrica.pdf](http://www.who.int/tb/publications/global_report/2004/annexes/en/SouthAfrica.pdf)

<sup>21</sup> "City of Cape Town / Metropole region TB Control Programme, Progress Report", City of Cape Town Health



TB in Cape Town is split into 76% pulmonary TB, 16% extra-pulmonary TB (EPTB, or TB that extends beyond the lungs) and 8% primary TB, primarily found in children. The latest unpublished statistics for the third quarter of 2004 show a slight increase in the case load for this quarter. The highest incidence occurs in Khayelitscha, the third largest informal settlement in South Africa, which accounts for 23% of all cases, due to an incidence rate in excess of 1000 per 100,000. Although more recent statistics are available for some measures, treatment outcomes are only compiled after one year, and this can make it difficult for City health care workers to stay motivated and focussed on the TB Control Programme

Day hospitals are the entry point for people using the national health service in Cape Town. If the hospital suspects TB, they do an initial test and, if positive, the patient is sent to a clinic in their local area where the disease is further diagnosed and subsequently treated. There are over 120 TB treatment centres around Cape Town, with local NGOs providing support services to the City.

## **2.6 Enhancing TB treatment adherence in Cape Town**

The use of DOTS is core to the City's TB Control Programme and aligns with the WHO recommendations of administering TB drugs using DOTS in areas where there is a high burden of TB. DOTS has been highly successful in improving TB adherence the world over and has been implemented in all countries showing a middle-to-high incidence of TB.

Clinic-based DOTS is still the most common system for giving treatment, but community-based DOTS (where patients travel to the houses of TB treatment supporters to receive DOTS) is increasing and has recently become a major treatment system for TB in Khayelitscha. The City's strategy is to increase community-based DOTS using NGOs, to reduce the costs and resources needed to support clinic-based DOTS. This decision was based in part on the results of a study in 2000, which found that community-based DOTS was between 2.8 to 3.6 times more cost-effective than clinic-based DOTS for new, smear-positive patients.<sup>23</sup> And a previous study in a rural area of KwaZulu Natal found community-based DOTS was the only strategy that could be implemented within the resource constraints of that time.<sup>22</sup> DOTS can also be administered at patients' workplaces, by a supervisor or colleague tutored by the clinic on how to do so.

In 2002, the City set a target of 30–40% of DOTS to be given in the community. Unpublished statistics for the third quarter of 2004 show a gain for most clinics in the number of patients receiving community-based DOTS. Community-based DOTS relies on local volunteers trained and managed by NGOs to give DOTS to patients at the volunteer's home. However, volunteers are paid very little and managing the service has proven challenging so far. Despite the cost-savings to the health service from an increase in community-based DOTS, TB treatment costs the health service dearly. The City is therefore keen to investigate more cost-effective treatment strategies that can at least maintain (if not enhance) current adherence levels.

## **3 About the On-Cue TB Compliance Service**

The On Cue Compliance Service is an initiative of Dr. David Green, a qualified medical practitioner and consultant in Cape Town. Dr. Green first conceived of the idea for using SMS reminders when he needed to help a family member remember to take her medication. He had treated a large number of patients for TB and reviewed literature on adherence, and learned that many TB patients do not take their medication simply because they forget. Given the mobile phone penetration in Cape Town (more than 71% of the population has cell phones)<sup>23</sup>, he surmised that that SMS reminders might also

<sup>22</sup>"Community-based, Directly Observed Therapy for Tuberculosis: An economic analysis", Floyd, Wilkinson, Gilks, February 1997,.

<sup>23</sup>"Digital divide assessment of the City of Cape Town" bridges.org, 2002, <http://www.bridges.org>

help with TB treatment compliance. And as a result, he set up the On Cue Compliance Service.<sup>24</sup>

The On Cue Compliance Service (hereinafter the "Compliance Service") takes the names and mobile phone numbers of TB patients supplied by a clinic, and enters them in to a database. Every half an hour the On Cue server reads the database and sends personalised messages to the patients, reminding them to take their medication. The technology is low-cost and robust: an open source software operating system, web server, mail transport agent, applications, and database.

Initially the SMS message sent to patients read: "Take your Rifafour now." When patients complained the message was boring, a variety of alerts were created, including jokes and lifestyle tips with the result that On Cue now has as database of over 800 messages that change on a daily basis. The patient can chose to receive messages in English, Afrikaans or Xhosa (the predominant African language in Cape Town).

On Cue approached the City in 2001 to run a pilot of the Compliance Service. The City chose Chapel Street clinic, which (like other state-run clinics) provides free treatment for infectious diseases, (including TB and sexually-transmitted diseases), inoculations, and free consultations for children under thirteen. The pilot intends to demonstrate that the Compliance Service can be used to reduce the number of TB patients on clinic-based DOTS, and thereby reduce the burden on the health service. To succeed, it must produce treatment adherence levels at, or above, those previously reported for the clinic overall.

When the Compliance Service pilot was first implemented, it was agreed that patients must first complete a month of clinic-based DOTS. This would allow staff to monitor their reaction to the drugs, detect any medical complications, and determine how adherent they are, prior to enrolling them on the Service. Patients were selected for the Service based on whether they had a mobile phone and whether they were considered by the health worker as adherent to their treatment regime. Patients were enrolled by sending On Cue their name and mobile phone number, initially via email, but later by fax. Patients visit the clinic at monthly intervals to collect more medication, at which time the nurse has the opportunity to inquire about how they are using the Service and gage whether or not they remain adherent. The pilot commenced in January 2002. To date, over 300 patients have taken part, with more than 280 having completed their six-month (or eight-month for re-treatment TB) course.

The Compliance Service should not be viewed as a replacement for DOTS (given that DOTS is the internationally-recognised method for achieving acceptable adherence levels for TB). Rather, it should be viewed as an auxiliary service, to supplement DOTS where possible, offering patients that are well settled on medication an enabler to continue treatment adherence at home and save money for both the health service and patient. Essentially, it is hoped the Compliance Service can lessen the burden of TB treatment in Cape Town and bolster the City's TB Control Programme.

## **4 Evaluation objectives and methodology**

The evaluation was comprised of three components. The first objective was to determine the effect that the use of the Compliance Service had on TB cure rates and treatment completion rates, by conducting an analysis of patient records. The second objective was to identify and describe any related social and economic impacts that may result from the use of the technology in this context, by looking at the clinics, their staff, and patients. The third objective was to conduct an assessment of the Compliance Service in terms of whether and how best practice principles for project management have been implemented.

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<sup>24</sup>For more information see: <http://www.on-cue.co.za>

With these objectives in mind, this evaluation set out to:

- Determine treatment outcomes (cure and completion rates) of this system.
- Examine whether the use of the technology in this given situation and environment is appropriate and relevant, using the bridges.org "Real Access/Real Impact" framework (described below).
- Examine the social and economic impacts, including effects on treatment (pharmaceutical) costs, working hours, and travelling costs for TB patients.
- Measure levels of user satisfaction, including patients and health workers.
- Measure the effectiveness of the technology and the approach taken to solving this problem.
- Gauge the use of best practices in project implementation, using bridges.org's "8 Habits of Highly Effective ICT-Enabled Initiatives" (described below).

#### The bridges.org *Real Access/Real Impact* framework and 8 Habits

It is impossible to gauge technology impact by merely looking at the strictly technical performance of the equipment; it is important to also consider how people use the technology and what affects their use. It is not really about the technology, it is about the people -- the technology users. Bridges.org evaluated this project by using a concept it has coined as "Real Access / Real Impact". The idea is that, despite the potential benefits offered by ICT, computers and connections will mean nothing to people in developing countries if they do not use it effectively. People may have physical access to very useful technology, but they will not use it if it is not appropriate to their needs, if they cannot afford to use it, if technical support is unavailable, if it adds too much burden to their already busy day (or even if they just perceive that it will), or if there are laws that limit its use. So in order for ICT to have a Real Impact on ground level development, people in developing countries need to have more than just physical access to technology, they need to have Real Access. The *Real Access* criteria used to shape this evaluation were (see Annex 2 for a full description):

- Physical access to cellular technology
- Appropriateness of cellular technology to health care in this context
- Cost impact: patient costs
- Cost impact: health service costs
- Capacity issues around using the Compliance Service
- Privacy and data protection
- Integration of the Compliance Service into daily routines
- Patient support and enthusiasm for the Compliance Service

Even though the evaluation focused on the technology, it also took into consideration how the project itself was implemented on the ground to the extent that project implementation had an effect on the technology use. Sometimes an initiative addresses the key factors that determine whether technology can be effectively accessed and used by people at ground level, but their failure to use basic best practice in project implementation limits the impact of their efforts. The "8 Habits of Highly Effective ICT-Enabled-Development Initiatives" provide a framework for assessing how an ICT project has been planned and managed. This evaluation looked at how the project has been conducted in terms of (see Annex 2 for a full description):

1. Doing some homework and starting with a needs assessment;
2. Implementing and disseminating best practice;
3. Ensuring ownership, getting local buy-in, finding a champion;
4. Setting concrete goals and taking small achievable steps;
5. Critically evaluating efforts, reporting back to clients and supporters, and adapting as needed;
6. Addressing key external challenges;
7. Making it sustainable; and
8. Involving groups that are traditionally excluded on the basis of age, gender, race

or religion.

#### 4.1 The evaluation process

The evaluation involved three groups of key stakeholders:

- *Clinic staff*: physicians, nurses, and other healthcare professionals;
- *Patients*: those who are, or have previously participated in the Compliance Service programme; and
- *City of Cape Town Health Directorate*: TB experts and managers of the TB Control Programme. In particular, *Dr. Virginia Azevedo*, a medical officer managing and supervising TB control in the City of Cape Town, was a key participant in the evaluation. Dr. Azevedo provided advisory input to the evaluation, helping to frame the questionnaires and assessed patient records for the collection of cure and completion rates.

The project evaluation combined quantitative and qualitative data collection. Information was collected from patient records, background documents and reports, clinic visits, and structured interviews of patients and staff through the use of questionnaires.

- *Background documents*. A literature review of TB and its treatment in South Africa was carried out by bridges.org, to gather background information and investigate facts provided by the Compliance Service and clinic staff.
- *Clinic visits*. The clinic was visited a number of times between May and September 2004, firstly to liaise with staff and work out the logistics of conducting patient interviews. These were carried out on four subsequent visits to the clinic in June and July 2004 and staff interviews conducted when convenient for health workers. Patient records were assessed on three occasions in September 2004.
- *Patient interviews*. 26 patients were interviewed as part of the evaluation. The interviews were anonymous (patient identities were confirmed by clinic staff and unknown to the evaluator) and conducted one-on-one after signing a consent form<sup>25</sup>. The interviews were structured through a patient questionnaire that was developed jointly by the evaluator and City health officials, and approved by the City Health Directorate. (See Annex 3 for the patient questionnaire.) Patients were invited to the clinic to be interviewed, in exchange for an amount of free credit with their cellular network provider. Despite this offer, it proved difficult to get patients to participate in the interviews. Patients were asked a number of questions to determine whether they were adhering to the treatment regime exactly, and if not, how they deviated. It was hoped that because interviews were anonymous and the evaluator was not attached to the clinic, patients would feel comfortable describing exactly how they took their medication and their experience with the Service. For more detail on how the patient interviews were set up and conducted, see Annex 8.
- *Patient records and treatment outcomes*. 221 out of 309 patient records were reviewed as part of this evaluation, covering current and past patients that have been involved in the Compliance Service pilot (these represent all of the records that were available; the evaluator was unable to access the missing records). The patient information collected includes treatment outcomes, residence, age, cell phone number, occupation, HIV status, whether the patient was a new or re-treatment case, and whether the patient was smear positive or culture positive. Anything else that stood out from the records was also noted. As only health workers are allowed access to patient records, City Health staff reviewed patient records at the Chapel Street clinic with the bridges.org evaluator entering the findings into a spreadsheet. Annex 1 contains a spreadsheet of this data.
- *Staff interviews*. Seven clinic staff members were interviewed as part of the

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<sup>25</sup> See Annex 6 for the consent form.

evaluation, including a clinical assistant, two nurses, a health worker from TB Care (a local NGO), one doctor, the clinic manager, and the receptionist. A brief staff questionnaire was developed with the City, to investigate procedural issues around the pilot at Chapel Street clinic and gather the opinions of healthcare workers on the use of the Compliance Service system. The interviews were conducted one-on-one, and the evaluator agreed to treat all views as anonymous. The evaluator used initial guiding questions to get the interview going, but the questions were mainly open and the conversation was allowed to move freely toward any direction of interest that came up. This method was used to explore broad topics and allow the participants to focus on the issues that mattered the most to them. The questionnaire can be found Annex 5.

- *Interviews of Cape Town Health Directorate officials.* The City's TB programme manager and the health district manager were interviewed and invited to give opinions of the Compliance Service pilot as well as their views on the most pressing issues the City faces in its TB Control Programme.

The following statistics were drawn from this data:

Cure rate =  $S+ / (S+ - (\text{"not TB"} + \text{patients who have not completed 6mths treatment})) * 100$

Completion rate =  $(S+ + TC) / (S+ - (\text{"not TB"} + \text{patients who have not completed 6 months treatment})) * 100$

Treatment Success rate =  $(S+ + \text{"cured"}) + (S+ + TC) / (S+ - (\text{"not TB"} + \text{patients who have not completed 6mths treatment})) * 100$

Where:

S+ = number of smear positive patients

Cured = number of patients marked as cured at the end of treatment

TC = number of patients marked as "treatment completed" at the end of treatment

## 5 Findings of the evaluation

### 5.1 Treatment outcomes

*Trends identified in the data collected* The clinic doctor estimated that 60% of all the patients at the Chapel Street clinic are HIV+, which aligned with the review of patient records, where 58% of the patients in the pilot who were tested for HIV (50.6% of the total) were HIV+ (see Annex 1). A greater proportion of HIV+ patients have extra-pulmonary TB (EPTB); sometimes this is specified, for example, TB of the lymph nodes. Often these patients are culture positive (cult+), meaning that tissue culture examination produced a positive result for the presence of the bacterium. Culture examination is important because HIV+ patients often produce a negative smear, but are cult+, and the City considers it an important diagnostic tool for TB/HIV.<sup>26</sup>

*Statistics for treatment completion and cure rates* Based on the data collected from 221 records of patients that participated in the Compliance Service pilot, treatment outcomes for new, smear-positive patients were (this data is also presented in a spreadsheet in Annex 1):

Cure rate = 62.35%  
Completion rate = 10.59%  
Treatment success rate = 72.94%

The latest statistics available for the City of Cape Town's TB Control Programme, on a per-clinic basis, are for the third quarter of 2003, and are calculated separately for new and re-treatment patients.<sup>27</sup> For all new, smear-positive patients treated at the Chapel Street clinic the outcomes were:

Cure rate = 66.4%  
Completion rate = 3.0%  
Treatment success rate = 69.4%

With the exception of a slightly higher completion rate for the pilot, treatment outcomes are very similar. It is not possible to assign any statistical significance to the difference in treatment success rates, due to the limited sample size. At first glance, all that can be said is that the Compliance Service has produced results that are normal for this clinic, but do not demonstrate a significant improvement.

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<sup>26</sup>City of Cape Town / Metropole Region TB Control Programme, Progress Report", City of Cape Town Health Directorate, 1997-2002.

<sup>27</sup>"Treatment Outcomes for 2003", unpublished statistics from the Cape Town City Health Directorate (with permission).

## 5.2 Real Access to the Compliance Service

### Physical access to cellular technology

*Cellular network at national level* It was important to consider whether cellular technology (mobile phones and SMS in this context) is available and physically accessible to the people that will use it. And this is particularly important when considering a scale-up of the Compliance Service. The cellular network in South Africa is based on the Global System for Mobile Phones (GSM) 900MHz standard, used all over Africa, Europe and most of Asia. As of June 2004, there were an estimated 18.7% mobile phone users, out of a population of roughly 45 million. The cellular network is on a par with many first world countries, covering over 71% of the population, and mobile phone users are found in remote corners of the country. There are three network operators in South Africa (Vodacom, MTN, and CellC) with market penetration of 9.7 million, 5.2 million and 3 million, respectively.<sup>28</sup>

*Availability of mobile phones in South Africa* It is estimated that 65% of people in Cape Town own a mobile phone<sup>29</sup>. Although new mobile phones are too expensive for most people (largely because they are imports), a thriving market in older model, second-hand and refurbished mobile phones means they can be purchased at a fraction of the cost. Consequently, mobile phones are widely accessible to South Africans and they are used across society. It is not uncommon to find family members sharing a phone, and often family members pass their old phones to children and siblings as they upgrade their phone. The cellular network operators are currently competing to capture the low-income end of the market, by offering slightly older, lower spec models for low prices, with a “free” starter pack to connect the user to the network.

Market reach was reflected in the findings of this evaluation, where half those interviewed were unemployed and yet still used mobile phones. Several patients reported they had upgraded their phones while on the Service; often this involves a change of number when the service provider is also changed, but only some thought to inform the clinic of their new number. This is likely to account for a large number of patients who reported an unexpected cessation in the Service, rather than it being due to a poor service from their cellular network operator.

*Network coverage in Cape Town* A reliable cellular network service is essential for the Compliance Service. If patients are situated in areas of poor coverage at the times they expect the SMS reminder, this will seriously impact on the Service. There will always be patches of poor signal strength, especially in city centres where high buildings and metal objects interfere with radio signals. But only one patient complained of a poor signal and this was only on the upper floor of her apartment. Not only did patients always have a signal at the time they expected their SMS reminder, all respondents said they rarely, if ever, experienced poor signal strength in the metropolitan area.

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<sup>28</sup>For more information see: [http://www.cellular.co.za/stats/statistics\\_south\\_africa.htm](http://www.cellular.co.za/stats/statistics_south_africa.htm)

<sup>29</sup>“Digital divide assessment of the City of Cape Town” bridges.org, 2002 bridges.org, <http://www.bridges.org>

*Quality of service from the network operators* Depending on the service provider, there may be times when SMS messages never reach their destination due to a variety of technical problems. Users also have to know how to clear the phone's memory when they have stored too many messages so that new ones can be downloaded, but the patients interviewed did not view this as a significant problem, as SMS is a popular feature which most people are familiar with.

15% of patients said they had expected to receive an SMS from the clinic and either it did not come for a number of days, or sometimes weeks. And one patient was enrolled in the Service but never received any SMS messages at all, but because he did not report this to the clinic, he received no help with adherence to his treatment regime. Clinic staff also indicated that several patients reported they had not received SMS reminders, or sometimes had received them for just a week or two and then they stopped, with no explanation as to why they had stopped. Many of the patient records reviewed contained a notation of the date the patient was enrolled in the Service, but no other notations confirming that the SMS reminders were being received.

### **Appropriateness of cellular technology to health care in this context**

*Electricity supply* Poor access to electricity is now mostly a rural problem: most (not all) areas in the informal settlements and poor communities in Cape Town have power. But some people in South Africa cannot afford a constant electricity supply, so the evaluation investigated whether any patients could not keep their mobile phones charged at all times.<sup>30</sup>

88% of the patients interviewed said they always have their phone charged and keep it with them at all times. Only two patients do not keep their phone with them. One said he only switched his phone on once a day (usually upon waking) to save on battery life, but when he did turn it on, he was immediately alerted to an incoming SMS and took his medication then. The other patient said that although he did not always keep a charged phone with him, he would definitely forget to take his tablets if it were not for the SMS reminder he received when he turned the phone on.

*Environment and security* Any project that uses technology to address a development issue must consider what ICT is appropriate for the environment that people live in. For example, personal computers can be inappropriate for use in disadvantaged communities in Africa, due to the expense of keeping them in temperature-controlled rooms and secured against fire and theft. Conversely, mobile devices, such as handheld computers and cellular phones are easy to protect against adverse environmental conditions, such as heat, damp or dust.

Mobile phones were found to be appropriate to the environmental conditions in the Cape Town area. No security fears were mentioned by those interviewed and because they are so ubiquitous, carrying a mobile phone (especially an older model) was

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<sup>30</sup>The evaluation team felt that asking directly if a patient could afford electricity would be insensitive, so the question simply asked whether they kept their phone charged and carried the phone with them at all times. For those that did not, lack of electricity would only have been one possible reason. See Annex 3 for the patient questionnaire.

not considered by the patients to be a great security risk.

*Patients not hearing their phone alert them to an incoming SMS* If patients do not hear their phone alert them to an incoming SMS, the Service will be compromised. This can easily happen in a busy City with high levels of background noise. It does not necessarily mean the patients do not take their tablets, only that they do not take them when the SMS reminder is received. A third of patients interviewed said they sometimes did not hear their phone alert them to an incoming SMS, but none considered it a problem. Some described their strategies for dealing with this, such as checking their phone display for the symbol announcing a new message (see Capacity findings below).

*Psycho-social aspects of using mobile phone* The psychological and social aspects of mobile phones also come to bear on their appropriateness in this context. Studies have shown that, unlike many other technologies, people are generally not intimidated by mobile phones.<sup>31</sup> People that have no previous experience with technology are not apprehensive about learning to use them, and because they are so widespread in society, people are not shy about asking for help. Informal support from friends and family means, unlike computers, anyone can be shown how to use them proficiently without having to pay. Patients in the pilot were very open to the use of SMS and those of all backgrounds appeared comfortable with using the technology.

### **Cost impact: patient costs**

*Cost of using SMS in South Africa* The average wage in South Africa is Rand 4442 per month (USD 778).<sup>32</sup> But this figure is likely to be skewed from the inclusion of a relatively small number of very wealthy individuals. Half of the patients interviewed were unemployed, so were 36% of the patients whose records were reviewed.

“Pay-as-you-go” schemes are largely responsible for making mobile phone use accessible to people with low incomes in South Africa. On a pay-as-you-go scheme, a cell phone user can purchase a SIMM card with a telephone number and small increments of “talktime” (the number of minutes for calls) and “airtime” (the timeframe during which the SIMM card is activated to receive and make calls). Receiving calls and SMS messages is free. (Recently, MTN and CellC have done away with airtime, and the airtime from Vodacom is so long that the user must use his/her phone very seldom to fall out of the airtime window.<sup>33</sup>) With a pay-as-you-go system, people who do not qualify for a service contract -- because they have no bank account, no verifiable mailing address, no credit history, or they are below an earnings threshold -- are still able to purchase credit from a cellular operator when they can afford to. However, charges for making calls on a cellular network are expensive for most people in South Africa; for example, Vodacom's standard pre-paid package costs R2.55 for calls to a land line and 80 cents per SMS.<sup>34</sup> Pay-as-you-go service usually works out to cost more per minute than for the contract-

<sup>31</sup> Information from previous conversations with scientists at CellLife, an NGO at the University of Cape Town, South Africa. For more information see <http://www.celllife.org>.

<sup>32</sup> For more information see [http://home.aigonline.com/country\\_view/0,4605,1385,00.html](http://home.aigonline.com/country_view/0,4605,1385,00.html).

<sup>33</sup> Vodacom offer 90 days of airtime for every R29 voucher purchased (the minimum denomination).

<sup>34</sup> For more information see <http://www.vodacom.co.za/prepaid/packages.asp>.

based service.

*Affordability of "airtime"* The Compliance Service only involves a patient receiving, and not sending, SMS messages. So long as the patient has airtime on their phone, there is no need for talktime credit. It was nevertheless important to ascertain that patients did always have at least airtime, but no one reported that they ever ran out of airtime. Even so, many patients complained that using mobile phones, especially to make calls, was expensive, and some of them said they only take incoming calls and SMS messages.

*Impact of the Service on travelling costs* Another aspect of affordability in the TB treatment context is the cost savings to the patient from not having to attend clinic daily to receive DOTS. The patient saves on transport costs and potentially on the wages lost from having to visit the clinic, especially important as many are paid by the hour. Some patients are reported to have lost their jobs because of the time away from work required for DOTS treatment, as corroborated by one patient interviewed. Despite efforts by the City to divert patients away from Chapel Street clinic to clinics closer to home, a significant number of patients insist on using Chapel Street. One reason is that it is on the way to work for many people. Another stems from the clinic's popularity as previously it was the TB headquarters for the central zone of Cape Town, with many senior staff and doctors based there. The legacy of the clinic's reputation as a centre for TB care may still make it more attractive to patients.

69% of patients interviewed travelled to the clinic by taxi, costing an average of R8 (or approximate USD1.40) each way.<sup>35</sup> The remainder walked, except for one person who drove. Some of the patients interviewed (primarily those who were unemployed) travelled to the clinic from home; others visited during their lunch hour; and some went to clinic either on the way to work, or on the way back. Extrapolating this data to determine the average travelling costs for patients on clinic-based DOTS as compared to the Compliance Service is not straightforward, and not within the scope of this study.

*Impact of the Service on working hours lost* The number of working hours lost due to clinic visits to receive DOTS will be a function of the time spent travelling to and from clinic plus the time spent at clinic waiting to see the nurse and receiving DOTS. The average time that patients reported they spent on a round trip to the clinic was 54 minutes. The Chapel Street clinic, similar to other primary healthcare centres, does not run an appointments system. The time that patients must wait to receive DOTS will largely depend on how many people happen to be at clinic that day, and the number of staff on duty. Assuming a 15-minute visit, the average number of working hours lost per visit will be approximately 1.25 hours. The Compliance Service requires a total of 27 visits, equating to 33.75 lost working hours (1.4 days), and clinic-based DOTS 120 visits (for new, smear-positive patients), equating to 150 lost working hours (6.25 days).

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<sup>35</sup>In South Africa, a "taxi" refers to a privately owned mini bus, typically carrying around 15 people. Taxis are the most common form of public transport being relatively cheap and are often the only transport affordable to people on low incomes.

### Cost impact: health service costs

*Estimated costs of the Compliance Service per patient*

National health services in developing countries are under constant pressure to keep costs low and stay within inadequate budgets, and it is common for them to cut corners to make ends meet. For example, there are eight primary care clinics in the Cape Town metropolitan area, but only two managers between them. The City commissioned this pilot in the hope that the Compliance Service would help reduce costs and lessen the burden caused by human resource shortages. On face value, the Compliance Service should be a far more cost-effective means of ensuring TB treatment compliance than clinic-based DOTS, and possibly even community-based DOTS, but this assumption must first be proven with a comprehensive cost analysis of the Service, and comparison with other treatment systems.

Conducting a cost analysis was not within the scope of this study, but it is useful to show the cost components of community-based DOTS against those of the Compliance Service, as a starting point. The following information is based on a report on cost and cost-effectiveness of clinic-based and community-based DOTS in Cape Town published in 2000.<sup>36</sup> as well as expert opinion from the City. It was not possible to assign monetary values for clinic visits because the cost of a visit depends largely on whom the patient sees, how long they stay and that staff member's hourly cost to the health service: parameters this study did not measure. However, the total cost of just treating a (new, smear-positive) patient on community-based DOTS and the Compliance Service are given in bold. It is also important to highlight the extra cost components for the management and training of community DOTS supporters, which account for a considerable proportion of the outlay for community-based DOTS.

<i>Cost Component</i>	<i>Community-based DOTS</i>	<i>Compliance Service</i>
2-3 healthcare visits for initial diagnosis	X	X
10 clinic-based DOTS visits for first two weeks treatment (including enrolment to Compliance Service and adherence education)	X	X
Supply of 1 month medication at day 20 (2 months for re-treatment TB)	X	X
Further clinic visits to collect more medication at 2, 3, 4, 5, 6, (7 and 8 if re-treatment TB) months	X	X
120 DOTS visits (160 for re-treatment TB) at R1.5/visit	R180 (R240 for re-treatment TB) per patient /month	
120 SMS reminders (160 for re-treatment TB) at R13.90/patient/month		R69.50 per patient/month
Supervision of DOTS supporters	X	

Training and updating of DOTS supporters	X	
Adherence checks at monthly visits by facilitator (see page [])	X (done with DOTS supporter)	X
Drugs (6 months for new TB; 8 months for re-treatment TB)	X	X
2 x smear tests (3 for re-treatment TB)	X	X

### Capacity issues around using the Compliance Service

*Capacity of patients to use the Service* The Compliance Service does not work unless patients understand exactly what to do upon receiving an SMS reminder, and they appreciate the importance of adhering to their treatment regime. Just as patients placed on DOTS are tutored about the importance of visiting the clinic daily to take their medication, patients on the Compliance Service also require training, and must demonstrate they have the capacity to use the Service correctly. All of the patients interviewed stated that they had no problems understanding how to use the Service. But questions around capacity revealed deviations from the treatment regimes and any deviation from the instructions given to them at the clinic, no matter how well-intentioned on behalf of the patient, will likely impact on adherence.

Similarly, the technology does not solve the problem of adherence for health workers. Interviews revealed some misunderstanding around the capabilities of the Compliance Service and how it fits into the TB Control Programme.

*Language and adherence* Language can be a problem related to adherence assessment that is particular to the cultural context of public health care in South Africa. Almost all patients at Chapel Street clinic have English as a second language; some can barely speak English. Health workers spoke English or Afrikaans, but only one spoke Xhosa, the predominant African language in the Western Cape. Clinic staff admitted that some patients probably did not fully understand the instructions given them. Several times during interviews the evaluator had to speak slowly, using short, common words, and felt that she was not always understood fully by some of the patients.

*Issues around choosing the time to take medication* Almost 40% of the patients interviewed said they did not choose the time the SMS reminder should arrive each day, but the nurse chose it for them. Of those that did specify the time, many said the time chosen was not actually the best time for them and with hindsight they realised that a better time could have been chosen. The majority took their tablets in the morning, either at around 5–6am (people in Cape Town often rise early for work and leave work at around 4pm), typically with a breakfast of porridge.

9am was another popular time, but interviews revealed that it was usually chosen by the nurse and not the patient. 9am roughly coincides with the time that many people in blue collar jobs take a tea break at work. However, this means that it is essential that they remember to take their medication to work with them every day. Roughly half said they always carry their medicine with them and the other half said they do not. Those that do not carry their medicine indicated that they took the

medication at home either with breakfast or dinner (since most of the patients were on a low income, they seldom eat out). One person said he kept his medication in his locker at work.

*Issues around record keeping* Patients are instructed to tick their record book (the "green card") immediately after taking their medication; 83% of those interviewed claimed to always fill in their green cards, and 70% of these patients said this was done immediately after taking their tablets. The evaluator felt that some of these claims may have been exaggerated. Two patients freely admitted they only filled out the book at weekends, after a week of treatment (one of whom was a medical student); however, when asked if they could have remembered incorrectly, they were certain they had not.

*Patients taking their tablets before or after the SMS* City TB experts set 15 minutes as the maximum time after receiving the SMS that patients would be likely to remember to take their medication. 16% of the patients interviewed said that they take their medication before the SMS arrives, 50% take them after the SMS and 34% do either. Of those that take their tablets before, roughly half claimed they would never have forgotten to take them if the SMS did not come and half said they sometimes would. Of those that took their tablets after the SMS, 62% took their tablets immediately, 19% took them within 15 minutes and 19% took them more than 15 minutes later. Regardless of whether their tablets were taken before or after the SMS reminder, 72% were adamant they had taken their tablets that day. And only 2 people admitted they would sometimes forget to take their medication despite the SMS reminders.

Typically, patients that reported taking their medication before the SMS reminder arrived were those taking unusual actions. For example, one patient used the SMS as a reminder to set her phone alarm to further remind her to take her medicine later in the day. Another used the SMS to alert his wife to giving him his tablets.

## **Privacy and data protection**

*Protection of patient data* As technology becomes integrated into society, people need to understand what happen "behind the screen" so that they can trust their electronic communications and transactions with government, businesses, or others in terms of privacy, security, or cybercrime. This also holds true for cellular technology. Patients on the Compliance Service want to know that information about their medical condition is not being shared with non-medical staff and that the Compliance Service is storing it in a secure place. In future, the more technically aware can be expected to want assurance that SMS reminders are not being intercepted on route to their phone, or that their number will not be given to third parties. These were not concerns aired by health workers or patients interviewed, but are worth bearing in mind for scale-up.

The Electronic Communications Act of 2002 deals with South African law around new forms of electronic communication, such as email and SMS. Currently, SMS is under the spotlight due to the number of companies using SMS to market their products. Some of this is unsolicited, creating a problem similar to that of "spam" email. The Act does not contain anything explicit regarding the use of SMS to communicate medically-related data, and there have been no court cases in this area. Hence, no precedent has been set regarding the use of SMS in the context of health care. However, the Act does infer that

SMS is an acceptable means of communicating with patients, so long as they have given their permission and confidentiality is maintained.

*Are patients worried the SMS reminders will be seen by others?* In the context of this study, privacy issues were highlighted by patients who are concerned about people seeing the SMS on their phone. TB, like HIV/AIDS, is still a taboo in South Africa, and many people are keen to keep their medical condition secret. Although the reminders do not contain anything personal, or any identifying information, they are signed from the clinic, so that a reader can find out the patient is being treated for TB. For example, this can be a problem in families where a cell phone is shared (sharing material possessions is common in many South African families).

Only two patients interviewed shared their phone with others; in both cases these were family members and the patients were not concerned the message would be read by them. Overall, 20% were concerned that other people would see the SMS reminders. For example, one young person said it was usual to pass phones around within a group of friends to show each other amusing messages, and was worried the SMS reminders would be seen.

### **Integration of the Compliance Service into daily routines**

*How do patients view the Service in their day-to-day lives?* People will not use technology if it adds further burden to their lives or does not integrate into daily routines, or even if they perceive that it will. If patients come to view the daily reminders as a nuisance, the Compliance Service will likely become less effective. (Conversely, the messages must not become so familiar that patients grow "fatigued" and begin to take them for granted or even ignore them.) The reminders must also come at a time of day convenient for the patient, when they have their medication, green card and food and water with them. Compared to being on DOTS, the patient is very likely to appreciate the convenience of the Compliance Service, but it remains to be seen whether this translates into satisfactory adherence levels.

None of the patients interviewed complained that they became tired or bored of receiving the reminders, although one person said that he received so many SMS messages each day that he sometimes did not recognise the SMS from the clinic. No one complained of having to carry their mobile phone with them at all times and to keep it charged. One or two patients did complain of messages continuing to come after their treatment had finished, and they found this irritating.

### **Patient support and enthusiasm for the Compliance Service**

*Public support for cellular technology in South Africa* South Africans are enthusiastic users of mobile phones, SMS being a far more popular application than telephone calls. In the last two years, SMS traffic in South Africa has increased by an incredible 1000%. Public support for technology use -- and especially uses of technology that have a direct social and economic impact on people's lives (such as in the healthcare area) -- will help to influence the government to change laws and regulations and create a more favourable environment for widespread technology uptake. For example, widespread public support for technology use will engender the political will in

government to drive changes to the legal and regulatory environment (such as allowing competition in the telecommunications market) that can help bring down prices and make it easier for people to access and use technology.

*How patients feel about the Compliance Service* Every patient interviewed stated their support for the Compliance Service, and more specifically, for using cellular technology in this way. Most were very pleased with the Service and thought it a good idea. Some said they thought procedure at the clinic could be improved to avoid a gap between the time they enrolled in the Service and the time they received their first SMS reminder, and one person said this wait had been disappointing as she had not received an SMS for several weeks. Here are some comments:

"It makes you feel good to think nurses at the clinic care enough to SMS you every morning."

"It [the Service] makes you feel more connected to the clinic than usual."

"I think it is a great idea and should be used for other things in the health service."

"I would definitely forget to take my tablets if I didn't get an SMS from the clinic."

### 5.3 Project management and implementation of the Compliance Service

#### Doing homework and conducting a needs assessment

*Why Chapel Street clinic was chosen* The Chapel Street clinic usually performs below the targets set by the City for treatment outcomes. There are other, similarly performing TB clinics in Cape Town, but this one was chosen for the pilot because, being close to the city centre, it was thought there would be a large number of working patients able to afford mobile phones. In fact, similar numbers of patients at TB clinics in the informal settlements -- where incomes are lowest -- appear to have mobile phones.

Chapel Street clinic is fairly unique in that it serves no single community. Patients are scattered over many areas, and coordinating community-based DOTS is difficult. As such, only 12% of patients are on community-based DOTS and it was hoped the Compliance Service would help to get people off clinic-based DOTS and reduce the workload at the clinic.

*Discussions with clinic staff at inception* At the beginning of the pilot, On Cue met with the clinic manager, explained how the Compliance Service worked, how to enrol patients and communicate with On Cue to resolve any problems with the Service. This information was conveyed to the TB nurse by the clinic manager, but no further information about communication with the Compliance Service was provided to clinic staff, nor were there specific task allocations or specific procedures set up.

*Needs of health* Some health workers said enrolling patients in the Service created extra work for them. This is a problem because technology will either be used badly or not at all if it does not integrate smoothly into daily routines. Extra work is inevitable,

*workers at the clinic* but it should be as non-invasive as possible and this becomes increasingly important as the number of patients on the Service increases.

*Needs of health workers at the City* Decision-makers at the City need to know how the Compliance Service will fit into the TB Control Programme. To do this, there needs to be some way of translating the overall aims of the Programme into measurable parameters at the clinic that can be applied to the Compliance Service. Relying on cure and completion rates at the end of treatment only paints part of the picture. Even had the original procedure been followed rigorously, this would still be the case: something more granular is required.

### **Implementing and disseminating best practice**

*Deviation from the original procedure* It was clear from both staff and patients interviews that implementation of the Compliance Service suffers from a lack of procedure, and the review of patient records confirmed this. The original procedure was to only enrol patients after one month of DOTS, but sometime during 2002 this began to change, so that by 2004 nearly all patients were being put straight on the Compliance Service. It is unclear why these changes took place. When asked, some staff said it was probably due to staff turnover, there being no written procedure to inform new staff. This view was contested by the City, who claim staff turnover at Chapel Street clinic is low. Two health workers interviewed (at the clinic and at the City) suggested that the Service made it possible for health workers to avoid having to persuade patients to come into the clinic for DOTS (which they normally have to do in the full knowledge of the inconvenience this brings to the patients). And one nurse commented: "It's hard to put people on DOTS when you know you are disrupting their life and the patient thinks he'll get into trouble at work."

Placing patients on the Compliance Service on the first day of treatment can have serious consequences. First, where it has not been ascertained that the patient is inclined to be adherent, it is unknown whether they are good candidates for the independent nature of the Compliance Service. Second, it could cause problems because there will be inadequate monitoring of adverse effects, resistance to the drugs, or unexpected complications, which are normally checked during early clinic visits. Several records were identified where patients who were enrolled in the Compliance Service from the first day of treatment should not have been, requiring close supervision during initial stages of treatment.

*Lack of monitoring of the Service during treatment* If the original criteria for enrolment are followed, then only patients shown to be adherent during the first month on DOTS, and whom are predicted as continuing to be adherent, will be chosen for the Compliance Service. But continued adherence (past the point at which the patient begins to feel better) depends on many things. For example, TB experts at the City stressed the importance of establishing friendly rapport between nurse and patient at the start of treatment. Putting in extra effort to get to know the patient and make them feel cared for at the beginning impacts on the likelihood of them remaining adherent, as well as the likelihood of them visiting the clinic toward the end of treatment for a smear test. But a number of

people will always be non-adherent, and when they are using the Compliance Service they will be harder to detect and deal with than those on DOTS.

Some health workers said that they asked patients at the second clinic visit (usually five days into treatment if enrolled immediately in the Compliance Service) whether they were receiving the SMS reminders. But it was not clear to the evaluator whether all health workers asked the patients about their receipt of SMS reminders, or if those that did ask always did so. Few patients were asked about the Service on subsequent clinic visits. Two patients who wanted to participate in the evaluation said they had been enrolled in the Service but had never received an SMS. Another patient said that she received SMS reminders over the weekend (when she was not supposed to take medication), but fortunately she knew not to take her tablets on these days. A problem reported to the evaluator by several people was that of changing phone numbers. These cases demonstrate the potential for patients to fall through the net through lack of supervision.

Most patients were asked questions around adherence at monthly visits, and their green card was checked. So, if the patient appeared adherent and their condition was improving, health workers usually assumed patients were using the Service as instructed. With no set procedures and given daily time constraints, staff usually did not investigate further, which resulted in a number of patients being entirely unsupervised. These patients were placed in the position of being entirely responsible for their own adherence, and some deviated from their treatment regime or stopped treatment all together.

*Problems removing patients from the Service*

Two patients and one member of staff claimed that reminders were still being sent after treatment had ended. However, On Cue claims that all patients are automatically removed from the database of active users after five months of treatment, so messages necessarily cease at that point. Apart from being irritating for patients, this is a waste of money for On Cue, and the issue needs to be resolved. This could be because patients did not understand the treatment regime sufficiently, and they thought that treatment was supposed to end before it actually did, so they stopped taking the medication prior to the end date.

*Tightening the criteria for enrolling patients*

Several health workers at the clinic said the lack of clear, written criteria for selecting patients to enrol in the Compliance Service is a problem. The evaluator was told that this decision is largely down to the intuition of the nurse to predict whether or not the patient will remain adherent. One said she chose patients based on whether they appeared responsible and "with it". At the same time, clinic staff recognised there were problems with this system for patient selection.

Review of patient records showed a large number were enrolled on the first day of treatment. This included HIV+ patients, who may have only learned of their HIV status recently. City health workers commented that this would likely have a negative effect on adherence, as the patient may still be learning to deal with their medical condition and not have the focus for adhering to a strict treatment regime.

### **Ensuring ownership, getting local buy-in, finding a champion**

*Staff buy-in* All staff interviewed supported and liked the Service. Health workers feel that the Service has resulted in more negative sputum results (improved cure rate) and less patients defaulting. One said that she believes the overall clinic statistics will be improved by the Service, and another agreed that patients are less likely to default. One nurse said record-keeping is a problem with the patients in the Service, but it is no worse than for patients on DOTS who are supervised at home by a family member. Most said it freed up time for staff, especially during times of staff shortages, and that Mondays and Wednesdays when the doctor is at clinic and patient numbers are high, are now manageable because fewer patients have to be seen for DOTS. The external health worker from TB Care said the Service was useful for recalling defaulters.

When asked about the benefits of the Service to the patient, health workers said patients' jobs are no longer in jeopardy from attending clinic-based DOTS. They thought that the Service gives patients a greater sense of responsibility for their own health -- one of the factors thought to enhance adherence. And nurses indicated that they were more confident in giving patients a greater supply of medication at one time. Some thought the Service gives patients a more personal interaction with the clinic. This is curious because, assuming they were comparing Compliance Service patients with those on DOTS, one would assume physically attending the clinic each day would be considered to be more interactive. And yet two health workers and two patients mentioned this increased sense of connection with the clinic.

*Lack of ownership* Despite support for the Compliance Service, some staff members voiced their frustration that the Service had been imposed on them without consultation. Many felt that had care been taken to include their needs at the beginning, there may have been a greater sense of ownership among staff, engendering a greater level of conscientiousness around running the Service in the clinic.

*No champion at the clinic* This pilot project suffered from having no local champion of the Service resident at the clinic (or at least visiting the clinic frequently). One nurse at the clinic appeared to be responsible for collating a list of patients each week and faxing this list to On Cue, but there was no single person assigned to oversee the project, or who would go the extra step to resolve problems in a proactive manner. Interviews with clinic staff revealed that all recognised this lack of leadership as a major problem.

### **Setting concrete goals and taking small achievable steps**

*The pilot was not a staged process* The pilot was not conducted as a staged process, but it was simply initiated in January 2002 and patients were added thereafter as they appeared. Some health workers interviewed indicated that they felt the project had tried to do too much too fast. Others suggested a staged approach with checks and balances would have helped create an environment where unexpected problems could be dealt with.

### **Critically evaluating efforts, reporting back, and adapting as needed**

*No reporting mechanism was put in place* Without stopping to evaluate the pilot at regular intervals, the clinic had no clear way of knowing how it was progressing. The pilot had no reporting mechanism to enable TB experts at the City to critique the pilot from a distance. This is essential for placing the Compliance Service in the broader picture of the TB Control Programme, without being distracted by the day-to-day concerns of the clinic.

### **Address key external challenges**

*Lack of leadership* The lack of on-site leadership to oversee the pilot had a significant impact on the outcomes. The clinic manager was involved at inception, briefing the TB nurse and helping to resolve initial problems. But the manager is shared among four clinics, which although small, may not leave her time for hands-on management of the project.

*Cut backs in internal technology* The City chose not to use all the features of the Compliance Service, notably the web-based interface that would provide health workers with an easy means of using the system. This would allow them to, for example, add and delete users, select the messages to send, and set up scheduling for the SMS reminders themselves. The web interface is currently being used at other clinics in South Africa that subscribe to the Compliance Service. Instead, the clinic initially relied on email to send On Cue a list of patient details every day. But at some point during the pilot, outgoing email was curtailed, so that the clinic could not directly email to On Cue, to update new patient information or report problems. Nurses could send an email to the City to be forwarded to On Cue, but they reported troublesome delays with this. Patient details were to be faxed to On Cue instead, but this proved to be problematic too because security is tight at the clinic and the fax machine is kept locked away in a cupboard in the manager's office, which is also locked when she is out. Further, faxes that are hand written are notoriously difficult to decipher, and this also contributed to errors. The sheer inconvenience of faxing patient details individually as they were enrolled, resulted in health workers deciding to collect names and numbers on a sheet of paper, which one nurse was (loosely) responsible for, and faxing it to On Cue on a Friday. It was clear that these short-comings in internal technology at the clinic inhibited the effective implementation of the Compliance Service.

*Over-stretched clinic staff* Staff shortages at the clinic may have been a problem, with health workers reporting that despite their support of the Service, no one had the time to look after it. Strictly speaking, only the TB nurse was in charge of the Service, as she is tasked with responsible for TB patients at the clinic, but the pilot had become more of a team effort at Chapel St clinic. Further, clinic staff reported that they were overburdened by their work schedules, but this is not corroborated by human resource figures for the clinic.

- Problems tracking TI patients* The study found a significant number of patients finished treatment as “treatment interrupted” (TI), either because they stopped taking their medication or, in many cases, moved from the area and could not be traced. This is consistent with findings reported by the WHO that note a large number of patients are lost to the system in South Africa. A member of the NGO TB Care was employed by the clinic to track down these defaulters, but was often unsuccessful because a number of patients give incorrect addresses. Often this was because the address was incomplete, the patient had moved, or was known by his neighbours by a nick-name not given to the clinic. And because there are a significant number of homeless people being treated by the clinic, this made her job even more difficult. Sometimes On Cue was contacted to send patients an SMS recalling them to the clinic, which she had found very useful. But bureaucracy at the clinic made it difficult for her to make such requests, and eventually she stopped asking.
- Patients changing number, losing their phone, etc* Some patients changed their phone numbers, lost their phones or their phones were stolen during their enrolment in the Service. This was a significant problem for the pilot because there were no procedures for patients to update their phone numbers in such cases. The Compliance Service could use SMS receipts at intervals to at least verify the number is still in existence, although this service has limited capabilities. But the extra cost, although small, would likely need to be passed on to the health service.

### **Making it sustainable**

- Costs of running the Service* Ongoing costs can be a show stopper for ICT-for-development projects, especially if they increase unexpectedly. Price increases for bulk SMS purchases and/or sending SMS reminders are out of the hands of On Cue and the City. But cellular service costs are unlikely to rise significantly, due to market competition and the fact that prices in this sector show a global trend of falling.
- Reliability of the Service* Computer downtime is known to be a significant contributor to the sustainability costs of technology and is a factor that was largely ignored in this pilot. It is essential that the Compliance Service does not suffer from significant downtime that would impact on its service delivery, and this is definitely an issue for scale-up. There was a period of two to three weeks toward the beginning of the pilot when no SMS messages were being received. On Cue resolved this problem and it did not reoccur, but since then there have been several reports of patients not receiving their reminders for two weeks or so after enrolment. When asked if this was a problem for adherence, health workers said not, as adherence was usually 100% in the first few weeks and only began falling once patients began to feel better. That said, one nurse commented that the disappointment of not receiving the reminders was de-motivating for patients, which could affect their willingness to be adherent.
- The evaluator did not find an adequate explanation for this problem; nor for the few that enrolled but never received an SMS. Healthcare workers claim all patients are placed on a list which they always fax to On Cue, and On Cue claim they add patients to the database as soon as they receive a fax. This aside, the enrolment information being collected was insufficient to run the Service efficiently. In January 2004, a site visit by the City to assess how the pilot was progressing found twenty-

five faxes containing a variable number of patients per fax. Each fax had patient names and numbers, but no corresponding TB registration number or patient record number. Because of this and some faxes not being dated, it was difficult to find records for a randomly selected number of these patients, or their entry in the TB registers. Several suggestions were made, including set up of a separate file to house the details of patients on the Compliance Service, but the evaluator did not find that they had been implemented at the time of the evaluation.

### **Involving traditionally-excluded groups and addressing socio-cultural factors**

*Groups the current Service caters for* The Service has taken steps to include traditionally excluded groups by making the SMS messages available in Xhosa. It is also available in Afrikaans, and could be translated into other languages. However, the SMS protocol only allows for ASCII characters so languages that use non-Latin based characters, such as Kiswahili, cannot be catered for at this time.

*People the Service is not suited to* One nurse suggested that street people are not suited to the Compliance Service, not necessarily on the basis of poor adherence or having no mobile phone, but because attending clinic for DOTS had become part of their life. In her opinion, stopping those daily visits, sometimes the only positive human interaction they have all day, would be a mistake. This may also hold true for other people, such as the unemployed or lonely. This lends further support to the benefits of spending time with the patient at the start of treatment to determine their individual needs.

*The effects of hierarchy* Another problem in South African health care is that of hierarchy. Medical personnel, especially doctors, tend to be held in great esteem by many people in South Africa, particularly those with less education. This impacts on the way in which patients relate to, and communicate with them. For example, nurses reported that when assessing some patients, they felt that they were given the answer the patient thought they wanted to hear, rather than the correct one. But breaking down these barriers to engender a trusting, more equitable interaction is not simple.

## 6 Discussion and analysis

The main finding of this evaluation is that the Compliance Service has potential as a cost-effective system that would be appropriate to complement DOTS in Cape Town clinics and beyond. However, a number of obstacles to the use of the Service have been identified, which need to be overcome in order to make this system work effectively.

The project management issues are so inherently intertwined with the technology that it is difficult to separate them. Project implementation clearly limited the effectiveness of the Compliance Service, but it is not a reflection on the usefulness of the technology itself. To the contrary, the Service has potential to provide more choice in the care of TB and greater convenience for the patient. However, the problems encountered do underline the limitations of the Service and imply there are important conditions for its success. With this in mind, the recommendations below are suggested as a basis to frame next steps for the pilot and for scaling the system more broadly.

### 6.1 Key findings

⇒ *Mobile phones and SMS have proven to be effective tools in the context of health care in South Africa in terms of accessibility, appropriateness and cost. But healthcare workers cannot rely on the technology alone to solve the problem of patient adherence.*

There were no significant problems around the use of SMS in the pilot. Affordable handsets are available, and the cellular network and SMS are sufficiently reliable. Cellular technology is appropriate in terms of security, usability, and the local environment. It is affordable for patients -- even for many unemployed patients -- largely because the Compliance Service involves incoming messages to patients that can be received for free. And at face value, it costs significantly less for the health service to run this Service than to run clinic-based DOTS, and somewhat less for community-based DOTS.

Yet the simplicity of the Compliance Service may have led health workers (at Chapel Street clinic, the City, and On Cue) to rely too heavily on the technology to solve the problem of patient adherence. There is nothing complicated about SMS, or how the Service works, so it was difficult for health workers to predict where and how it might fall short. Rather than first identifying its limitations and working around them, the Compliance Service was just put in place and assumptions were made about its efficacy.

⇒ *Both patients and healthcare workers liked the Service and were able to use cellular technology effectively. Yet a significant number of patients interviewed were not using the Service as instructed.*

Public support is essential for the uptake of technology in society and this pilot provides a good example of this on a smaller scale. There was overwhelming support for the Service from both patients and clinic staff, largely because it helped make TB treatment more convenient. Patients had the capacity to use mobile phones and SMS proficiently and the Service integrated well into daily routines. And patients were relieved at not having to visit clinic daily for DOTS, while at the same time health workers felt they were no longer responsible for disrupting their patients' lives.

Nevertheless, a disconnect exists between patient's support for the Service and their ability (or willingness) to use it as instructed. Several findings point to this. Patients often forgot (or did not think) to tell the clinic of a change in mobile phone number, causing a cessation in service. Patients take a variety of actions on receipt of an SMS reminder, rather than taking their tablets immediately and marking the green card. And patient records show many completed their course of medication, but did not come to clinic for a final sputum test. This suggests patients were not sold on the idea

of adhering strictly to their treatment regimes, despite their enthusiasm for a service that was designed to help them do so.

- ⇒ *The Compliance Service showed rates for TB cure and completion similar to those of clinic-based DOTS at the clinic. But they could not be used to gauge treatment adherence levels due to poor implementation procedures used in the pilot.*

When the cure and completion rates for patients that participated in this trial are compared against the average rates for patients that use the DOTS system at this clinic, no major, statistically significant differences were seen. But reliable treatment adherence levels could not be ascertained due to poor implementation procedures used in the pilot. Patients were not monitored sufficiently, so their records hold very little information as to how they were actually using the Service and whether they were adherent. This meant treatment outcomes could not be used as a gauge of adherence.

There was no written procedure for using the Compliance Service. Again, this may be due in part to the simplicity of the system acting as a disincentive for clinic staff to carefully document its implementation. This -- along with the lack of clarity on how the Service should be integrated into TB care at the clinic -- together were significant factors that led to shortcomings of project implementation. Several findings support this, each having the potential for more far-reaching consequences. Patient names and numbers were being recorded on a piece of paper and faxed to On Cue every Friday, meaning those enrolled at the beginning of the week had no service for a number of days. Healthcare workers were not overly concerned because patients are almost always adherent in the first two weeks. But there will always be exceptions, and City TB experts are particularly concerned that HIV+ patients will be among this group. Many HIV+ patients will have just learned they are HIV+ when they are first treated for TB, as many are suspected of being HIV+ and advised to have a test. These patients have yet to adjust to the seriousness of their situation and will not be in the right frame of mind for committing to adhere to their TB treatment regime. HIV+ patients need extra attention, and putting them on the Compliance Service from Day One of treatment will likely be a mistake.

- ⇒ Healthcare workers tended to either chose, or suggest, the time of day to receive the SMS reminders, rather than agreeing a time with the patient as part of a discussion about their daily routines. A number of patients interviewed said the time chosen was not actually convenient, although they may only have discovered this after some time on the Service. This suggests that the healthcare workers have insufficient knowledge of the patient and their routines, and further emphasises the need to clarify procedure.

## **6.2 Obstacles to widespread rollout**

- ⇒ *Monitoring for treatment adherence is a problem where patients are not seen daily (as they are with DOTS).* There are a number of ways that patients enrolled in the Compliance Service could be monitored better, none of which suffice in isolation. For example, extra effort could be put into the interaction with Compliance patients when they visit the clinic. The United States' Centre for Disease Control (CDC) suggests an information-intensive form of questioning in a "casual manner" to flush out issues that affect patient adherence.<sup>37</sup> But such interchange takes time, which most health workers at the clinic claim they do not have.
- ⇒ *An overall lack of ownership of the project at the clinic limits the proactive participation of the staff, and no one on-site takes responsibility for ensuring the Service is implemented effectively.* No one at the clinic is responsible for managing the day-to-day running of the Service, ensuring data is being recorded and reporting to managers at the City. Staff members do not receive training on how to use the Compliance Service, and no one checks that service standards are maintained. Enthusiasm and drive for change must come from the top, and getting buy-in and support from the clinic manager is key.

- ⇒ *A lack of regular feedback and interaction between the City, On Cue, and the clinic creates a "disconnect" that hinders success in a number of ways.* Current communication channels between the clinic and On Cue are insufficient. Procedural problems are left unattended. The City has not aligned the outcomes of the Service with targets set by the TB Control Programme.
- ⇒ *A number of practical implementation issues limited the effectiveness of the pilot.* The collection of data of any nature was not conducted, from patient comments on the Service to unusual events in their lives that may impact on adherence. Logistical problems were not tackled, such as dealing with phone number changes or difficulties in contacting On Cue. And health workers did not have guidelines for using the Service.
- ⇒ *Clinic staff schedules are tight and many staff members feel that they are over-worked.* Whether real or only perceived, it is crucial that the Compliance Service does not add to the burden of busy staff members. There seems to be some discord between the City and the clinic as to how over-worked the staff are, which will affect the uptake of the Service. And access to supporting technology (such as email) at the clinic is crucial to the integration of the Compliance Service into staff work schedules.
- ⇒ *City and clinic bureaucracy limits the add-on of functionality that would expand the usefulness of the Compliance Service.* For example, the health worker from TB Care wanted to use the Compliance Service to track defaulters, but often could not because bureaucracy at the clinic stood in the way.
- ⇒ *Issues of privacy, data protection, and security will affect the widespread use of technology in healthcare in Africa over the long-term.* Some concerns over privacy need to be addressed, but at this time, it is legal to use SMS in this way providing the patient has given consent. With the increased migration of patient records to electronic formats, existing legislation will need to be reformed and supplemented with more specific legislation to deal with the issues that will arise. For example, especially sensitive areas will relate to blood transfusions and the non-public disclosure of HIV status. Enforceable legal mechanisms and procedures should be implemented to protect patient data, and this is an long-term issue for the Compliance Service.

## **7 Recommendations to the City Council**

In our view, the Compliance Service pilot should be re-implemented and re-evaluated, leveraging on the lessons learned in this initial evaluation. The renewed pilot should be conducted according to clear, written procedure for running the Service, and recording data derived from it.

In the interim, the Compliance Service should be continued for those currently enrolled; given the level of enthusiasm for the Service, a return to clinic-based DOTS may have a negative impact on patients that are currently using the Service successfully. However, it would be advisable to recall these patients and remind them of what they should do upon receiving an SMS reminder. Scaling up will depend on the ability of On Cue to address the obstacles outlined here, but there is no reason that this could not be done.

### **7.1 Re-implementing the pilot**

- ⇒ *A renewed pilot should start with a staff needs assessment and staff training on how the Compliance Service works.* Canvassing clinic staff for their opinions on how the Compliance Service should be implemented is key to its future success. The staff members involved in this pilot have useful experience that should be drawn upon, to understand what works best and what is not working. Staff should be encouraged to propose, implement and support adaptations of the Service. To initiate this, a short training session could be held with clinic staff to remind them how the Compliance Service works and the objectives of the pilot, and to place it in the larger context of the City's TB Control Programme.

- ⇒ *Guidelines should be developed for monitoring treatment adherence, and tracking treatment outcomes of patients participating in the Compliance Service.* A new procedure should be developed by the City in consultation with the TB nurse at Chapel Street clinic. The procedure must identify the criteria for patient selection, such that those selected for the Compliance Service are more likely to remain adherent while not being supervised. It must provide instructions on how to educate the patient, to make sure every effort is put into gaining the patient's buy-in to their treatment regime prior to them finishing an initial period of clinic-based DOTS. And it must contain guidelines on how to conduct rigorous adherence checks on the few opportunities healthcare workers have to interact with patients on the Compliance Service.
- ⇒ *After the initial phase on clinic-based DOTS, patients should be more carefully selected to participate in the Compliance Service, and a means of ongoing assessment is needed.* The criteria for patient selection will include those who: are shown to be highly compliant during the initial phase of clinic-based DOTS; are progressing well on treatment and fit the medical criteria for the pilot; have a basic level of literacy; can demonstrate to the TB nurse that they understand the importance of adherence and the procedure to follow upon receiving an SMS; are responsible enough to inform the clinic of a change in phone number or circumstances; and buy-in to finishing their treatment and commit to visiting the clinic for a final smear test. It is also critical that the nurse understands what motivates the patient to be adherent and what is going on in their life that may impact on this. Getting to know the patient in this initial phase of clinic visits presents the only opportunity for her to do so.
- ⇒ *The pilot should have a dedicated facilitator on-site at the clinic to carry the burden of running the Service.* Among other responsibilities, the facilitator would conduct adherence interviews with patients on the Service, for example, when they visit the clinic to collect monthly supplies of medication. The best candidate would be a bilingual person of African origin, with whom patients would feel comfortable (preferably not a medical professional) such as someone from a local NGO working in the TB field. This person should be pro-active about implementing the Service and act as a local champion for it.
- ⇒ *There are a number of options to address the problem of patients changing their cell number, and a mix of solutions is recommended.* SMS receipts could be used, but the costs of using receipts so frequently may make it unfeasible. And as mentioned above, an SMS receipt only shows the SMS was received by the recipient's SMS server, but does not prove it was delivered on to their mobile phone. At monthly checkups, health workers should ask patients if their number has changed or if they intend changing it. And depending on the scale of the problem, the On Cue system could be configured to SMS patients at intervals reminding them to inform the clinic of a change of number, or indeed other personal circumstances.
- ⇒ *Reporting structures that involve regular feedback and interaction between the City, On Cue, and the clinic must be implemented so that procedural problems can be recognised and addressed early on.*
- ⇒ *Internal technology at the clinic must be reviewed to enable the smooth running of the Service.* Initially, to improve communication between the clinic and the Service, the City could check outgoing email can be sent to On Cue, and that staff know how to use it. But the service would be greatly improved were clinic staff able to use the web interface provided by On Cue, to access the database of patients directly.
- ⇒ *An SLA should be adopted to guarantee service delivery from On Cue.* A minimum turn-around can be specified by the City to set expectations for the timeframe for processing of requests to enrol patients and resolving technical problems. Similarly, processes for dealing with system downtime should be agreed. For example, an apology could be sent to the patients and the clinic would be informed immediately. As more patients are put on the system, the City should obtain written assurances that backup services are in place should the On Cue server fail.

⇒ *An ongoing evaluation of the pilot should be conducted, starting with a thorough project planning exercise in the beginning that sets measurable benchmarks against which future indicators can be gauged.*

## **7.2 Suggested new procedure for a Compliance Service pilot**

A new procedure for re-implementing the pilot, based on the lessons learned from this evaluation, is represented in Diagram 2. It hinges on the City nominating a member of staff (or employing someone) as a Compliance Service facilitator. The main purpose of a facilitator is to remove the day-to-day burden of running the Service from healthcare workers, especially the TB nurse. For re-implementation at Chapel Street, if there are no funds to employ someone, the HIV/AIDS councillor may be a good candidate to fill this role; if not, the clinic receptionist could be considered, although she does not speak Xhosa.

Assuming the new procedure is being followed, once the TB nurse has decided a patient is suitable for enrolment to the Service, and has briefed them on the importance of adherence, they can be passed to the facilitator. The facilitator needs to work with the patient to find out the most convenient time and place for taking the tablets with food and water. The patient needs to be given explicit instructions on actions to take upon receiving an SMS and solutions must be found for patients with irregular lifestyles.

According to the City, new, smear-positive patients could be started on a minimum of two weeks clinic-based DOTS (this equates to ten days of treatment as weekends are excluded). For re-treatment TB patients, a minimum of two months clinic-based DOTS is required. It would be best to start the Compliance Service immediately (on Day One of treatment), to identify and resolve any problems with the Service itself, such as the SMS reminders not arriving, or errors in patient information given to On Cue. The facilitator would also use this time to check the issues that have come out of this evaluation, such as ascertaining the time the SMS is received is as convenient as first thought, that the patient can read and understand the messages, and that they are following instructions correctly and have no problems with the Service, for example, privacy issues.

Key to the role of facilitator is having the time to get to know the patient sufficiently in those first two weeks to enable them to judge their suitability for un-supervised treatment. The facilitator may consider a patient ready after the first two weeks of DOTS, or she may not, and keep them on DOTS longer until she is convinced they will remain adherent. This decision cannot be made in isolation, because the facilitator is unlikely to be a medically-qualified member of staff, and needs the TB nurse to give expert opinion both on the patient's suitability in terms of their medical condition and her own opinions of their adherence.

The facilitator would also complete the Compliance Service record book, which acts as a central point for all information on patients currently in the Service (see Diagram 1), and emails a list of patient names, numbers and TB registration numbers to On Cue at the end of each day. When On Cue verifies that the patients have been added to the Service, the names and numbers should be re-checked against the record book the next day. It is important to provide space in the Compliance Service record book for comments about the patient, to enable the City to evaluate the Service. Anyone (including the doctor) could add to this column, although it is likely to be most often the facilitator, and a copy of the book should be sent to the City at intervals. Ideally, this should all be done electronically, and again, enabling clinic staff to use the web interface to the Compliance Service would be best. If necessary, the pilot could start with a carbon copy book, but should the Service be scaled up, switching to digital format will become necessary.

Diagram 1: Suggested contents for the Compliance Service record book

<b>TB registration number</b> (also used to identify patient record)	<b>Name</b> (including any "nick names" or aliases)	<b>Mobile phone number</b>	<b>Backup phone number</b> or contact details	<b>Address</b> (or, if the patient is homeless, a description of the places they frequent regularly)	<b>Enrolment date</b>	<b>Initial DOTS phase</b> (number of days)	<b>Service checks</b> (according to written procedure) Keeping track of this is a lot of extra work	<b>Adherence checks</b> (according to written procedure) Keeping track of this is a lot of extra work	<b>Comments</b>
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Diagram 2: Suggested new procedure for a Compliance Service pilot

**Tasks for the Clinic**

Guidelines containing a description of the Service, how it fits into the TB Control Programme, On Cue contact details, criteria for enrolment, procedure for monitoring adherence...

Service record book (carbon copy useful)<sup>2</sup> containing patient name, number, a second contact number, TB registration number, date of enrolment, type of TB, details of treatment regime, treatment outcome and an extra column for comments.<sup>#</sup>

Facilitator establishes a relationship with the patient, and their buy-in to adherence

TB nurse selects patient

Patient educated about Service and adherence.\*  
Service record book filled in by nurse.

Patient name, number, TB registration number emailed to On Cue at EOB.\*

On Cue sends reply within 24 hours, verifying new entries to database. Clinic double checks these details.\*

Min 2 weeks DOTS for new, S+ patients, and 2 months DOTS for re-treatment TB.\*

Facilitator and TB nurse decide if patient can be placed on self-supervision, if not, DOTS is continued.

Service and adherence checks done at months 2, 3, 4, 5 and 6 (7 and 8 for re-treatment TB). All data recorded in the Service book\*

One week before end of treatment, On Cue to send email informing clinic of date patient will be removed from the Service.

**Tasks for the City**

TB experts to provide specific criteria for enrolment, based on an initial group of "low risk" and "predicted as adherent" patients. Arrange "refresher" training at clinic with emphasis on how the Service fits into the TB Control programme, and how special care must be taken to monitor patients for adherence. Train Service facilitator.

Ensure the clinic is able to send and receive email from On Cue (also allow html to On Cue web server at a later date).

Provide clinic with procedure for Service check, e.g. verify patient is receiving SMS at correct time and in desired language. Adherence check, e.g. patient to be asked what they do upon receiving an SMS, check the time chosen is suitable, and if not, request On Cue to change it (via email).

Request carbon copy of Service record book at intervals, for evaluation.

\* Denotes activities handled by Compliance Service facilitator at the clinic.

# This should be done electronically, but the staff may not have the capacity to deal with learning to use a new system efficiently without training and practice.

+ On Cue could provide an HTML form on their website for ease of use; this will be necessary for scale up.

### 7.3 Scaling up the Compliance Service

The following are a list of recommendations for scaling up the Compliance Service across the province, and beyond.

- ⇒ *Planning a comprehensive procedure, testing and evaluating it thoroughly, and refining it based on lessons learned is key to an effective scale-up of the Compliance Service.*
- ⇒ *Scale-up requires dedicated responsibility to ensure the Compliance Service is implemented uniformly across all sites.* This is necessary to enable successful integration of the Service into the TB Control Programme.
- ⇒ *On Cue must have the capacity to scale-up across the region, and the technical details should be discussed between the City IT Department and On Cue.* On Cue should carry out a needs assessment with TB experts at the City and the clinic TB nurse to ensure the Compliance Service meets their needs, before scaling up. At this stage, it would be prudent to liaise with other groups involved in moving health service data to electronic formats, to ensure the Compliance Service system is compatible.
- ⇒ *All new patients should be required to sign a legal consent form to give their permission for the clinic to communicate with them via SMS.* This will ensure that the Compliance Service falls strictly within the law, and avoid the potential of litigation against the City from dissatisfied patients.
- ⇒ *Expansion to other languages should be undertaken, to continue extending the reach of the Service.* On Cue has indicated that the Compliance Service can be translated to other (Latin-character based) languages with few difficulties. This may not be an immediate concern for the City, but should nonetheless be explored with an eye toward extending to health services in other provinces.

## 8 Concluding remarks

The Compliance Service pilot has produced treatment outcomes in line with those reported for the clinic, but contrary to expectation, they were no better. However, these results are tied to the way in which the Compliance Service was implemented, and because there were many shortcomings in implementation, these treatment outcomes are not valid to judge the effectiveness of the system itself. Only by tightening up and following an agreed procedure will meaningful values for treatment outcomes be obtained.

Frankly, there is not much to say about the technology. It works and it is effective. And on face value, it also provides a more cost-effective treatment option, both for the health service and patient. The convenience of TB treatment for the patient is also greatly improved.

But, the Compliance Service is only a viable option if adherence levels are at least those of clinic-based DOTS. If they are less, non-adherent patients are likely to stay infectious for longer, worsening their condition and spreading the disease. A six-month (minimum) course of any medication, especially if it has to be taken under strict conditions, is difficult for anyone to adhere to. And if a patient has little contact with the clinic, it is likely some will forget the gravity of their medical condition, especially once they begin to feel well. But adhere they must, and so the Compliance Service essentially presents a trade-off between the gains made on cost and convenience and the losses from having to put extra efforts into getting to know, and monitor self-supervised patients. The technology is not a silver bullet to solve the problem of patient adherence: it is all down to the way in which it is implemented.

We believe that if the Compliance Service were re-implemented and re-evaluated,

leveraging on the lessons learned in this evaluation, treatment outcomes would be improved. The findings presented here highlight the most important areas requiring attention, and starting over should not be difficult, provided sufficient thought is put into the process. Key to the success of the Compliance Service is an understanding of where the use of the technology ends and care giving begins. The Compliance Service could be a valuable enabler of the TB Control Programme but getting that fit right is all important.

## Evaluation of the On Cue Compliance Service Pilot bridges.org, 29 March 2005

### Annex 1. Treatment outcomes from assessment of patient records *NB: Based on an assessment of of 221 patient records*

Pat. num	M/F	Age	Employment status	Catgry of patient	Trtmnt Outcm	HIV status	Comments	New, S+ and Cured	New, TC and S+
1	F	36	Unemployed	New	TC		EPTB (pleural effusion), notified & started SMS same day. 30 days later had not yet received the SMS. No entry ever made confirming that SMS was received.		
2	M	42	?	New	?		S+, notified & started SMS same day. 11 days later had not yet received the SMS, VCT offered but not done, discharged:cured 4/12/02. Re-investigated again 2004, S+, referred for TB Rx to Gugu clinic, Cult- (after decontam) uncertain about current TB status)	S+	
3	M	54	Employed	New	TI		EPTB (lymph nodes-ZN+), sputum specimens both leaked and not repeated , started SMS from day one: Rifafour supplied 30 + 30 + 100 tabs TI 2/05/03. Now on ARV.		
4	M	37	Unemployed	New	TC		EPTB-Lymph node, Notified & started SMS same day- 7 days later SMS not received. Dr ? SMS working 12 days later. Entry on 10.04.02 stating SMS working well. 16/08/02		
5	M	37	?	New	Cured		N Cult+, notified & started SMS same day		
6	F	38	Employed	Re-Rx	TC		Cult+, 2000(cure) 2003(resist to INH "Rifafour x 1 year),2/54 of Rx in Nyanga East, started SMS after completing 2/12 of SM at Chapel TC-21/07/04		
7	F	29	?	New	TC		P EPTB (pleura), notified & started SMS same day- 8 days later SMS had not been received yet TC-17/12/03		
8	F	27	Unemployed	New	TF		Cult+, contact of known MDR, reported as MDR too, notified & started SMS same day- 2 days later requested tabs to go away for 2 weeks, away often for large periods of time, given drugs and syringes to carry on Rx. No entry about the status of her SMS messages. Started on ARVs (converted!) 06/01/04		
9	F	49	Unemployed	Re-Rx	N/A yet		S+, 1998(?), 2001 (T) 2002 (cure-SMS) 03/04 (failure), started SMS from day one - Not given streptomycin! ? Never supervised	S+	
10	F	28	Unemployed	New	TC		P EPTB (Pleura) started on SMS from first day.		
11	F	26	Unemployed	Re-Rx	?		P Rx stopped. Left to EC ? Sputum results		
12	M	35	Self-employed	New	TC		P Cult+		
13	M	38	?	New	Cured		N S+ Started SMS first day	S+	Y
14	M	25	?	New	TC		N No Sputum done -CXR, When was SMS started? TC-21/07/04		
15	F	31	?	New	N/A yet		P Cult +, notified & started SMS same day		
16	F	25	?	New	N/A yet		N S+, notified & started SMS same day	S+	
17	M	25	Part-time	New	N/A yet		N S+, notified & started SMS same day	S+	
18	F	22	?	New	N/A yet		? S+, notified & started SMS same day	S+	
19	M	39	Student	New	N/A yet		N Cult+, notified & started SMS same day. HIV test done in 1998, not repeated since.		
20	F	27	?	Re-Rx	N/A yet		P EPTB (Abdom), Rx (1999-Kenya), started SMS once SM stopped		

21	F	32	?	New	N/A yet	P EPTB (Glands), started SMS while experiencing probs on TB drugs, Frequent interruptions of Rx			
22	F	44	Employed	RAC	N/A yet	2002 (S+ Started Rx 30/01/02, Discharged TC on 07/10/02), RAC 2004 (Cult+) started SMS from day one (SM injections?)			
23	F	43		New	Cured	P			
24	M	26	Unemployed	New	TI	P Started on SMS first day, appointment one month later, never returned and not traced			
25	F	26	Employed	New	TC	P EPTB (pleural effusion)			
26	M	30	Unemployed	New	Cured	P S+ started SMS first day	S+		Y
27	M	22	Employed	New	TC	? EPTB (pleural effusion)			
28	M	39	Self-employed	RAC	TI	P EPTB (peural effusion), SMS only started after 2 months injections			
29	F	28	?	New	TC	P Cult + started first day			
30	F	27	Unemployed	New	TC	P Cult + started first day			
31	M	28	Employed	New	Cured	? S+ started SMS first day	S+		Y
32	F	26	?	RC	Cured	N S+ SMS started after 2 months of injections	S+		
33	M	39	Unemployed	New	Cured	S+ does not have a cell phone himself, appears as if he was put on SMS service on sister's phone. Had to be called in often. Cured, but patient disappeared toward end of treatment	S+		Y
34	F	30	Employed	New	TI	P EPTB, started SMS first day, never returned and could never be recalled			
35	M	27	?	New	TC	P EPTB (Abdom), on ARV, started on SMS first day			
36	F	42	?	New	Cured	P S+ disseminated TB	S+		Y
37	F	29	?	New	not TB	P S- TB was not confirmed and TB Rx was stopped			
38	F	18	Unemployed	New	transferred out	P EPTB (disseminated TB)			
39	F	24	Student	New	TI	N S+ started SMS first day, only attended clinic once and did not have treatment for almost 2 months	S+		
40	F	31	Employed	New	TC	P EPTB			
41	F	30	Employed	New	Cured	P S+ started SMS first day, but 6 weeks later no SMS had been received.	S+		Y
42	M	34	Unemployed	New	TC	P S- and on ARV			
43	F	25	?	New	TC	? EPTB started on SMS immediately			
44	F	33	Self-employed	New	Cured	N S+ started SMS immediately	S+		Y
45	M	34	Self-employed	New	transferred out	P ARV, had no cell phone, partner was the person receiving the SMS			
46	M	25	Employed	New	TC	N EPTB (Pleural effusion), S+, sputum results?			
47	M	42	Unemployed	New	TI	N S+ started on SMS immediately, given appoint 2 months later, but never returned	S+		
48	F	47	?	New	TC	? EPTB (Pleural effusion)			
49	F	47	Unemployed	RAC	TC	cult+ started on SMS after 2/12 of injections, but no cell phone number recorded: probably husband's used. ? Finally transferred to Hillcrest.			
50	M	45	?	New	TC	P EPTB, on ARV, started on SMS immediately			
51	M	28	?	New	TC	? cult+ started SMS immediately			
52	F	21	Student	New	TC	N EPTB (Peural effusion), started SMS immediately, checked that SMS was received, left for Botswana, but not informed of new number			

53	F	57	Unemployed	RAC	TC	? cult+ had numerous side effects, Rx re-started one drug at a time, had injections which also had to be stopped, stopped attending clinic, but still qualified as "TC"			
54	M	24	?	New	TC	P cult+ resistant to INH, started SMS on same day as diagnosed HIV+ and with TB, numerous problems related to treatment			
55	M	34	?	New	TC	P S+, did not produce a cell phone when asked to a month after diagnosis	S+		Y
56	F	22	Unemployed	New	TC	P EPTB, pericardial effusion, started SMS immediately.			
57	M	37	Self-employed	RAC	Cured	? S+ poor attender to clinic DOTS, but was started on SMS after streptomycin	S+		
58	M	22	?	RAC	TC	? S+ started Rx at Green Point clinic, later on started SMS after streptomycin stopped	S+		
59	M	28	Unemployed	New	Cured	N S+	S+		Y
60	F	24	?	New	Cured	? S+, started on the first day	S+		Y
61	F	45	Unemployed	New	not TB	? S+, only 1 mth treatment	S+		
62	F	25	Unemployed	New	TI	N Cult+, SMS from beginning			
63	M	21	Unemployed	New	TC	? Cult+, taken off SMS because of poor compliance and brother will supervise. But no response a month later, eventually got hold of, moved addr, and clinic and finally completed			
64	M	31	?	New	TI	P S+, note to say SMS should come at 10:00, but Rifimiacin then given for taking at night, but no indication that the SMS time had been changed	S+		
65	F	19	?	New	TC	? EPTB, started on SMS on week 2 after initial nausea had passed.			
66	F	33	?	New	D	P DOT initially started at work, PTB			
67	F	33	?	New	Cured	N Gets SMS at 07:45, from first day. S+.	S+		Y
68	F	39	?	New	Cured	N S+, started on the first day, green card was not marked, recalled a number of times, itchy skin, improved.	S+		Y
69	M	26	?	New	Cured	? S+	S+		Y
70	M	20	Student	New	Cured	? S+, started his treatment supervised at college. SMS started when on holiday	S+		Y
71	F	31	Unemployed	New	TC	N S+	S+		Y
72	M	37	?	RC	TC	? Cult+, started on SMS after streptomycin stopped at 2 mths, but HIV test done last in 2000.			
73	M	28	Employed	New	TC	N Cult+, DOT by SMS from first day, client was uncooperative after 2 mths and had nausea.			
74	F	44	Employed	New	Cured	? S+, DOT by SMS started on first day	S+		Y
75	M	20	Student	New	TC	S+, DOT by SMS started on first day, green card not signed and does not get SMS as changed cell number. Claims he did tell sister but some mixup. Number changed on record but was Dr Green updated?	S+		Y
76	M	35	?	New	Cured	S+, put on SMS first day, later, green card found to be not marked, later lost it. Has heart disease. Boss deducting wages for attending clinic.	S+		Y
77	F	20	Unemployed	New	TC	P EPTB, SMS started on first day due to number of public holidays. Later, DOTS supervised at home by mother			
78	F	24	?	New	Cured	N S+, started DOT at home, then started on SMS after 2 months.	S+		Y
79	M	21	Student	New	TC	S-, SMS started first day, arranged for 09:00 but unclear whether patient chose this time or the nurse did. Unknown whether treatment continued through the holidays, which were 3 months, and longer than the arrangement by the clinic to cater for them.			
80	M	24	?	New	TC	? Green card was completed, S-, EPTB, SMS from start, was some checking done afterwards, good compliance.			

81	M	21	Employed	TI	Cured	?	S+, restarted after interruption, which was in the DRC, SMS started after injections finished, also, details taken for setup of SMS and service was checked thereafter.	S+	Y
82			?	RAC	TC	N	EPTB, Green card marked ahead of the date, when asked, said it was not her. SMS organised for 09:00, but second request made 2 mths later, so appears as if SMS service not done for 2 mth.		
83	F	27	Unemployed	New	TI	?	S+, DOT by family, 2 wk into treatment was not answering the phone, no other reference made to the service. Green card not marked always, and still S+ at 2mth. Client weakened and then allegedly moved to Swaziland. Looks like SMS service was organised but looks like it wasn't used.	S+	
84	F	28	?	New	TC	P	EPTB, house mate supervising DOT, put on SMS after 2 weeks supervision at home. Client did not receive SMS after a mth, Dr Green contacted, client then received SMS from 20/12/01.		
85	M	53	Employed	RTAI	TI	N	Put on SMS after injections stopped at 2mth, checked to see receiving messages but green card no signed and patient was not aware he had to do so. Big problems with previous reactions.		
86	M	28	Unemployed	New	TI	N	EPTB, started SMS first day, no problem on medication, no more on SMS.		
87	M	24	Student	New	TI	?	SMS from first day, could not be contacted at either of 2 nums		
88	M	38	?	New	transferred out	P	Cult+, diabetic, SMS started first day, green card was not marked. Did not take tablets for 13 days when on hols. Later taking DOT at Khayelisha.		
89	M	26	?	New	TC	N	Cult+, started on SMS first day, checked 2 weeks later and was receiving SMS		
90	F	36	?	New	Cured	?	S+, SMS started first day, checked for SMS 2 weeks later and not receiving.	S+	Y
91	M	27	Unemployed	New	TI	?	S+, SMS started first day, not available on cell num, someone sent to home, noone in.	S+	
92	M	27	?	New	Cured	N	S+, SMS arranged for 17:00 and started first day, request by Dr to check SMS at 2 mth, but nothing more in record.	S+	Y
93	M	35	Employed	New	Cured	?	S+, SMS started first day, some confusion over details, but nothing more.	S+	Y
94	F	26	?	New	TC	P	S+, SMS started first day, not receiving SMS 6 days later, receiving SMS a mth later, given separate drugs to take by herself, but this is typically bad for adherence.	S+	Y
95	M	32	Unemployed	New	D	?	S+, SMS started first day but records also say brother supervised DOT, card marked, contacted brother 3 mths later and brother told staff he had died.	S+	
96	F	38	Unemployed	New	TC	?	Not able to produce sputum, SMS started first day, checked receiving SMS 2 wks later.		
97	M	23	?	New	Cured	P	S+, SMS started first day but also explained by nurse. Has to have injections every 6 wks. SMS service checked at 7 days and 3 mths.	S+	Y
98	M	27	Student	New	TC	N	EPTB, started SMS on first day, very little in notes after that.		
99	M	26	Employed	New	Cured	N	S+, started SMS first day, not receiving SMS 3 wks later and there is a note to check this, but nothing else.	S+	Y
100	M	34	Employed	RAC	TC	P	S+, previously at the Welfare Org, Woodstock. SMS started first day at 08:30, then mentioned for 2mth, then Dr request patient be registered on SMS service one mth after this. SMS checked one mth after this and is receiving. (noted as RV+ on notes?)	S+	
101	F	26	Unemployed	New	TC	?	EPTB, SMS started 6 days after start of treatment, no other mention thereafter.		
102	M	27	Self-employed	New	TI	P	EPTB, SMS started first day, not answering phone 3 wks later.		
103	F	39	Unemployed	New	Cured	?	S+, SMS started first day, not receiving SMS 8 days later. Seen at clinic with various complaints over next 6 mths, no other mention of SMS.	S+	Y

104	F	26	Student	RI	Cured	? Receiving DOT at Green Point clinic, then TI before restarting at Chapel St. Put on SMS immediately due to doing well after previous DOT.			
105	F	24	Student	New	TC	? S+, SMS started first day, and not mentioned thereafter. Patient looks to be cooperative though.	S+		Y
106	F	27	Employed	New	TI	S+, SMS started first day at 2pm. SMS checked at 2 weeks, client reported messages changed frequently and were fun. Compliance 100% at 3 mths, but then patient defaulted and could not be reached on phone.	S+		
107	M	24	?	New	TC	? Cult+, SMS from beginning, checked 3 mths later and was receiving SMS.			
108	F	32	?	New	Cured	? S+, SMS from beginning, not checked thereafter.	S+		Y
109	F	25	?	New	TC	? EPTB, SMS started after 2 wks at 08:00. Green card explained. SMS checked at 3 mth visit: going well.			
110	F	30	?	New	TC	? S+, SMS started first day and checked 7 days later. Not receiving SMS. Had support of work. No further check.	S+		Y
111	F	33	?	New	TC	? EPTB, SMS started first day, not answering phone 3 wks later.			
112	F	36	?	New	Cured	S+, referred from Green Point. Counselling on adherence and put on SMS 3 days later. Note 2 wks later that patient would like SMS service, so assume no SMS as yet, but nothing in records thereafter.	S+		Y
113	M	32	?	New	Cured	? SMS from first day, S+, MRC positive, no more notes on SMS service.	S+		Y
114	M	36	Self-employed	New	Cured	S+, SMS from first day, no other mention thereafter.	S+		Y
115	M	32	Employed	New	Cured	S+, SMS from first day, 2 wks later had not yet received one, further note to say SMS arranged for 09:00 (not known if patient chose time). No other mention of SMS.	S+		Y
116	M	29	Employed	New	TI	? EPTB, green card not marked for first month: counselled on this. Called repeatedly.			
117	F	27	?	New	Cured	S+, started on DOT at clinic before wk, then on SMS after one mth following counselling. Time chosen by patient and Dr as 10:00. SMS service checked 3 days later. Three mth later was not receiving SMS as phone not working, but no further mention.	S+		Y
118	F	47	?	New	TC	? EPTB, started SMS first day, going away for 2 weeks within first mth of Rx, no further mention of SMS.			
119	?	25	?	New	TC	EPTB, initially on DOT at Claremont, then put on SMS after one mth. Other clinic had to be informed, as she had missed DOT. Notes mention continuation phase to be aided by SMS after patient was seen to be much better.			
120	F	28	Unemployed	New	TC	TB of the lymph nodes. Transferred from Gauting, SMS started first day. Intense Rx regime needed, patient not happy on it.			
121	M	23	?	New	TI	S-, started SMS first day. Missed appointments then contacted 4 mths later and said he had not taken Rx for 3 wks, but was actually 8.5 wks ago			
122	M	48	Employed	New	Cured	S+, cult+, SMS started first day, no other mention thereafter.	S+		Y
123	M	17	Student	New	TC	? EPTB, minor, SMS started first day at 09:00 (do not know if patient chose time). No further mention.			
124	M	41	Unemployed	New	TC	EPTB, SMS started first day and checked 7 days later and checked again one month after: SMS being received.			
125	M	28	Unemployed	New	TC	Type of TB labelled ?. Started on SMS first day and checked 1mth later and 4mth later with no complaints at service			

126	F	24	Unemployed	New	TC	?	EPTB, SMS started first day, patient complains of nausea and vomiting and tried on different Rx and doses. No mention of SMS service.			
127	F	33	?	New	TC	P	TB other organs, DOT at Greenpoint clinic for first 2mth, then SMS requested but note (in pen and handwriting of a mth later) to say phone stolen. Note sent to Greenpoint 1mth later to advise of SMS service. One mth later, DOT being supervised at home by husband, who was advised how to fill in green card. Good compliance reported, no further mention of SMS.			
128	F	33	?	New	TI	N	EPTB, already on Rx, severe reaction to drugs, put on SMS immediately with client given tabs in individual, labelled packets, as requested by patient.			
129	F	29	?	New	Cured	?	S+, cult+, no mention of method of adherence in notes, only that green card was unmarked at 3mths.	S+		Y
130	F	19	Unemployed	New	TC	?	S-, SMS started first day. A lot of counselling given re attitude. Nothing further on SMS.			
131	M	31	Unemployed	New	transferred out	P	TB of the nose. Already on treatment. No mention of SMS, except 609:006 written on front page by num. Patient can only speak Swahili.			
132	M	35	?	New	TC	P	TB of the lymph nodes. SMS started first day, no further mention.			
133	M	25	Unemployed	New	TC	?	S-, SMS started first day at 10:00 and checked one wk later. Note of DOT at home 3 mth later, but not clear if this means via SMS or under supervision.			
134	M	53	Unemployed	New	Cured	?	S+, SMS started first day, no other mention.	S+		Y
135	M	22	Unemployed	RAC	TC	?	EPTB, initially on DOT at Greenpoint, English poor, then attending civic centre for DOT. Not sure when SMS started, only a note at 2mths to say SMS were being received.			
136	M	32	?	RAC	Cured	?	S+, SMS started first day, no other mention.	S+		
137	F	57	Unemployed	RAC	TC	?	S-, started on DOT at clinic, then treatment point crossed out and replaced with SMS, but no record in notes. Patient had long records with many problems: dizziness, eye problems, nausea			
138	F	32	Unemployed	New	Cured	?	S+, DOTS discussed and put on SMS immediately	S+		Y
139	F	23	Unemployed	New	Cured	?	S+, SMS started on day and one note to say SMS in progress after 1mth.	S+		Y
140	F	30	Unemployed	New	TC	?	EPTB, SMS started first day, no other mention thereafter.			
141	M	30	?	New	TI	?	EPTB, DOTS discussed on day one. Note to say no SMS being received 3 wks later, next checked at 3 mths and was being received. Used SMS service to recall patient.			
142	F	39	?	New	TC	?	SMS service on records but no other mention			
143	M	20	?	New	TC	?	SMS from first day, EPTB, rapid recovery, no check on SMS service.			
144	M	26	?	New	Cured	?	S+, SMS started first day (SMS sent to a friend's phone?). Change of phone number and Dr Green informed at 5mths.	S+		Y
145	M	21	?	New	TC	?	S+, SMS started first day, then a note to say DOTS being done at the clinic and SMS to start 1mth into treatment.	S+		Y
146	?	19	Unemployed	New	TC	?	EPTB, initially put on DOTS at clinic, then on SMS one mth later			
147	F	33	Unemployed	New	Cured	?	S+, SMS started first day, arranged for 09:00. Checked 1wek later: not receiving SMS	S+		Y
148	F	28	Unemployed	New	TC	P	TB of the lymph nodes. SMS discussed first day and started shortly after. Green card unmarked at 2wks: note to stop SMS if unmarked at next visit. Lots of missed visits. SMS used to recall patient.			
149	F	41	Unemployed	New	transferred out	?	S+, SMS started first day, and not mentioned thereafter. Patient looks to be cooperative though.	S+		
150	F	24	Student	New	TC	?	EPTB, started on SMS after 1wk			

151	M	35	Unemployed	New	TI	N	SMS started first day, no other record of service.			
152	F	21	Unemployed	New	transferred out	N	S+, no mention of SMS service except on front page.	S+		
153	F	19	Student	New	Cured	?	S+, no mention of SMS service except on front page.	S+		Y
154	M	25	Unemployed	New	TC	?	EPTB, SMS discussed on first day but not clear how patient did DOTS.			
155	F	24	Unemployed	New	TC	?	TB of the lymph nodes. SMS from first day			
156	M	28	Unemployed	New	TI	P	TB Meningitis. SMS from first day, defaulted. Recalled with SMS after 1mth.			
157	F	26	Unemployed	New	TC	?	TB of the lymph nodes. Husband supervising DOTS, green card explained. Later SMS.			
158	M	30	Unemployed	New	TI	P	TB of the lymph nodes. SMS started first day, no further mention.			
159	M	25	?	New	TC	?	S+, SMS started first day, not receiving SMS after 1wk. Four mth into treatment, green card not marked. Note to stop SMS if not marked at next visit. Was marked 1mth later.	S+		Y
160	F	24	?	New	TC	N	EPTB, counselled on TB and compliance. Started SMS first day at 08:00, green card also explained. One wk later had not received SMS. One mth later, still no SMS and cell num had not changed. Client asked to call clinic if he still did not receive SMS. No other note.			
161	F	46	Unemployed	New	Cured	?	S+ plus small effusion, SMS started first day, no other mention.	S+		Y
162	F	38	?	New	Cured	?	S-, SMS started first day. Counselled on TB and compliance. Receiving SMS one wk later.			
163	M	21	Student	New	TC	?	EPTB, SMS from first day, quick recovery.			
164	M	23	Unemployed	New	TC	N	S-, SMS started first day. No further mention of service.			
165	F	21	Student	New	transferred out	?	TB of the lymph nodes. No record of DOTS except on first page.			
166	M	28	?	New	transferred out	?	EPTB, referred from Green Point. SMS from first day after explaining medication and green card. Returned to Zimbabwe.			
167	M	49	?	New	Cured	?	S+, referred from Green Point. SMS started first day, no other mention.	S+		Y
168	F	30	Unemployed	New	TI	P	S+, SMS started first day, with compliance explained. Note to try DOTS by SMS for 2 wks. Notes say patient discharged	S+		
169	M	22	?	New	TI	?	EPTB, DOTS for one wk, then on to SMS. Patient was committed to Rx but defaulted at 6mths as felt better.			
170	M	18	Unemployed	New	TI	?	S+, transferred from another clinic. Counselled on green card, but no mention of starting SMS, although patient was recalled by Dr Green at 6mth	S+		
171	M	37	?	New	Cured	?	S+, referred from Green Point. SMS from first day, compliance explained.	S+		Y
172	F	27	Unemployed	New	TC	?	TB other organs, SMS started first day, card not marked a wk later.			
173	F	20	Student	New	TI	?	S+, SMS started first day, counselled, no further checks.	S+		
174	F	24	Student	New	Cured	?	S+, started on SMS the second day	S+		Y
175	M	27	Unemployed	New	TC	?	EPTB, no mention of SMS but patient recovered quickly			
176	M	30	Unemployed	New	TC	?	EPTB, SMS started first day. Discussed compliance 1 wk later as no card brought to clinic. SMS checked at 3mth			
177	F	33	?	New	TC	N	TB of the lymph nodes. SMS started first day and checked at 1wk			
178	F	19	Student	New	TC	?	EPTB, put on SMS but no further mention.			
179	M	31	?	New	D	P	SMS from first day, could not be contacted at either of 2 nums			
180	F	38	Unemployed	New	TI	?	Referred from another clinic, SMS started first day @ 09:00, no other mention.			
181	F	29	Unemployed	New	Cured	P	Referred from Green Point, started on SMS first day, going on ARVs.			

182	M	24	Unemployed	New	Cured	? SMS from first day, no other mention.			
183	F	20	Unemployed	New	transferred out	S+, SMS from first day, after 3mth had only ever received 1 SMS. Recalled by Dr Green at 6mth. Patient went back home.	S+		
184	F	26	Employed	New	Cured	? No mention of SMS except on front of record.			
185	M	28	Unemployed	New	Cured	? S+, SMS started after 1wk, no other mention.	S+		Y
186	M	28	Unemployed	New	Cured	? S+, SMS started first day, 3mth later had not received an SMS, no other mention.	S+		Y
187	F	23	Unemployed	New	Cured	P S+, DOT at home by sister or husband, but this may have meant via SMS.	S+		Y
188	M	27	Unemployed	New	Cured	? S+, EPTB, SMS started first day, no other mention.	S+		Y
189	F	29	Employed	New	TC	N EPTB, referred, pregnant, no mention of SMS except on front page.			
190	M	37	Unemployed	New	TC	P TB other organs, referred from Green Point, counselled re compliance, green card explained, SMS started first day @ 09:00. 1mth later not getting SMS. One wk later, SMS sent out for patient to attend clinic, 1 wk later SMS checked.			
191	M	27	?	New	Cured	P Referred from Green Point, SMS arranged after 1mth. Lots of problems including confusion, no other mention of SMS.			
192	F	31	Unemployed	New	not TB	P S+, referred from Green Point, SMS started first day, time chosen 20:30. SMS checked 2 wks later.	S+		
193	M	19	Unemployed	New	TC	? EPTB, SMS started after 3 days, recovered quickly.			
194	F	52	Unemployed	New	Cured	? Only one mention of 'DOTS at home' at 5mth			
195	M	25	Unemployed	New	TC	N EPTB, referred, counselled re compliance and green card. SMS arranged first day for 10:00. SMS checked at 2mth, rapid recovery			
196	F	23	?	New	Cured	? S+, compliance counselling given and green card explained. Started with DOTS at work, then SMS started at 2mth @ 10:00.	S+		Y
197	F	26	?	New	TC	P EPTB, not sure what type of DOTS, as both home and sms mentioned on front page.			
198	M	27	?	New	TC	P TB other organs, unsure of DOT.			
199	F	27	?	New	TC	? S-, started DOTS at Green Point. Was kicked out of her living quarters at company when diagnosed.			
200	F	28	Unemployed	New	Cured	P S+, severe pneumonia, started SMS first day at 13:00.	S+		Y
201	F	36	Student	New	Cured	? S+, notes say patient going to Lesothu for 2 mth but still put on SMS (does signal go to Lesothu?).	S+		Y
202	F	44	Student	New	Cured	? S+, referred, SMS started first day, green card + compliance explained, no other mention of SMS.	S+		Y
203	F	31	Unemployed	New	TC	P TB of the lymph nodes. Referred, no notes on SMS.			
204	F	51	Unemployed	New	TI	? S+, SMS from first day, compliance good at 2mth, defaulted around 5th, recalled by SMS.	S+		
205	F	33	Unemployed	New	Cured	P S+, SMS started first day, recalled at 6mth by SMS.	S+		Y
206	M	23	Student	New	TI	N S+, SMS started first day, plus counselling. Defaulting 3mths later, recalled by SMS twice.	S+		
207	F	36	Unemployed	New	TC	N EPTB, SMS started first day and checked 3 days later. Green card not ticked.			
208	F	28	Employed	New	TC	P TB military, referred, ARVs being discussed. SMS first day + with her sister? No other mention of SMS.			
209	M	40	Employed	New	TC	P Cult+ TB other organs, referred from Green Point, SMS first day			
210	M	36	Self-employed	New	TC	P TB meningitis. SMS from first day, no other record.			
211	M	22	Employed	New	TC	? EPTB, SMS from first day, no other mention.			

212	F	29	Unemployed	New	TC	? TB military, referred, SMS started first day, complicated case, unsure whether it was DOTS at home or SMS.			
213	M	37	Unemployed	New	Cured	? Chapel crossed out and SMS put on front page, but nothing more in notes			
214	M	33	Unemployed	New	TC	? TB other organs, S+, multiple complaints, long notes, SMS setup after 1wk then no other mention.	S+		Y
215	M	35	Unemployed	New	D	? S+ and disseminated TB, referred, SMS from first day, multiple problems.	S+		
216	M	27	?	New	TC	N S-, referred, motivated, SMS from day one, no other mention of SMS.			
217	F	25	Employed	New	Cured	? S+, referred, compliance explained + green card, put on SMS from first day. No other mention.	S+		Y
218	M	25	Employed	New	Cured	N S+, SMS started first day, recalled via SMS at 2mth. Patient not found at given address, came into clinic	S+		Y
219	M	29	Employed	New	Cured	? S+, SMS from first day, no other mention thereafter.	S+		Y
220	F	28	Unemployed	New	TC	P Cult+, SMS from beginning			
221	F	33	Employed	New	TC	P TB other organs, referred, DOTS started at work and possibly changed to SMS later: notes are unclear.			

<b>Totals</b>	
80	Number of Unemployed
36.2	Percent Unemployed
65	Number HIV+
90	Number of initially S+ patients
53	Number new, S+ and Cured
2	Number S+ minus not TB
62.35	Cure rate: new, S+ (%)
10.59	Completion rate: new, S+(%)
73	Successful Treatment rate: new, S+ patients (%)
109	Number not tested
58.04	Percent HIV+ of those tested
3	New, S+ but N/A yet: meaning have not completed treatment
9	Number of New, S+ and TC

## Evaluation of the On Cue Compliance Service Pilot bridges.org, 29 March 2005

### Annex 2. Results of patient satisfaction survey

*NB: Based on survey of satisfaction with Compliance Service*

Question and response type			Patient number												
			1	2	3	4	5	6	7	8	9	10	11	12	13
Q1	What area of Cape Town do you live in?	Area (descriptive answer)	Woodstock	Khayelitsha	Seapoint	Guguletu	Guguletu	City	Woodstock	Nyanga	Green Point	Mitchells Plain	Woodstock	Rondebosch	Khayelitsha
Q2	How much does it cost to get to the clinic? (one way, ZAR)	Cost (numerical answer)	3	14	12	5	10	Walk	Walk	10	6	10	Walk	Drive	9.5
Q3	How long does it take you to get to the clinic? (minutes)	Time (numerical answer)	15	45	45	20	20	35		60	15	60	20	10	60
Q4	If you have to visit the clinic to receive your medicine, do you have to take time off work?	Yes / No / NA	No	Yes	NA	NA	No	NA	NA	Yes	Yes	Yes	No	Yes	NA
Q5	Before you were signed up for the SMS service, was it ever a problem to take time off work to come to the TB clinic?	Yes / No / NA	NA	NA	NA	NA	NA	NA	NA	No	No	No	No	No	NA
Q6	Do you always keep your phone charged and on you?	Yes / No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Q7	What cellular service provider are you with?	Vodacom / MTN / CellC	Vodacom	Vodacom	Vodacom	Vodacom	MTN	MTN	Vodacom	MTN	Vodacom	MTN	Vodacom	Vodacom	Vodacom
Q8	Do you ever get poor cell phone reception in the place where you normally receive your SMS from the clinic?	Yes / No	No	No	No	No	No	No	No	No	No	No	No	No	No
Q9	Have you ever been expecting an SMS from the clinic, and it did not come?	Yes / No	Yes	No	Yes	No	No	Yes	Yes	No	No		No	No	No
Q10	Do you ever run out of airtime on your phone so that sometimes you cannot receive incoming calls?	Yes / No	No	No	No	No	No	No	No	No	No	No	No	No	No
Q10a	If Yes, how often does this happen?	Numerical (estimate)													
Q11	Is it sometimes difficult to read the message on your phone?	Yes / No	No	Yes	No	No	No	No	Yes		No	No	No	No	No
Q12	Why did you choose to receive the SMS at a particular time of day?	Descriptive	Does not eat am, due to an operation, so prefers to take tabs at 14:00.	Patient has just eaten breakfast.	Did not chose time.	Patient just chose a time at random.	Patient is at school at 9:00.	Chose 10:35, with no reason given.			Did not chose time	18:00, as forgot in am. At night is more relaxed, having dinner.	Chose am because he checks his phone first thing.	09:00 chosen as this is when tea is taken.	08:00 chosen because patient will be at home then.
Q13	Do you sometimes not hear your phone alert you to the SMS coming from the clinic?	Never / Sometimes / Often	Never	Never	Sometimes	Never	Never	Never			Sometimes	Never	Sometimes	Sometimes	Never
Q14	Do you always carry your TB medicine on you?	Yes / No	No	Yes	Yes	No	Yes	Yes			No	No	Yes	Yes	No

Q15	Do you normally take your medicine before or after you receive your message?	Before / After / Both	After	Both	After	After	After	After		Before	Before	Both	After	Both
Q15a	If ans to Q15 is "Before", how many times would you have forgotten to take the medicine if it wasn't for the message?	Never / Sometimes / Often		Often						Sometimes				Never
Q15b	If ans to Q15 is "After", when you receive a message to take your medicine, how soon after do you take it?	Immediately / Within 15 min / More than 15 min later	<15 min	Immediately	>15 min	>15 min	Immediately	Immediately					<15 min	Immediately
Q16	Do you ever forget to take your medicine, even after receiving message from the clinic?	Never / Sometimes / Often	Never	Never	Never	Never	Never	Never		Never	Never	Never	Never	Never
Q17	Do you keep a daily record of the tablets taken?	Yes / No	Yes	Yes	No	Yes	No	Yes		Yes	Yes	Yes	Yes	Yes
Q17a	If Ans to Q17 is "Yes", how long after taking the tablets do you record it?	Immediately / Within 15 min / More than 15 min later	Immediately	Immediately		Immediately		Immediately		Immediately	Immediately	Immediately	Immediately	Immediately
Q18	How often are you unsure about whether or not you have already taken the tablets?	Never / Sometimes / Often	Never	Never	Sometimes	Never	Never	Sometimes		Never	Sometimes	Never	Once	Never
Q19	Do you share your phone with anyone else?	Yes / No	No	No	No	No	No	No	Yes	No	No	No	No	No
Q20	Are you ever concerned that someone might see an SMS sent from the clinic on your phone?	Yes / No	No	No	Yes	No	No	No	No	No	No	No	No	No

**Notes taken during interviews**

**Patient number 1** Patient was well know to the clinic as was RAC

**2** Think patient did not answer Q18 accurately: sometimes think he/she is confused. Always receives 2 SMS (reason unknown).

Although did not chose time of SMS, it is ok at 09:02, as will have eaten. Does not keep a daily record as thinks SMS suffices. For Q18, even if patient is

**3** unsure if tabs were taken, SMS will be on display of phone.

**4** SMS comes before patient has had lunch, so takes tabs after he/she has eaten.

**5** Family and friends are aware of his/her TB and says it is no problem people knowing: no taboo.

**6** Patient believes she would forget to take tabs without SMS.

**7** Only some Qs answered as patient only on SMS service for 3 days, as moved to home based care giver, which nurse is happy with. Gets a lot of SMS and had difficulty recognising those from the clinic.

**8** Only some Qs answered as patient signed up for the service but never received an SMS. Method of adherence not know. Patient comes in once a month for tabs, and got the impression she sometimes forgets to take them, but had not informed staff of their being missed.

**9** Receives SMS at 08:02. Was not asked for time, but says this is ok, but then said took tabs at 18:00. Patient told tabs (200mg Rifaficin) must be taken either 1hr before or 2 hr after food, which may have confused them and affected compliance.

**10** Work does not know, only his wife. Likes the service as a backup to wife forgetting. Uses SMS as a second reminder, as takes tabs before it comes.

Patient appears to switch his phone off frequently, but as the SMS is always there when he switches on, he is always reminded and so never forgets tabs.

**11** French speaker: English fairly basic, so may not have understood nurse's adherence advice.

**12** Patient enjoys the SMS as "amusing". Service took 3 weeks to start, which did not worry him and did not forget tabs in that time. Forgot tabs just once, and since then has decanted 1 dose a day into a seperate container so not to repeat.

**13** Not concerned about others seeing the SMS because patient locks phone and deletes SMS immediately up on receipt.

			Patient number												
Question and response type			14	15	16	17	18	19	20	21	22	23	24	25	26
Q1	What area of Cape Town do you live in?	Area (descriptive answer)	Woodstock	Seapoint	Khayelitsha	Seapoint	Green Point	Observatory	Mouille Point	Blouberg	Khayelitsha	Khayelitsha	Salt River	Observatory	Woodstock
Q2	How much does it cost to get to the clinic? (one way, ZAR)	Cost (numerical answer)	Walk	9	10	Drive	10	3	6	7	Train	10	3	3	Walk
Q3	How long does it take you to get to the clinic? (minutes)	Time (numerical answer)	20	20	30	30	20	10	15	30	60	30	7	12	10
Q4	If you have to visit the clinic to receive your medicine, do you have to take time off work?	Yes / No / NA	Yes	NA	Yes	Yes	NA	Yes	NA	NA	Yes	Yes	NA	Yes	NA
Q5	Before you were signed up for the SMS service, was it ever a problem to take time off work to come to the TB clinic?	Yes / No / NA	Yes	NA	Yes	Yes	NA	No	NA	NA	Yes	Yes	NA	Yes	NA
Q6	Do you always keep your phone charged and on you?	Yes / No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Q7	What cellular service provider are you with?	Vodacom / MTN / CellC	Vodacom	Vodacom	MTN	Vodacom	Vodacom	Vodacom	MTN	MTN	MTN	Vodacom	MTN	MTN	MTN
Q8	Do you ever get poor cell phone reception in the place where you normally receive your SMS from the clinic?	Yes / No	Yes		No		No	No	No		No	No	No	No	No
Q9	Have you ever been expecting an SMS from the clinic, and it did not come?	Yes / No	No		No		No		No	No		No	No	No	No
Q10	Do you ever run out of airtime on your phone so that sometimes you cannot receive incoming calls?	Yes / No	No	No	No	No	No	No	No	No	No	No	No	No	No
Q10a	If Yes, how often does this happen?	Numerical (estimate)													
Q11	Is it sometimes difficult to read the message on your phone?	Yes / No	No		No		No	No	No	No	No	No	No	No	No
Q12	Why did you choose to receive the SMS at a particular time of day?	Descriptive	12:00 Did not chose time	9:00 Not clear if patient chose time.	Patient did not chose time.		10:00 Patient did not chose time.	10:00 Patient did not chose time.	Patient did not chose time.	09:00 Eating porridge at this time.	09:30 Patient had no choice.	20:00 Leaves phone in locker at work, gets reminder after work.	09:30 Patient chose time after discussion with nurse.	Patient does not mind when SMS comes.	13:00 Patient chose lunch time, but actually ended up taking tabs in am.
Q13	Do you sometimes not hear your phone alert you to the SMS coming from the clinic?	Never / Sometimes / Often	Never	Never	Sometimes	Never	Sometimes	Never	Never	Never	Never	Never	Sometimes	Sometimes	Never
Q14	Do you always carry your TB medicine on you?	Yes / No	No	Yes	No	No	Yes	No	No	No	Yes	No	No	Yes	Yes
Q15	Do you normally take your medicine before or after you receive your message?	Before / After / Both	After		Both		Both	After	After	After	Before	After	After		Before
Q15a	If ans to Q15 is "Before", how many times would you have forgotten to take the medicine if it wasn't for the message?	Never / Sometimes / Often			Never		Sometimes				Sometimes				Never
Q15b	If ans to Q15 is "After", when you receive a message to take your medicine, how soon after do you take it?	Immediately / Within 15 min / More than 15 min later	Immediately		Immediately		Immediately	<15 min	Immediately	Immediately		Immediately	>15 min		

Q16	Do you ever forget to take your medicine, even after receiving message from the clinic?	Never / Sometimes / Often	Sometimes		Never		Never	Never	Never	Never	Never	Never	Never	Sometimes	Never
Q17	Do you keep a daily record of the tablets taken?	Yes / No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q17a	If Ans to Q17 is "Yes", how long after taking the tablets do you record it?	Immediately / Within 15 min / More than 15 min later	Immediately		Immediately				<15 min	Immediately	Immediately	Immediately	Immediately	>15 min	Immediately
Q18	How often are you unsure about whether or not you have already taken the tablets?	Never / Sometimes / Often	Sometimes				Sometimes	Sometimes	Never	Never	Never	Never	Never	Never	Never
Q19	Do you share your phone with anyone else?	Yes / No	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No
Q20	Are you ever concerned that someone might see an SMS sent from the clinic on your phone?	Yes / No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No

**Notes taken during interviews**

**Patient number 14** Lives in a two-floor flat, and only gets a signal on the upper floor. Tabs kept in a locker at work, also takes them at home. Does not mark green book, but marks a calendar instead. Nurse suggested she go on SMS because she kept forgetting to take tabs.

**15** Several questions unanswered as only signed up that day.

**16** Work is strict: patient needs to produce a letter every time he visits clinic and has to work back the time. Tabs are kept in the office. A colleague reminds him at 9:30 and also puts an alarm on his phone, which means he never forgets tabs.

**17** Lost one job through having to attend DOT at clinic.

**18**

**19** Patient would forget to take tabs if it were not for the SMS. At first did not realise the SMS was from the clinic. Medical student. Takes at 8pm because feels tired if takes tabs in am. Writes himself a reminder when he receives SMS. Writes in green card

**20** Only family knows. SMS service gives the patient a "good feeling because it is good to think someone else, elsewhere is concerned for my health". Before receiving SMS, the patient would forget tabs.

**21** Only family knows, but this is not a problem.

**22** Patient pays R105 pm for train fare. Takes tabs at 5:30 with porridge, before SMS comes. Sometimes shares phone with children and leaves it at home. Likes the service a lot.

**23** Patient thinks he would forget to take tabs without the SMS. On DOTS had to take unpaid leave. Likes the service.

**24** Never forgets tabs because the SMS reminds him to put a reminder on his phone to take tabs later. Thinks the service is good and should be extended to other areas of medicine. Prefers people to know he has TB.

**25** Phone was stolen (hence had not memorised new number). Could not ascertain whether adherence worsened after then. Has girlfriend and family to remind him. SMS came every day but was getting too many SMS for his SIMM. Marks green card weekly. Not concern

**26** Only one friend knows, but not bothered if the SMS is seen. Takes tabs at 6:00.

## Totals

Q2	How much does it cost to get to the clinic? (one way, ZAR)	Average travel cost = R7.81
Q3	How long does it take you to get to the clinic? (minutes)	Average travelling time = 27.96
Q4	If you have to visit the clinic to receive your medicine, do you have to take time off work?	Number who take time off work = 12; Number who do not = 3; Number unemployed = 11
Q5	Before you were signed up for the SMS service, was it ever a problem to take time off work to come to the TB clinic?	Taking time off work was a problem = 6; It was not a problem = 6; NA = 14
Q6	Do you always keep your phone charged and on you?	Number who keep their phone charged and with them = 23; Number who do not = 3
Q7	What cellular service provider are you with?	Vodacom = 15; MTN = 11; CellC = 0
Q8	Do you ever get poor cell phone reception in the place where you normally receive your SMS from the clinic?	Poor signal sometimes = 1; Never get a poor signal = 21
Q9	Have you ever been expecting an SMS from the clinic, and it did not come?	Number expecting an SMS but did not receive it = 4; Number who always received an SMS = 17
Q10	Do you ever run out of airtime on your phone so that sometimes you cannot receive incoming calls?	Number who sometimes run out of "airtime" = 0; Number who never do = 26
Q11	Is it sometimes difficult to read the message on your phone?	Number who could not read SMS sometimes = 2; Number who never had this problem = 21
Q14	Do you always carry your TB medicine on you?	Number who always carry their tablets = 11; Number who sometimes do not = 13
Q15b	If ans to Q15 is "After", when you receive a message to take your medicine, how soon after do you take it?	Number who take tablets after SMS arrives and immediately = 10; less than 15 min later = 6; more than 15 min later = 10
Q17	Do you keep a daily record of the tablets taken?	Number who mark their green card = 19; Number who do not = 4
Q17a	If Ans to Q17 is "Yes", how long after taking the tablets do you record it?	Card is marked: immediately = 16; less than 15 min later = 2; more than 15 min later = 16
Q19	Do you share your phone with anyone else?	Number who share their phone = 3; Number who do not = 22
Q20	Are you ever concerned that someone might see an SMS sent from the clinic on your phone?	Number concerned with privacy = 5; Number who are not = 20



**bridges.org**  
spanning the international digital divide

## **ANNEXES 3-8**

(Annexes 1-2 attached separately)

### **Evaluation of the On Cue Compliance Service Pilot**

Testing the use of SMS reminders in the treatment of Tuberculosis in  
Cape Town, South Africa

**bridges.org**

29 March 2005

Prepared for the City of Cape Town Health Directorate and the International Development Research Council (IDRC)

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### **Annex 3. The bridges.org *Real Access / Real Impact* framework**

Tackling the digital divide is an enormous task, and no one group could solve the problem on its own. Bridges.org has examined the ICT development field and considered what works, and what does not work -- and why. It has built on its own experience and the thinking of a number of other organisations to design a holistic, integrated strategy it calls Real Access/Real Impact (RA/RI). This framework sets out the determining factors in whether there is Real Access to ICT: access that goes beyond computers and connections so that technology use makes a Real Impact on socio-economic development. It is not about a specific technology application that is used in a certain way. Rather, RA/RI is a roadmap to the digital divide that can be used to improve the way that ICT is integrated into initiatives in healthcare, education, small business development, government services and other programmes in the countries and communities that have the most to gain.

Financial measurements and organisational processes are established benchmarks for planning, monitoring and evaluating development projects; but these measurements often fall short in the ICT arena, insofar as they are insufficient to give a full understanding of the immeasurable benefits to society that ICT projects and policies bring, or external challenges they face. Gauging the number of computers and connections is relatively easy, but measuring the level of effective use of ICT is much more difficult. Traditional measurements also highlight project shortcomings, but usually fail to give specific guidance on what a project or policy process needs to do to improve.

The Real Access/Real Impact approach can be used as a basis for the analysis, measurement, and implementation of initiatives on all levels, from the ground to high-level policy deliberations. The RA/RI methodologies can be used both prescriptively, as part of a project planning exercise, or after-the-fact, to reflect on project successes and failures. They can also be used as the basis for technology research, or to inform policy-making processes. The RA/RI methodologies are widely applicable to efforts by communities, civil society organisations, development aid organisations, governments, and the business sector. RA/RI considers whether people have the capacity to use ICT and whether they actually are using it, including analysis of the underlying factors that affect whether they do (or do not) and why. The RA/RI framework helps initiatives plan effectively and take concrete steps for implementing ICT as part of what they do, highlights the strengths of ICT projects and policies, and provides direction for future improvements. The exploration of ICT for development issues through the lens of RA/RI promotes a new understanding of the dependencies influencing success and impact of ICT development projects and policies in economic, social and ecological terms. RA/RI provides a fresh angle on the issues, prompts ideas for moving forward, and ensures an all-embracing approach.

#### Two methodologies

The Real Access/Real Impact framework is comprised of two methodologies:

(1) The Real Access criteria are used to frame the analysis of all issues surrounding ICT access and use, including the "soft" aspects that are often overlooked. They are designed to anticipate or detect the reasons that ICT development initiatives, government e-strategies, or grassroots projects fail to achieve their goals or highlight how and why these projects succeed. ICT must be physically accessible, appropriate to local conditions, and affordable. People must understand the benefits of ICT, and have the training and skills necessary to use it. Locally relevant content and services must be available, and ICT must be integrated into people's daily routines without being a burden. The effects of socio-cultural factors must be addressed so they do not inhibit widespread ICT use, and people must trust ICT in terms of security, privacy and cybercrime. Legal and regulatory frameworks must not limit the effective use of ICT, the local economic environment must be able to sustain its use, and national macro-economic policy must be conducive to widespread ICT use. Governments must have the political will to drive change, and the

public must support government strategies to promote ICT use.

(2) Sometimes initiatives address substantive issues effectively, but still fall short because of poor project administration. So a part of the RA/RI framework also recommends the 8 Habits of Highly Effective ICT-Enabled Development Initiatives, which look at the application of best practice in ICT project management. The 8 Habits form a set of guidelines for ICT development, which advise projects to: implement and disseminate best practice; ensure local ownership; do a needs assessment; set concrete goals and take small achievable steps; critically evaluate efforts; address key external challenges; make it sustainable; and involve groups that are traditionally excluded.

## **The Real Access Criteria**

There are twelve inter-related Real Access criteria that can be used as part of a project or policy planning initiative, or evaluation exercise. Each one is set out below, with a short description, a set of example questions that can help frame thinking about how to apply the criteria to ICT projects and policies, and an example of an initiative that highlights the issue. The Real Access criteria are:

### *1. Physical access to technology*

The first step is to consider whether ICT is available and physically accessible to the people and organisations involved with or affected by the project or policy. Looking at the technology itself is obvious, including the availability of hardware, software, telecommunications networks, and Internet services. But in developing countries, it is also important to think very broadly and consider geographic, environmental and contextual challenges that can affect physical access to ICT. For example, basic infrastructure, such as electricity and roads, is often a critical issue affecting physical access to technology. And depending on the target group involved, access problems for people with disabilities must also be considered.

### *2. Appropriateness of technology*

Once physical access to ICT is determined, it follows that the technology used in projects and policies must be appropriate to local needs and conditions. Appropriateness can be gauged in terms of power sources, security, environmental conditions, and other aspects of the local situation. The ICT targeted in the project or policy must also be suitable to how people and organisations need and want to put technology to use. A wide variety of technologies are now available, and it is important to think broadly about options for appropriate technology. For example, desktop computers and high-bandwidth connections are often the first things that come to mind when people envision an ICT project, but they are not the best technology choices in the context of local realities of developing countries. For example, the majority of people and organisations in poor communities lack electricity or a secure location for desktop computers, making them inappropriate for many ICT projects and policies. More appropriate ICT options may include handheld computers and public access points, as well as innovative uses of cellular telephones, television, and radio for Internet access. Solar, battery, and other alternative power sources, together with portable devices and wireless connectivity offer greater possibilities for rural access.

### *3. Affordability of technology and technology use*

Once it is determined that appropriate ICT is available, the next question is whether people and organisations can afford to obtain or access it, and use it in their work and their lives. The affordability problem is, of course, tied directly to the general conditions of poverty. At a macro level, there are cost implications of infrastructure investment needed to bring technology to communities that lack electricity, telephone networks, or basic hardware. And in very poor communities, which often need basic necessities such as food, healthcare, and sanitation, striking the right balance between technology and other priorities is required. At the micro level, pricey hardware and the high cost of telecommunications and Internet connectivity in developing countries are primary barriers to the affordability of ICT in education, healthcare and small businesses, especially in

remote areas. For example, a computer costs the equivalent of a years' average income for the majority of people in developing countries, and Internet users in many developing countries pay higher connectivity charges than their counterparts in the developed world. Affordability is a short-term problem, which shifts to a question of sustainability in the long-term. Policy-makers and development practitioners need to make realistic choices about introducing costly ICT services in poor communities, and may be better off integrating creative uses of inexpensive technologies into development efforts. One option for developing nations and low-income communities is public access points, which provide low-cost or even free computer and Internet access, but project/policy planning must account for subsidising the costs of providing these services over the long-term. Telecommunications liberalisation and technology convergence are also bringing down costs and making many technologies more widely affordable in different contexts.

#### *4. Human capacity and training*

Any technology will be insufficient if people do not understand how to put it to effective use as part of their lives or their work, either because they are not trained to use it, or they cannot imagine the possibilities for how they could use it. People will be encouraged to use ICT only when it is apparent to them that it will have a positive impact on their daily lives. Further, it is essential that people understand the broader potential for technology, so that users are empowered to innovate for themselves and use technology in creative ways that may not have been envisioned by the project or policy. At one level, employees in schools, libraries, hospitals, civil society organisations, governments and businesses need the basic technical skills to use ICT in their daily work. It is equally important that high-level technical support skills are available to ensure that ICT can be set-up and maintained. The lack of technical support is a major obstacle to technology use in many developing countries, and skills transfer should be an element of any development project involving ICT. Illiteracy is also a major barrier to ICT use in many countries, but there are innovative applications of technologies that can help with this. For example, voice and image-based technologies can help side step the need for reading and writing skills as prerequisites to ICT use.

#### *5. Locally relevant content and services*

In order for ICT to be meaningful in the daily lives and work of people and organisations, there must be locally relevant content and services available, which can be accessed through ICT. In the context of socio-economic development programs, local relevance means things like educational materials, health information, environmental data, or agricultural extension services that are useful to people in the communities served. It could also mean locally relevant applications, such as software or computerised systems for administration of patient records, drug distribution management, small business tax calculations, or literacy training. Government information and services to citizens are a great example of local content that can be adapted for widespread distribution through the electronic environment. Another example of locally relevant content disseminated effectively through ICT is basic healthcare information -- such as how to prevent deaths from diarrhoea through Oral Rehydration Therapy (ORT) -- that can reach vast numbers of people via radio and television in poor and rural areas where there are few medical facilities. At a personal level, the use of ICT for communication with loved ones, business colleagues, or customers, can be a considerable motivating factor. But regardless of the content or service, its availability in local languages is critical if ICT is to be relevant and useful to the communities and groups targeted by ICT projects or policies.

#### *6. Integration into daily routines*

Without the many conveniences enjoyed by developed countries and well-off communities, people in developing countries and disadvantaged communities often face a variety of burdens in their daily lives. Day-to-day tasks that are simple for privileged groups -- such as cooking or cleaning -- are often time-consuming and inconvenient for the less advantaged. And in a work environment, basic tasks involved in teaching, hospital administration, government service provision, and other jobs often take longer where

modern conveniences are unavailable. Even the journey to work, school, or the local hospital can be a burden to many, when public transportation is poor, roads are bad, and distances are long. In this context, integrating technology use into peoples' daily routines is a major hurdle for many ICT for development initiatives. Yet this seemingly obvious issue is often overlooked by ICT projects and policies, where technology use becomes an additional burden to the already over-burdened lives of people in developing countries, and this proves to be a factor that limits widespread technology uptake. People are unlikely to use technology if it involves efforts that outweigh the benefits. For example, where people have to travel out of their way to use telephones or telecentres, it is likely to limit their use. Or when teachers are required to take a computer course outside of the school day in order to get training to use computers in their classrooms, they may be less likely to participate in ICT projects. Moreover, people will usually not use technology for technology's sake, but they will find ways to integrate ICT use into their lives and work when it helps them improve the way they do something that they need to do anyway.

### *7. Socio-cultural factors*

Across the globe, people are prevented from full participation in their societies and economies on the basis of their gender, race, disability, age, or other socio-cultural factors, and these issues can also limit ICT uptake. When certain groups are alienated it not only hinders ICT penetration to the detriment of those excluded, but also limits the benefits of diversity in the information society more broadly. For example, in many countries women are limited in their technology use, and ICT professions continue to be male-dominated. There are also growing gaps between younger and older generations in relation to technology use in different communities: older people often believe that they are "too old" to use technology, while in some communities a "pecking order" for technology use prevents younger people from using ICT. Other inequities seen in broader society are often exacerbated in the ICT field, such as those based on race or disability. But ICT use and the information exchange it engenders can be a powerful driver for social change. When harnessed by traditionally excluded groups, ICT can be used to help promote understanding of the politics around discrimination and division in society and the economy, which can be a first step toward social change.

### *8. Trust in technology*

The level of confidence that people have in computers and the Internet has been a defining issue in the development and widespread acceptance of ICT in the developed countries of the world. The same is proving to be true in developing countries, especially as issues of privacy, data protection, security, and cybercrime begin to affect developing country ICT users. If computer and Internet users do not feel confident about what happens "behind the screen", it can significantly limit the ways that people are willing to use the technology. This is especially relevant to the adoption of e-government and e-commerce applications, but also has bearing upon the motivation to become e-literate generally. Some believe that a lack of awareness about these key issues among new ICT users is a potential time-bomb: where unsophisticated users naïvely trust online information they are more susceptible to scams and fraud, and if the problem harms to many, there could be a backlash against technology use. As part of efforts to advise people and organisations about the benefits of technology, it is also important to inform about the risks involved in ICT use to help new users guard against them.

### *9. Local economic environment*

While the usefulness of technology for socio-economic development has been demonstrated, the sustainability of such efforts in developing countries has proven challenging. At the end of the day, the local economic environment determines the extent and frequency of technology use in the long-term. So ICT projects and policies should also be designed with local economic conditions in mind. If people and organisations cannot afford to use technology now, subsidised ICT projects will not succeed in the long-term if steps are not taken to improve the economic environment. Technology used to foster economic growth can help expand ICT use in the community more generally. For example,

when community-based organisations and small businesses are involved in providing technology services and creating content for other businesses, this can generate revenue to help make local technology use sustainable, which in turn will have a positive impact on the local economy. However, it is important that the potential negative economic effects of ICT projects and policies are also considered. For example, ICT training programmes can be useful, but local job opportunities must be created for those who acquire ICT skills so they do not have to leave their families and communities in search of employment. Failed community access projects can lead communities to reject future technology projects, where they feel that funds have been drained from the local economy that might have been better used for other things.

#### *10. Macro-economic environment*

Where the local economic environment determines the sustainability of technology use in ways that are seen directly at the community level, macro-economic policies have an impact that is initially seen at the national level, but which eventually is also felt at the local level. National governments and regional economic bodies usually set macro-economic policies that are then implemented by regulatory agencies. There are a variety of macro-economic policies that can affect the widespread uptake of technology, including policies governing deregulation of key industries; foreign direct investment; banking and currency controls; trade tariffs, labour and employment standards; and taxation. Macro-economic policies can hinder technology use, for example where foreign investment in local technology industries is discouraged by high taxation or currency controls. Alternatively, macro-economic policies can help create an enabling environment for the widespread use of ICT, for example where customs duties on technology are reduced to encourage computer imports. ICT projects and policies need to consider how the macro-economic environment will affect their activities, and plan accordingly. If macro-economic policies have a negative impact on ICT uptake, development projects may want to consider whether to engage in advocacy activities to promote appropriate changes.

#### *11. Legal and regulatory framework*

Policy positions that are agreed upon in international, regional, and national institutions are implemented through laws and regulations at the national level to form the framework for governing the country. ICT policy-making happens at the international level through processes like the ITU discussions on telecommunications policy, UNCITRAL development of model laws, and WTO negotiations on trade. And at the regional level it is seen in efforts to address cross-border issues like Internet exchange point negotiations, technology trade and investment cooperation, or consortium bids to roll out Internet backbone infrastructure. At the national level ICT policies cover a range of issues, from radio and television broadcasting to the provision of telecommunications services. ICT policies and the resulting legal and regulatory framework can either foster or hinder the effective, widespread use of ICT, depending on the principles that shape it and how they are implemented. Governments must understand the implications of their decisions for the technology end user, and shape an appropriate long-term strategy to implement laws and regulations that support technology use.

A range of projects are underway in developing countries that integrate ICT in a number of critical areas, including notably education, healthcare, government, trade, and small business support. However, these projects frequently encounter obstacles that directly or indirectly relate to the country's legal and regulatory framework. One example is projects that rely on technology or infrastructure use that may be limited by current laws or regulations, such as satellite, wireless, or Voice over Internet Protocol (VoIP) technologies. Another example is ICT projects that are hindered by a general law or regulation, such as fiscal or other regulation that limit cross-border trade and communications. A final example is projects working in a particular area (such as healthcare) where current laws or regulations do not cover ICT use (such as privacy and data protection laws governing the handling of electronic health data).

There are many examples where a nation's leadership has embraced ICT and is ready to promote a legal and regulatory environment that will enable its widespread use. But often at the working level, government officials do not understand the implications of existing laws and regulations that may hinder ICT use, nor the changes they need to formulate and implement to create a more favourable framework. Although the development aid industry generates a tremendous volume of reports, advice, and analyses aimed at helping developing countries shape laws and regulations, developing country governments frequently raise concerns that the recommendations offered do not show sufficient understanding of local needs and conditions. There is no "one size fits all" solution and transplanting legal models to developing country environments does not work. An effective ICT legal and regulatory framework is unique for each country, and must be shaped by the existing web of legislation, local culture, economics and politics. Developing country leaders need to have a realistic appreciation for what ICT can – and cannot – do for their countries, they must consider and adopt appropriate legislation, balance the needs and views of the relevant constituencies, and engage with the right people to ensure the legal and regulatory framework will be implemented. When the legal and regulatory framework limits ICT use, it can be helpful for development projects to engage in advocacy activities to inform ICT decision-making and promote appropriate changes to laws and regulations.

#### *12. Political will and public support*

Developing country governments can play a key role as engines for socio-economic development. Most developing country leaders are convinced that ICT will help their nations solve the economic and social problems they face, and they are ready to drive the necessary changes. Government has the unique ability to lead the way while facilitating others to expand the scope of activity and become involved in the process. It is critical that governments lead effectively and bolster public confidence in the path they take. However, translating a grand vision into practical steps that fit their local context is not a simple matter. Governments often try to meet the short term demands of their constituencies, and fail to provide a coherent long term plan for prosperity, or hinder the efforts of development initiatives and the private sector to address ICT disparities.

Public participation is also needed so that governments do not have to carry the burden for development alone, but can garner the support they need to see long-term strategies through. If citizens are informed and empowered to participate in the policy-making processes that determine how ICT shapes their society, they will offer their support to government decisions, and be more pro-active in improving their own lives. Many people do not have the capacity to participate on a policy-making level – they do not understand the issues being addressed, nor do they have any clear channels to express their concerns and acquire information. Further, most people do not see the relevance, or the direct impact, that policy-level developments have on their lives. Effective ICT policy-making requires an understanding of the needs of current and potential technology end users; better channels of communication between them would help everyone.

Some governments have planned e-strategies, but at a practical level they lack the political will to drive change because they do not enjoy widespread public support for an ICT-focused approach. Often this is because government officials fail to engage stakeholders in framing the e-strategies, so they do not have public buy-in for their long-term plans. In some cases the government has partnered with the country's business and civil society sectors to promote ICT-enabled development at the ground level, but the various stakeholder groups lack the experience and resources to give effective input. The government needs to be engaged through lobbying and advocacy by citizens to promote strategies and policies that can enhance ICT use. Governments need to be informed about what is happening on the ground, and ICT can play a part in this. For example, e-mailing lists can form simple channels for communication between citizens and government officials.

## **The 8 Habits of Highly Effective ICT-Enabled Development Initiatives**

The RA/RI criteria focus on the substantive factors affecting ICT projects and policies. Yet sometimes initiatives consider and address these issues, but still fall short because of poor project administration. The 8 Habits of Highly Effective ICT-Enabled Development Initiatives are a set of best practice guidelines for project management, which aim to ensure the internal health of initiatives harnessing ICT for development. Like the Real Access criteria set out above, the 8 Habits can be used proscriptively for planning, or retrospectively for evaluation. The 8 Habits are:

### *1. Do some homework, conduct a needs assessment*

Any ICT initiative should start by doing its homework and conducting a needs assessment. Homework should look at similar initiatives that have gone before, to learn from successes and failures and understand what has worked best and what has not worked, and why. Almost any ICT initiative can glean something from the experiences of other efforts that can be applied to their own project or policy. And as development initiatives increasingly share information about what they do, it will be easier for others to learn from past experience. Another part of comprehensive homework to be done as part of planning is a thorough assessment that looks at the real needs of the community or group targeted for the project or policy.

### *2. Implement and disseminate best practice*

Based on findings from the homework exercise, ICT initiatives should build their efforts on established best practice in the field. And as they implement best practice in their projects, ICT initiatives should carefully examine their efforts and determine what works best so they can share their experiences with others. Initiatives should contribute to the community of knowledge in the field by contributing their own input to best practice principles about ICT projects and policies.

### *3. Ensure ownership, get local buy-in, find a champion*

ICT initiatives that are imposed from outside -- whether international development aid projects dreamed up in London or Washington and delivered in a developing country, or projects designed in national capitals for implementation in rural areas -- often struggle to get the buy-in from communities that is needed to ensure their success. By working with a local ICT champion who understands the issues and the potential benefits of technology, the initiative can engage an ally to support and promote ICT use among local groups. The best ICT champion is someone in a position of authority, who is respected by local community members, and sets an example as a technology user. Building the project or policy from ground up, with the active involvement of the community, will also help ensure that the local participants feel a sense of "ownership" over it.

### *4. Set concrete goals and take small achievable steps*

Many ICT initiatives suffer from goals that are too lofty, and project plans that try to do too much in too little time. Identifying concrete and realistic objectives from the outset will give the initiative targets to aim for. And when the project gets bogged down or sidetracked -- as invariably happens -- these clear targets will provide a focus point to get things back on track. Equally important is the need for a structured methodology that is based on small achievable steps. This will keep project implementation moving forward, even when the objectives seem far away and unobtainable.

### *5. Critically evaluate efforts, report back to clients and supporters, and adapt as needed*

Significant amounts of money have been spent on ICT initiatives during recent years, and too frequently there is little to show for it. ICT initiatives should treat the funding that supports their efforts more like an investment than a gift. They should regard funders as investors or clients, and report back to them regularly on the progress they are making and the impact they are having. Part of the reporting should be based on a critical evaluation of their efforts. If an initiative cannot demonstrate progress and impact, then it should use the evaluation as a learning process, and adapt its methodologies as needed to

improve its work.

*6. Address key external challenges*

External challenges are obstacles to the success of an initiative that are beyond the direct control of those implementing the project or policy, factors that are sure to limit the impact that could be made by an ICT initiative. For example, each of the Real Access criteria identified above can become an external challenge in one way or another to ICT projects or policies. There will always be external challenges that will affect ICT initiatives, including many that will not be anticipated in planning processes. What is essential in effective project management is that these challenges are identified, understood, and tackled head on.

*7. Make it sustainable*

Many well-intentioned ICT initiatives start off strong but fail in the long-term because they do not become sustainable. ICT initiatives should be built upon sound "business" plans that include provisions for overall sustainability. If an ICT initiative does not achieve economic sustainability by generating income, then it must deliver well on its social mission and report back effectively so that its funders will continue to support its work and it can achieve "social" sustainability.

*8. Involve groups that are traditionally excluded on the basis of gender, race, religion, age, or disability*

Given the environment of discrimination in so many countries, it is simply best practice for any ICT initiative to make a concerted effort to involve groups that are traditionally excluded on the basis of their gender, race, religion, age, disability or other socio-cultural factor.

## Annex 4. Patient questionnaire

(1) What area of Cape Town do you live in?

[Ans: area]

(2) How much does it cost to get to the clinic?

[Ans: numerical]

(3) How long does it take you to get to the clinic?

[Ans: numerical]

(4) If you have to visit the clinic to receive your medicine, do you have to take time off work?

[Ans: yes/no]

(5) Before you were signed up for the SMS service, was it ever a problem to take time off work to come to the TB clinic?

[Ans: yes/no]

(6) Do you always keep your phone charged and on you?

[Ans: yes/no]

(7) What cellular service provider are you with?

[Ans: Vodacom / MTN / CellC]

(8) Do you ever get poor cell phone reception in the place where you normally receive your SMS from the clinic?

[Ans: yes/no]

(9) Have you ever been expecting an SMS from the clinic, and it did not come?

[Ans: yes/no]

(10) Do you ever run out of airtime on your phone so that sometimes you cannot receive incoming calls?

[Ans: yes/no]

If Ans = yes:

How often does this happen?

(11) Is it sometimes difficult to read the message on your phone?

[Ans: yes/no]

(12) Why did you choose to receive the SMS at a particular time of day?

[Ans: descriptive]

(13) Do you sometimes not hear your phone alert you to the SMS coming from the clinic?

[Ans: never / sometimes / often ]

(14) Do you always carry your TB medicine on you?

[Ans: yes/no]

(15) Do you normally take your medicine before or after you receive your message?

If Ans: Before

14a) How many times would you have forgotten to take the medicine if it wasn't for the message?

[Ans: Never / Sometimes / Often]

If Ans: After

14b) When you receive a message to take your medicine, how soon after do you take it?  
[Ans: Immediately / within less than 15 minutes / more than 15 minutes]

(16) Do you ever forget to take your medicine, even after receiving a message from the clinic?

[Ans: Never / Sometimes / Often]

(17) Do you keep a daily record of the tablets taken?

[Ans: yes/no]

If Ans: Yes

16a) How long after taking the tablets do you record it?

[Ans: Immediately / less than 15 minutes later / more than 15 minutes later]

(18) How often are you unsure about whether or not you have already taken the tablets?

[Ans: Never / Sometimes / Often]

(19) Do you share your phone with anyone else?

[Ans: yes/no]

(20) Are you ever concerned that someone might see an SMS sent from the clinic on your phone?

[Ans: yes/no]

## **Annex 5. Questions used in interviews with healthcare workers**

1. How do you decide whether a patient can be signed up for the SMS service?
2. What do you do to sign a new TB patient up to the SMS service?
3. Are there ever times when it is not possible to fax Dr Green immediately after signing a patient up to the SMS Service?
4. What are the benefits of the service for you as a health worker?
5. What are the benefits of the service for the patients?
6. What problems have you had with the service?
7. Have you ever heard of patients not receiving their SMS?

## **Annex 6. Consent form**

### **CONSENT FORM FOR PATIENT PARTICIPATION IN THE CHAPEL STREET ON-CUE COMPLIANCE SERVICE EVALUATION**

Bridges.org is a not-for-profit organization that is evaluating the On Cue SMS Compliance Service on behalf of the International Development Research Council. The bridges.org evaluation aims to evaluate how effective the Service is in reminding TB patients to take their medication on time. The purpose of this questionnaire is to evaluate the efficacy of the technology in delivering these reminders and as such, does not ask medically related questions.

This form provides us with your permission to collect this information under the conditions stated below.

I understand that I will have to answer a questionnaire about whether and how the SMS Service is helping to remind me to take my TB medication daily.

I understand that my participation is completely voluntary, and that I am free to withdraw from the study at any time I choose, without affecting my further treatment and care.

I understand that the questionnaires for this project will be coded in such a way that my name will not appear on the form and that all reasonable efforts will be used to keep my answers confidential.

I understand that the results of this research may be published or reported, but that my name will not be associated with any published results.

Having read this document and had the opportunity to ask questions, I hereby consent to participate in an evaluation of the SMS Service for reminding me to take my TB medication.

Signed:

Place: Chapel Street Clinic, Woodstock, Cape Town

Date: \_\_\_\_\_ July, 2004

## Annex 7. Results of a survey of health worker satisfaction with the Compliance Service

<b>Question for health worker</b>	<b>Responses</b>
(1) How do you decide whether a patient can be signed up for the SMS service?	There are no official criteria for deciding which patients should be signed up to the Compliance Service. Nurses and clinic assistants chose patients based largely on their own intuition as to the patient's capacity to understand how they should use the Service and if they are likely to be adherent. They were chosen if they fitted this perception and had a mobile phone. Nurses also signed up people who were unable or unwilling to attend clinic every day for DOTS.
(2) What do you do to sign a new TB patient up to the SMS service?	Nurses take a note of the patient's name and mobile phone number and ask when the patient would like to receive it. One health worker said they should be on DOTS for 2 weeks first to check for any side-effects to the medication before putting them on the service, but no one else verified this. One suggested she put them on the service immediately if they appeared to be a person with a particularly rushed life style.
(3) Are there ever times when it is not possible to fax Dr Green immediately after signing a patient up to the SMS service?	The nurse apparently responsible for faxing On Cue with new patient details said she collects the details over the course of a week and then faxes them on a Friday. She tells her patients not to expect an SMS for a week. Another nurse said she tries to fax new patient details immediately, because she was concerned that patients would lose enthusiasm for receiving SMS reminders, which might impact on adherence. This nurse also said signing patients up was far easier when they had outgoing email. Since the City cut ICT costs, outgoing email can only go to their email server and so the clinic relied on the district manager at the City, to forward the message to On Cue. Communicating with On Cue on a regular basis was flagged as a problem due to changes in the clinic's internal technology and lack of procedure.
(4) What are the benefits of the Compliance Service to the health worker?	Health workers thought the Service had resulted in more negative sputum results (improved cure rate) and less patients defaulting. One thought the overall clinic statistics would be improved by the service, another agreed that patients are less likely to default. One nurse said card ticking was a problem but no worse than for patients on DOTS, supervised at home by a family member. Most said it freed up time for staff, especially during times of staff shortages, and that Mondays and Wednesdays when the doctor is at clinic are now manageable. The external health worker from TB Care said the Service was useful for recalling defaulters, but because she had to rely on a clinic staff member to contact Dr Green to do this, it made the whole thing inefficient and she did not often bother with it.

<b>Question for health worker</b>	<b>Responses</b>
(5) What are the benefits to the patient?	Patients do not have to put their jobs in jeopardy from attending DOTS at the clinic. The Service gave them more of a sense of responsibility, which is thought to enhance adherence. This meant that nurses were confident of being able to give them a greater supply of medication at once. Some thought the Service gave patients a more personal interaction with the clinic.
(6) What problems have you had with the service?	One nurse said the service could be bad for some people, especially those who are unemployed and homeless, because coming to clinic had become part of their daily routine and she thinks they liked the one-on-one interaction. One staff member thought far more checks and balances should be put in place to ascertain SMS messages were being received, the patient was happy with the Service, and was adherent. She suggested the receptionist could ask these questions on arrival of every person attending clinic known to be on the Service. This would save time for the nurses, and make one person responsible for ensuring the Service was satisfactory for each patient on it. Another problem occurred when people were taken off the Service after finishing treatment.
(7) Have you ever heard of patients not receiving their SMS message?	There was a patch of about 2–3 weeks toward the beginning of the pilot when no SMS messages were being received. Since then there have been several patients who have not received messages for the first two weeks. When asked if this was a problem for adherence, health workers said no, as adherence was usually 100% in the first few weeks until people began to feel better. But not being able to email On Cue direct causes inefficiencies and waiting to fax him at the end of the week such that patients do not start receiving SMS for some time after they have signed up, can put them off the service and actually de-motivate them. One health worker said some patients never get onto the Service, despite their details being faxed off and did not know why.

## Annex 8. Details on patient interviews

### Conducting a test for patient interviews

A preliminary meeting with the clinic manager was arranged through the City. The evaluator was given a tour of the clinic and a suitable room was found in which to conduct interviews. The evaluator was introduced to staff and given the opportunity to ask questions around day to day operations, the role of individual staff at the clinic and how the pilot was progressing. A procedure was discussed for conducting the interviews and a date agreed.

Patients were invited to the clinic to be interviewed, in exchange for an amount of free credit with their cellular network provider. The vast majority of patients were expected to use pay-as-you-go schemes, in which people pay for a set amount of credit provided on scratch cards (known as “airtime vouchers”) available from a wide number of outlets (cell phone retailers, supermarkets, news agents, post offices). Both On Cue and staff at the clinic did not believe we would come across many, if any, patients paying their network provider via contract, and so unable to use pay-as-you-go vouchers. Vouchers within the same price bracket were purchased from each operator<sup>1</sup>. The following message was devised to send to patients:

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We'd like 2 no how u r finding this SMS service! Cm 2  
clinic between 7:30 n 3pm on Fri 9 Jul to tell us n we'll  
give u a R55 Voda voucher. Note 4 work if needed
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The message was written using abbreviation's commonly used by SMS users, which were necessary to fit the message into the maximum number of characters allowed for one SMS (hence the lack of a final period which would have broken this limit).<sup>2</sup> Clinic staff predicted most patients would come on their way to work, or at lunch time, so the evaluator should be present during opening hours. The “note” in the last phrase refers to a letter for employers provided by a health care worker, should one be needed.

Although staff had predicted the incentive of airtime vouchers would result in a large number of people coming to be interviewed, it was decided that a small, pilot group should first be used. On Cue was asked to send the message to 20 patients in their database. Twenty Vodacom users were invited to the clinic and a flag was set in the patient database so these people were not sent any further invitations. Twenty R55 Vodacom vouchers were purchased for the interviews.

Depending on the response and how long the interviews took in practice, parameters such as the message content, day of week to conduct interviews and number of people to contact, could be adjusted. A pilot also gave the evaluator the opportunity to discuss with the City any questions that proved to be poorly worded, or not as useful as thought, and change the questionnaire before continuing.

### Procedure for conducting patient interviews

Because bridges.org staff hold no medical qualifications, measures had to be put in place to ensure patients remained anonymous at all times. The procedure agreed with the clinic manager was for the receptionist to ask respondents to confirm their name and cell phone number and check it against the list of patients to whom the message had been sent. This was done on advice from staff concerned the SMS message would be forwarded to

<sup>1</sup> Airtime vouchers available from each cellular network provider that were as close in value as possible were: R55 Vodacom, R60 MTN, R70 CellC.

<sup>2</sup> The SMS protocol allows up to 160 bytes of data per message.

unscrupulous individuals, giving them the opportunity to give false interviews and obtain a free airtime voucher. When the patient's identity had been verified, they were asked to read and sign a consent form.<sup>3</sup> The receptionist collected these forms and stored them securely so that at the end of the evaluation, the number of consent forms matched the number of interviews conducted. Patients were then directed to the interview room where the evaluator was waiting. In this way, patients remained anonymous to the evaluator and patient confidentiality was respected.

Before asking questions, the evaluator briefly described the study, who bridges.org are and why decision makers in the health service are keen to hear what patients have to say about the Compliance Service. This opening, and an effort by the evaluator to appear friendly and non-authoritarian, set the patient at ease. In this way, the evaluator hoped to get accurate answers and gather anecdotal information as the interview progressed.

### **Changing the methodology in response to the test interviews**

The response to the first SMS was extremely poor, with only one patient responding. Following discussions with clinic staff and On Cue, it was decided that all patients currently on the Service should be contacted as they were predicted as being more willing to come to the clinic, than people who had finished their treatment. A second SMS was sent out to all 23 patients currently on the Service.

Again, the response was extremely poor, with only two respondents this time. After further discussions, it was decided to SMS all 309 patients in the Compliance Service database and to give them the choice of either a Monday or Wednesday. These days were chosen because a doctor is present, meaning the clinic would be very busy. It was hoped patients currently on the Service, who happened to be coming to the clinic to see the doctor, would agree to being interviewed at the same time. And giving a choice of two dates would increase the chances of former patients being able to attend. It was not possible to predict the numbers who would come because the clinic does not run on an appointments system. Initially these days had been avoided because should the response be significant, as was initially predicted, bridges.org did not want to cause the clinic extra problems.

Twenty three patients and former patients arrived at the clinic to be interviewed on these two days, and it was decided that no further attempts would be made. This brought the total of patients interviewed for the evaluation to 26. The poor turnout was discussed, and increasing the value of the airtime vouchers suggested, but clinic staff doubted this would pull in more people. The consensus of opinion was that people were probably reluctant to ask for more goodwill of their employers to attend clinic, and as many are paid by the hour, this was a further disincentive. Staff said people were usually "sick of the sight of the clinic" once they had finished treatment, and wanted to put their illness behind them. Previous studies at the clinic that had given cash incentives to participate had been highly successful. Airtime vouchers are exchanged like cash in the poorer communities of South Africa and so the lack of response was puzzling.

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<sup>3</sup> See Annex 6 for more information.