Development and evaluation of an mHealth intervention to improve the uptake of sexual and reproductive health services in Mwanza Tanzania

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by

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List of Acronyms

ADDO	Accredited Drug Dispensing Outlet
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Anti-retroviral Therapy
CDC	Centres for Disease Control and Prevention
CCHP	Comprehensive Care Health Plan Tanzania
CSS	Cascading Style Sheets
CTC	Close-to-community provider
DALE	Disability Adjusted Life Expectancy
DALY	Disability Adjusted Life Years
DHMT	District Health Management Teams
DHS	Demographic Health Survey
DMO	District Medical Officer
DS	Drugstore (Drug shop)
FGDs	Focus Group discussions
FP	Family Planning
GDP	Gross Domestic Product
HF	Health Facility
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HTML	Hyper Text Markup Language
ICPD	International Conference on Population and Development
IDIs	Indepth interviews
IntHEC	Health education and Community integration Trial
MDG	Millennium Development Goal
MoHSW	Ministry of Health and Social Welfare Tanzania
MoEVT	Ministry of Education and Vocational Training
MTUHA	Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya
NGO	Non-Governmental Organisation
NHP	National Health Policy Tanzania
NIMR	National Institute for Medical Research Mwanza
PPP	Purchasing Power Parity
PPP	Public Private Partnerships
RMO	Regional Medical Officer
SEAM	Strategies for Enhancing Access to Medicines
SRH	Sexual and Reproductive Health
SSA	Sub-Saharan Africa
SMS	Short Message Service
STIs	Sexually Transmitted Infections
TACAIDS	Tanzania Commission for AIDS
TCRA	Tanzania Communications and regulatory Authority
TFDA	Tanzania Food and Drug Administration
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
VCT	Voluntary Counselling and Testing
VEO	Village Executive Officer
WEO	Ward Executive Officer
WHO	World Health Organization
WHS	World Health Statistics

List of Supporting Manuscripts

Peer reviewed papers

1. Dusabe J., Nnko S., Changalucha J., Mchome Z., Kitilya B., Payne G., Mapella E. and Obasi A. (2013) Design of a community-based mobile phone text message referral intervention in Tanzania. *J Telemed Telecare July 2013 19: 295-297, doi:10.1177/1357633X13492291.*
2. Dusabe J., Mchome Z., Nnko S., Changalucha J. and Obasi A. "There are bugs in condoms" – capacity of community based healthcare providers to offer adolescent reproductive health services in Tanzania. *Journal of Family Planning and Reproductive healthcare (Accepted).*

Conferences

1. Dusabe J., Nnko S., Changalucha J., Mchome Z., Kitilya B., Payne P., Mapella E., Obasi A. (2013) Design of a complex intervention: community-based mobile phone text messaging for sexual and reproductive health referral in Tanzania. *Sex Transm Infect* 2013;89:A379 doi:10.1136/sextrans-2013-051184.1186
2. Dusabe J., Maulet N., Nnko S., Mapella E., Sayi L., Dagobi A., Boubacar H., Pascal M. and Obasi A. (2011) 'Community choices on appropriate adolescent reproductive health referral interventions'. *The Journal of Sexual Medicine*, Vol 8, Issue Sup 3, p. 248.
3. Dusabe J., Maulet N., Nnko S., Mapella E., Sayi L., Dagobi A., Boubacar H., Pascal M. and Obasi A. (2011) 'Iterative intervention development for improvement of ARH services'. The Journal of Sexual Medicine, Vol 8, Issue Sup 3, p. 248.
4. Dusabe J., Maulet N., Nnko S., Mapella E., Sayi L., Dagobi A., Boubacar H., Pascal M. and Obasi A. (2011) 'Rationale and design of IntHEC – a cluster randomised trial of adolescent reproductive health interventions in Tanzania and Niger'. *The Journal of Sexual Medicine*, Vol 8, Issue Sup 3, p. 247.
5. Dusabe J., Nnko S., Changalucha J., Mchome Z., Kitilya B., Mchome Z., Shagihiru M., Payne P., Mapella E., Obasi A. (2014). Integrating mobile interventions within district health systems: a text-messaging platform for sexual and reproductive health referral Tanzania. Health Systems symposium, 30 Sept – 3 Oct, Cape Town, 2014.

Preface

"...We shall never cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time."

T.S. Eliot

Abstract

This thesis documents the development and evaluation of an mHealth intervention for sexual and reproductive health (SRH) referral from drugstores to health facilities in Mwanza Tanzania.

SRH is an important factor for human development. Over the last 2 decades, provision and accessibility to SRH services has benefited from international and national health promotion interventions. In developing countries, use of close to community providers (CTC providers), such as village health workers, has been a key component of health promotion. This has been especially true in Tanzania where up to 70% of formal primary health care facilities lack health staff. CTC providers have been promoted through international initiatives such as the World Health Organization's (WHO) task-shifting initiative. WHO's recognition of CTC providers ranges from cadres at the grassroots level such as village health workers and drugstores to formal auxiliary providers based in health facilities, such as medical aides and nurses.

In Tanzania, drugstores provide a range of SRH services ranging from simple advice on how to use a condom to complex prescriptions of antibiotics for STI treatment. Evidence has shown that drugstores – though more likely to have health-related training than any other informal CTC providers – lack skills necessary for provision of SRH services. This may contribute to poor SRH outcomes, such as increase in prevalence of sexually transmitted infections (STIs)/human immunodeficiency virus (HIV) and

antibiotic resistance. Accessing SRH services at the formal health facility level is key to improving these outcomes.

To create SRH service linkages and integration between drugstores and health facilities in Mwanza, Tanzania, an intervention that pioneered an mHealth SRH referral from drugstores to health facilities was designed and implemented for 18 months from September 2012 to February 2014. Referral between these two SRH providers using mHealth tools had not been attempted before. The intervention provided an electronic platform accessible to 52 drugstores and 18 health facilities in two districts of Mwanza region. Through a toll-free number and password, drugstores referred patients with SRH conditions to health facilities using the text-messaging feature on their mobile phones. From the platform's in-built data collection tool, SRH uptake data demonstrated that 38% of patients referred from drugstores accessed HIV, STIs, family planning and maternal health services at the health facility level. A follow-up randomised household survey found that 72% of the participants would accept such type of referral in future, and among those who had ever visited drugstores for SRH services, 15% had heard about the intervention. At the end of the intervention, drugstores and health facilities confirmed that it was beneficial to their SRH service provision and that they would like to continue implementing it.

In conclusion, this text messaging intervention pioneered community referral from drugstores to health facilities for SRH treatment by using mobile phones which appeared to be acceptable and effective in Mwanza Tanzania. With the growing use of mobile phones in Africa and the need to

provide SRH services beyond the Millennium Development Goals (MDGs) era, mobile phone-based community referral through CTC providers, such as drugstores, could make an important contribution to achieving Universal Health Coverage targets.

1 Introduction

1.1 Background

Sexual and reproductive health (SRH) is an important factor for human development and international health. The topic rose to prominence after the 4th United Nations (UN) International Conference on Population and Development (ICPD) in 1994, which declared a need for enhanced provision of SRH services by all member states to their populations [1]. Since then, SRH service delivery has gone through various target-setting modifications [2, 3] and calls for outcome improvements [4]. Although SRH lacked significant representation in the MDGs [5], SRH outcomes have improved in the MDG-era; in particular HIV/AIDS prevention and treatment [6], family planning and antenatal care, as well as prevention and treatment of STIs [7].

Among other actions, health promotion could be responsible for improvement in these outcomes. Health promotion has been defined by the WHO as "a process of enabling people to increase control over, and to improve their health" [8]. It has already made important contributions to strengthening of health systems [9], international funding [10, 11] and other approaches, such as involvement of close-to-community providers (otherwise known as lay-health workers) in provision of SRH services [12]. Lay health workers have contributed to increased uptake of anti-retroviral therapy (ART) [13] and access to antenatal and obstetric care services [14], especially through the global 'task-shifting' initiative promoted by the WHO [15]. However one cadre of close-to-community provider that is less promoted by the WHO's 'task-shifting' initiative, but is particularly active

in developing countries, is the drugstore. Drugstores are private shops that sell medicines in rural villages, and urban centres, and play a major role in the provision of medicine services across sub-Saharan Africa (SSA) [16]. Drugstores are more popular than formal health facilities in Africa especially at the village level [17]. They provide treatment for many conditions ranging from analgesics to antimalarials, from condom distribution to antibiotics for STI treatments, often illegally [18]. The illegal medicine trade has been attributed to lack of integration into the mainstream health sector and loopholes in regulation of drugstores [19]. However, drugstores' role and work with the health sector has been documented and several countries, such as Tanzania, have set up systems to licence and upgrade them into recognised medicine-distributing agents [20].

In the 2000s, mobile phones emerged as another strategy that could provide a route for improvements of health services among African populations. It is estimated that by the end of 2014 the number of mobile phone subscriptions will equal the number of people on earth at 7 billion [21]. Unlike other development paradigms, Africa has competitively engaged in mobile telephony with subscriptions increasing faster at times than in developed countries [21]. Due to this extensive growth in mobile phone usage, 'mHealth' – a technique that uses mobile phone technology to promote and deliver health services – has developed rapidly on this continent and researchers from different disciplines have evaluated it with varying degrees of success; a trial based in Kenya suggested that short message service (SMS)-based training improved malaria case management among clinicians [22]. Another trial in Tanzania suggested SMS reminders increased skilled

birth attendance to 60% in intervention group which compared favourably to 47% in the control group [23]. Conversely, a case-control study in the USA suggested that smart-phones incorrectly identified digital clinical images of cutaneous lesions as non-melanomatous [24]. However, a systematic review and meta-analysis of published evidence suggested that mHealth could help to improve health service delivery, and recommended further research into this area [25]. Involvement of mHealth in promotion of SRH was therefore seen as an important aspect of this PhD as described in later chapters.

This thesis describes the design, implementation and evaluation of an mHealth intervention to improve SRH service delivery and uptake. Although significant achievements have been made over the last 20 years in SRH [26], this year (2014, the 20th anniversary of the Cairo International Conference on Population and Development (ICPD)), the WHO called for further action on equality, quality of care and accountability in SRH service delivery [27]. Therefore, further research into this area is both necessary and timely. This thesis explores the role of drugstores in SRH service delivery and their linkage into the mainstream health sector. A combination of a health promotion approach – specifically the use of lay health workers – applied to the new technique of mHealth was used to deliver and evaluate an SRH referral intervention at formal health facility level.

1.2 Aims and objectives

Aim

The main aim of this study was to implement and evaluate an mHealth intervention on uptake of SRH services at formal health facilities, close-to-community providers and household levels in Mwanza region, Tanzania.

Specific objectives

1. To consult close-to-community healthcare providers (CTC providers) on SRH service provision and access in communities;
2. To consult the communities on existing SRH services, perception of and preferred CTC providers for SRH referral to health facilities;
3. To conduct a situational analysis examining the health facility infrastructure and levels of SRH service uptake;
4. To design an mHealth referral intervention for SRH services in accordance with findings obtained from Objectives 1-3 and implement that intervention with the preferred CTC providers and health facilities;
5. Through the intervention, to estimate the uptake of SRH services at health facility level as a result of the CTC provider referrals from the community;
6. To assess the awareness, attitudes and future uptake of the CTC referral intervention within the communities after implementation;

7. To examine the service providers' attitudes towards mHealth referral for SRH services after intervention implementation;

1.3 Outline of the thesis

The above objectives were achieved iteratively through the following stages:

- Reviewing the literature and establishing what had been achieved in Mwanza region regarding SRH, close-to-community providers and mHealth (Chapter 2 of this thesis);
- Aligning the intervention with targets of a larger cluster-randomised trial within which the work reported in this thesis was nested (Chapter 3);
- Conducting situational analysis sub-studies and stakeholder consultations to establish the desired intervention prototype and the SRH situation in health facilities (Chapters 4, 5 and 6);
- Designing and implementing the intervention in communities through CTC providers and health facilities and collecting data on service uptake evaluation (Chapter 7);
- Analysing the intervention data using statistical techniques to present the estimated outcomes of the implementation (Chapter 8);
- Collecting and analysing household-level data on the awareness, uptake and attitude on the intervention (Chapter 9);

- Collecting and analysing qualitative data on the experiences of CTC providers and health facilities after participating in the intervention (Chapter 10);

- Triangulating discussions from Chapters 4 to 10 into the overall discussion that links into evidence and literature from other researchers, conclusions and recommendations as well as implications of the intervention in Tanzania and globally (Chapter 11).

1.4 Scope

This study implemented a grassroots level intervention with drugstore attendants (see following Chapters) and health facilities and addressed SRH access concerns of the community. Providing referral and collecting data on uptake of SRH services formed the core of this study. Outcomes on this indicator were obtained from electronic data collected automatically as patients entered the referral system, and from the household survey that was conducted after the intervention implementation.

Patient follow-up was beyond the scope of this study, and no confirmatory tests to verify diagnoses of SRH conditions were performed. Health facility clinicians' diagnoses were used to estimate the numbers of infections or diseases the study reported on.

The study did not provide any technical training or assessment on standard health or SRH service delivery to health facility clinicians or drugstore attendants beyond the qualifications obtained by these providers during their formal training.

1.5 Setting

Country background

Tanzania is a country in East Africa of 940,000km^2 land surface area. It shares borders with eight countries: Kenya, Uganda, Rwanda, Burundi, Democratic Republic of Congo, Zambia, Malawi and Mozambique. Its coastline with the Indian Ocean is on the eastern frontier (Figure 1.1).

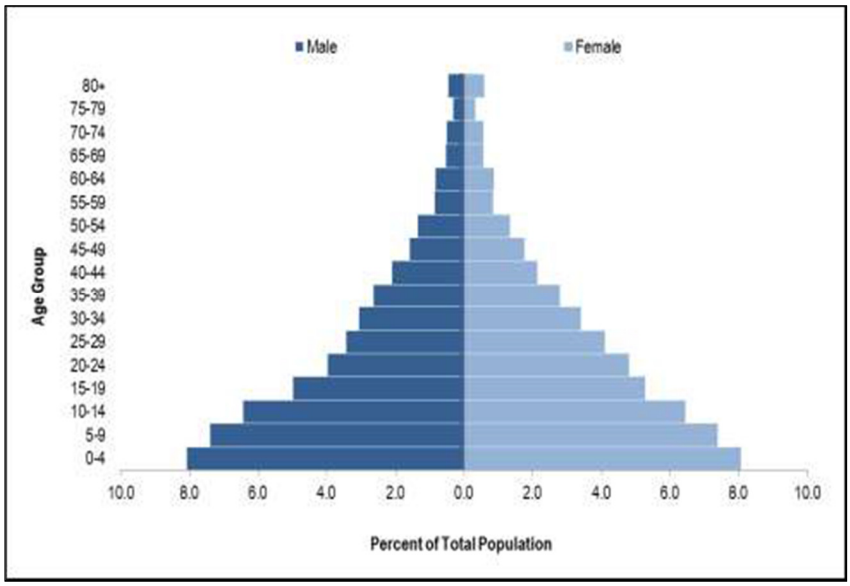
Figure 1.1 Map of Tanzania

Source: Google 2014 [28]

Population

The National Bureau of Statistics reported a population of 44.9 million people living in Tanzania in 2012 [29]. Figure 1.2 illustrates the population age groups of Tanzania and shows a young population (almost a third of the population are aged below 15 years) that decreases with increasing age.

Figure 1.2 Population of Tanzania by sex and age group



Source: Tanzania National Bureau of Statistics, 2013 [29]

Socio-economic and political setting

Tanzania has a pluralistic multiparty political system, with Chama Cha Mapinduzi (Kiswahili for: *"Party of the Revolution"*) as the ruling party. Decentralisation by devolution is the form of governance.

Before the World War 1, the mainland of what constitutes today's Tanzania was called *Tanganyika* and was divided into southern and northern 'spheres of influence' ruled by Germany and Britain respectively. In 1919, under the Treaty of Versailles, the whole of Tanganyika was given to Britain as part of the East African territory. The country was ruled thereafter under British colonial administration until 1961 when it gained independence (9th December). In 1964, Tanganyika united with the Islands of Pemba and Zanzibar (12th January) to become the United Republic of Tanzania [30].

In light of this history, English is one of the two official languages in Tanzania alongside Kiswahili, the latter being the National Language. Tanzania has over 120 languages [31] spoken by over 120 tribes that inhabit the country's 127 districts (current as of 2012) distributed in 26 administrative regions. The country is governed by a constitution that has gone through amendments since British rule and independence.

The people of Tanzania have a significant order of organisation that existed as successful chief- and kingdoms with a formidable political system since before colonisation. The many tribes inhabiting the country uphold a variety of beliefs and practices that enrich Tanzania's cultural heritage. Tanzania's capital city is Dodoma. Dar es Salaam, the country's biggest city, is its largest commercial centre.

The national currency is the Tanzanian Shilling (approx. 1.00 US dollar = 1,648.48 TZS – May 2014 exchange rates). In 2014, Tanzania ranked 152nd out of 182 countries on Human Development Index [32]. In 2011, its Gross Domestic Product (GDP) based on the purchasing-power-parity per capita estimated in International Dollar was 1,673.64 and its share of the world's total GDP was 0.084% in the same year [33]. Also, its literacy rate was 71% in 2013 [34].

The health system

Tanzania's health system has a pyramidal hierarchy. In this hierarchy, the highest level of health service delivery is the national referral hospitals and the lowest is the community health services. In that hierarchy the regional and district hospitals, health centres, and dispensaries link the national

referral hospitals and community health services. Service delivery and policy implementation follows a decentralised model. The most recent National Health Policy (NHP) (2003) [35] defines roles for every cadre of the health system as follows:

- **Community health services:** communities have an obligation to define their own health service delivery. The NHP gives them a mandate to choose their own community health workers whose responsibilities are mainly health education and assisting in aspects of community public health interventions.

- **Dispensaries:** these have the responsibility to establish the dispensary committees who run the outpatient services including treatment of STIs, antenatal care (ANC) and maternal delivery services. A dispensary catchment population is 5,000 people. The majority of health system facilities are dispensaries and there are 5,680 nationwide [36].

- **Health centres**: provide outpatient and in-patient services, first-point referral services and supervise dispensaries. A health centre catchment population is 50,000 people. However, the NHP suggests that where the population number is higher, a range of services should be increased to cover the need. There are just 742 health centres in Tanzania [36].

- **District hospital services (District Health Management Teams):** DHMTs are mandated to provide all basic health services as well as being the second-level referral. They have a responsibility to provide

healthcare to a whole district catchment population. The NHP mandates the hospitals to form hospital management committees and hospital management teams to oversee the hospitals' responsibilities, which include supervision of the lower health systems.

- **Regional hospital services:** these house the second-level referral facilities and are responsible for provision of all services offered at the district level but with more complex expertise, including specialised surgery, obstetrics and gynaecology.

- **National referral and specialised hospital services:** these are at the highest level of health service delivery in Tanzania. They are referral centres for level two hospitals. They have a responsibility to provide all services offered to lower levels, as well as specialised treatment, teaching and research. Including district, regional and national hospitals, there are 241 hospitals in Tanzania [36] although it is not clear how many of these have a national referral status.

The Tanzanian NHP recognises the role of traditional medicine in the provision of health services, and gives the village community government the responsibility to assess and recommend particular traditional practitioners for registration by authorities.

The Ministry of Health has a normative role to set standards for all parameters of health service delivery in all the facility levels, including staffing, equipment, drugs, reagents, medical supplies and approved building plans.

This health system shows the existence of clear structures aligning with elaborate administrative and geographical demarcations. Since independence Tanzania adopted the primary health care delivery system, which is disseminated to most remote and rural areas. The decentralisation of health services in the 1990s further increased the coverage of Tanzania's health system. Despite the country's vast size, at least every ward[1] has a connection to a health service delivery point. By 1992, 93% of Tanzania's population were within 10 km of a health facility and 72% were within 5 km [37].

Health indicators

The WHO's 2013 World Health Statistics (WHS) report presented an unfavourable image of Tanzania's health system. Although the report cited challenges of missing data due to variability of sources [38], it showed that many of Tanzania's health indicators were worse in comparison to African and global averages (Table 1.1). This is even more striking regarding human resources for health, where there is over five-fold difference between Tanzania and the African region and ten-fold difference between Tanzania and global averages on the availability of frontline health workers (see Table 1.1). Although the data on Africa and global averages for availability of generic medicines were missing from the WHS report, Table 1.1 shows that availability of generic medicines in the Tanzanian public sector is only 23%. This highlights the lack of medicines in the majority of public sector

[1] A ward being an administrative structure with a population of approximately 10,000 people

health facilities, which could have a substantial impact on how curative services are provided in these facilities.

Table 1.1 Selected health indicators for Tanzania

Indicator and measure between 2005-2012*	**Tanzania**	**African Region**	**Global**
Health expenditure as a % of total GDP in 2010	7.2%	6.2%	9.2%
Life expectancy in years of age in 2011	58 male, 61 female	55 male; 58 female	68 male, 72 female
Adult mortality rate (15-60 years of age) per 1000 people in 2011	363 male; 322 female	362 male; 317 female	190 male; 129 female
Number of physicians per 10,000 people in 2012	0.1	2.5	13.9
Number of nursing and midwifery personnel per 10,000 people	2.4	9.1	29.0
Number of dentists per 10,000 people	<0.05	0.4	2.6
Number of pharmacists per 10,000 people	<0.05	0.6	4.4
Number of psychiatrists per 10,000 people	<0.05	<0.05	0.3
Number of hospital beds per 10,000 people	7	Ω	30
Median availability of selected generic medicines (public sector)	23.4%	Ω	Ω
Median availability of selected generic medicines (private sector)	47.9%	Ω	Ω
Median consumer price ratio of selected generic medicines (public sector)	1.3	Ω	Ω
Median consumer price ratio of selected generic medicines (private sector)	2.7	Ω	Ω

* based on WHS 2013 [38]; Ω – data missing

Summary

This chapter has introduced the research topic for this thesis and described the country setting in which the research was conducted. The next chapter presents a detailed account of the literature on SRH issues relevant for this thesis.

2 Literature review

2.1 Introduction

The aim of the study presented in this thesis is to design, implement and evaluate an mHealth intervention to promote the uptake of sexual and reproductive health services at formal health facilities in Mwanza region, Tanzania. This chapter reviews the literature on four key issues underpinning this thesis as follows:

1. **Sexual and Reproductive Health** (SRH) – this section reviews SRH topics and is divided into four specific components namely: HIV, STIs, family planning and maternal health (ANC and delivery). Global, regional and national epidemiology, delivery models and integration are discussed in this section;
2. **Close to community providers (CTC)** – this section reviews the literature relating to CTC providers including community health workers, drug stores and their attendants, referral and task-shifting as well as public private initiatives for SRH.
3. **mHealth** – this section encompasses the global application of mobile-phone health, its general use in SSA, application for SRH service delivery and use with CTC/informal service providers.
4. The final section summarises the literature relating to the **action research framework** on which the approaches of the sub-studies and their processes in this thesis are based, as a typology for the service improvement initiatives to improve SRH services in SSA.

Key issues within each sub topic are explored, starting with basic definitions and overview of historic significance, following with the global landscape and evidence for SSA, concluding with a focussed outlook on Tanzania.

2.2 Methods

This review was conducted by searching published articles from Ovid MEDLINE (R), Ovid OLDMEDLINE (R) and Global Health 1946 to Present as well as PubMed 1950 to present. This was done using the search terms in Appendix 2.1 and their MeSH headings. In addition, grey literature of on-going projects and unpublished reports were also hand-searched on the worldwide web. In total, 2625 records were retrieved. These were screened and those with irrelevant titles were excluded, remaining with 671 records whose abstracts were screened. Abstracts of 415 records were relevant to this thesis and their full text articles were downloaded, reviewed and used in the literature review and discussion of the thesis.

2.3 Definition: SRH

In 1994, a gathering of representatives from 179 countries in Cairo, Egypt adopted the WHO's definition of reproductive health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters related to the reproductive system and to its functions and processes" ICPD 1994 [39].

This definition encompasses the right for all people to have a satisfying and safe sex life, the capability to reproduce and freedom to decide if, when and how often to do so. Also it includes the right of men and women to be informed and have access to safe, effective, affordable and acceptable

methods of family planning and fertility regulation of their choice, and the right to access appropriate health services that will enable women to go safely through pregnancy and childbirth, as well as couples' rights to get services enabling them to have healthy infants [40].

SRH has been globally recognised as an important aspect of development [5]. Over the years, deficiencies in SRH have been identified among the world's major causes of disease burden and sequalae [41]. Therefore, the topic is broad and includes all forms of SRH issues. This thesis addresses SRH conditions and access to SRH services.

2.4 HIV/AIDS

Global epidemiology of HIV/AIDS

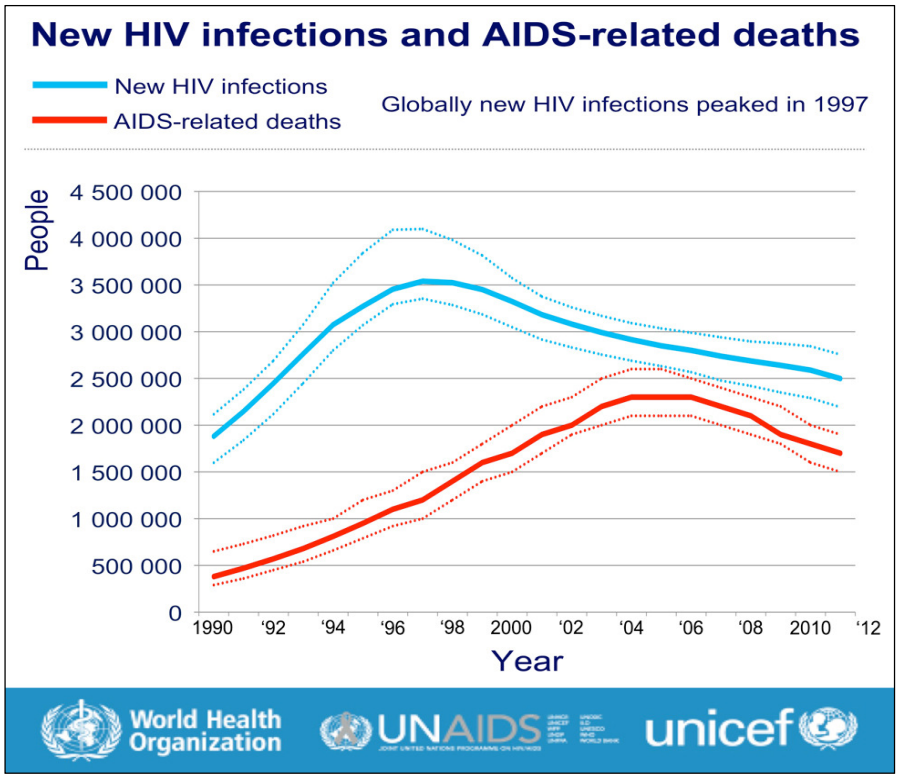
The condition later to be known as the *Acquired Immune Deficiency Syndrome* (AIDS) was first diagnosed in 1981, when a group of clinicians reported of five patients with *Pneumocystis carinii* in the Morbidity and Mortality Weekly Report of the US Centres for Disease Control and Prevention [42]. Two years later, virologists discovered that a virus was responsible for causing this condition [43, 44]. That virus got its name – *Human Immunodeficiency Virus (HIV)* – based on the way it weakens the human immune system, a process that leads to AIDS [45]. The weakened immunity reduces the body's ability to fight infection and the sufferer eventually dies of 'opportunistic infections' [46]. A cure for HIV has evaded medical and pharmaceutical researchers. The only possible form of treatment to date slows HIV by attacking stages of its replication [47].

By 2012, HIV/AIDS had claimed more than 36 million lives globally and 35 million people worldwide were infected [48]. Its virulence and lack of effective treatment attracted global attention; the Joint United Nations Programme on HIV/AIDS (UNAIDS) – a body set up in 1995 to deal specifically with global HIV/AIDS advocacy and fundraising – reported that in 2012 it was planning to spend US$18.9 billion on HIV programmes in low- and middle-income countries [49]. HIV is therefore recognised as one of most serious pandemics to date.

However, reports suggest that the global impact of HIV in terms of morbidity and mortality is reducing: the UN suggested that the number of

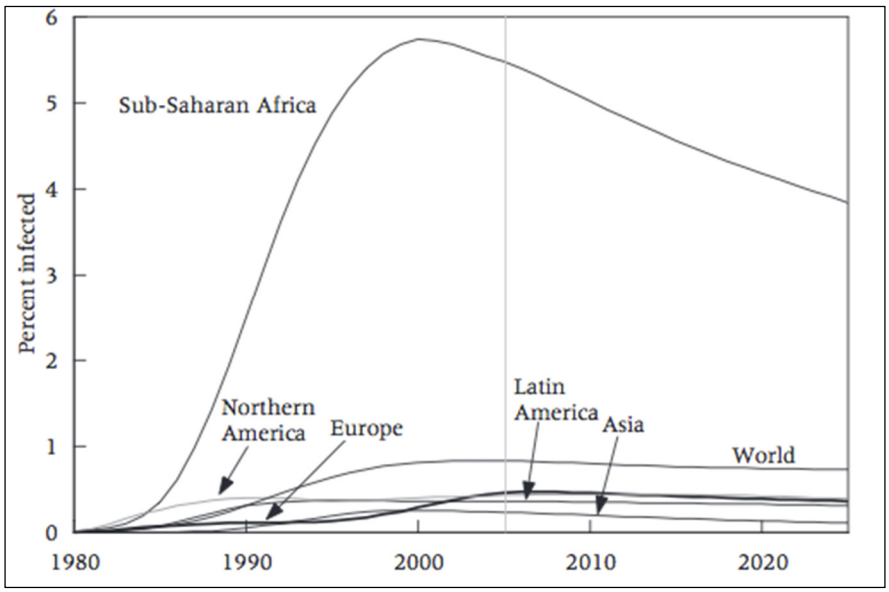
HIV infections peaked in late 1990s and deaths in the early to mid-2000s (Figure 2.1).

Figure 2.1 No. of HIV infections and AIDS deaths 1990-2012



Since it was first reported, HIV has affected SSA more than any other global region [50]. The 2013 UNAIDS report suggests that 70% of new infections in 2012 occurred in SSA. Figure 2.2 suggests that whereas the world HIV prevalence peaked at 1%, in SSA the prevalence reached 6%, before gradually declining as illustrated by Figure 2.2.

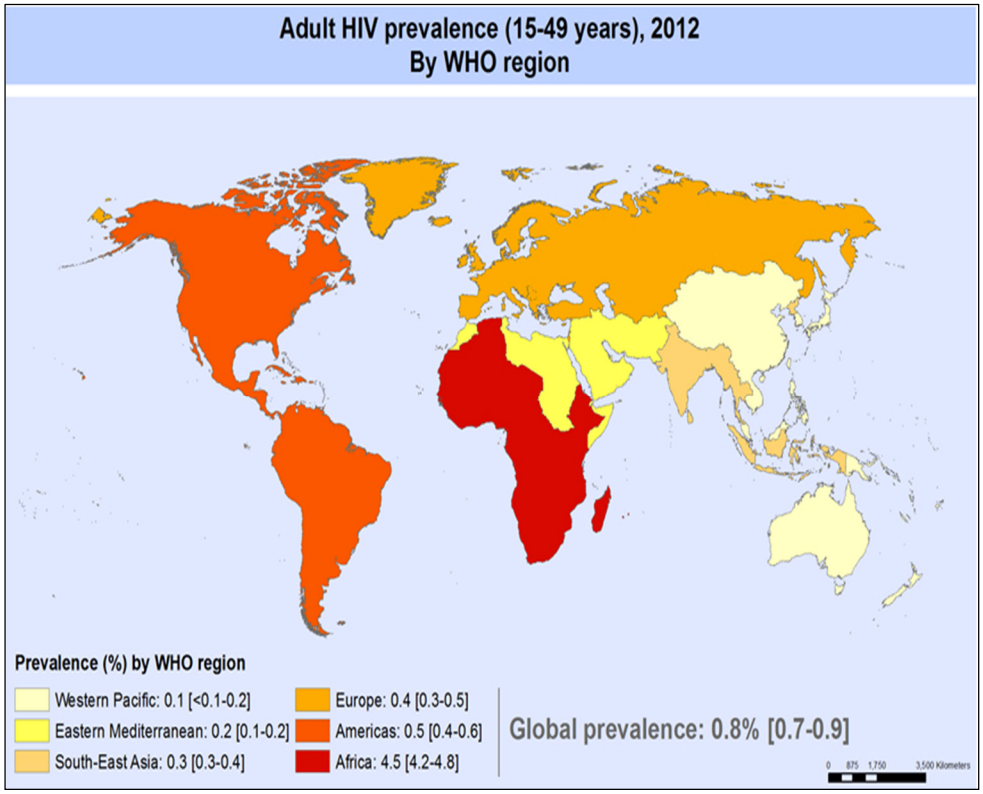
Figure 2.2 Global HIV prevalence from 1981 to 2020



Source: Bongaarts et al. 2008 [50]

This trend has persisted over a period of time (Figure 2.2): WHO used the latest data from 2012 to draw a map of regions showing that prevalence on the African continent (excluding the North Eastern Arab countries) was 4.5% in 2012 (Figure 2.3). As projected in Figure 2.2, the WHO map further shows that the Western Pacific had the lowest prevalence of 0.1% in the same year. All the remaining global regions are within 1% prevalence, contributing to a global prevalence of 0.8% (Figure 2.3).

Figure 2.3 Global HIV prevalence 2012 (15-49 years)



Source: WHO [48]

HIV in SSA

HIV transmission occurs through cellular exchange of body fluids from an infected to an uninfected person. Sexual intercourse has been responsible for over 85% of all infections [51]. In SSA, most HIV infections are acquired predominantly through heterosexual contact [52].

In the early 2000s, HIV killed 2 million people every year in Africa, a number the WHO stated was 10 times more than the number of people killed in wars and conflict on the continent in a one-year period [9].

HIV mostly affects sexually active age groups. HIV in SSA is also disproportionately more prevalent among women than men [49], presenting

challenges of control measures as in some settings women are less able than men to access health facilities due to socio-economic factors.

The impact of HIV in SSA in the 1990s has driven SRH calls for action and brought the disease to the global agenda: HIV is the only disease that has its own UN agency – UNAIDS.

HIV has been associated with lowering health expectancy: in 2000 (when HIV infection and mortality reached their peak), the disability-adjusted life expectancy (DALE) of 32 countries affected by HIV was less than 40 years compared to the average DALE of 70 years in countries where HIV/AIDS has not had a devastating impact [9]. The mass effect on reduction of life-years in countries of high epidemic affects all aspect of life including provision and access to health services as well as economic outcomes [9].

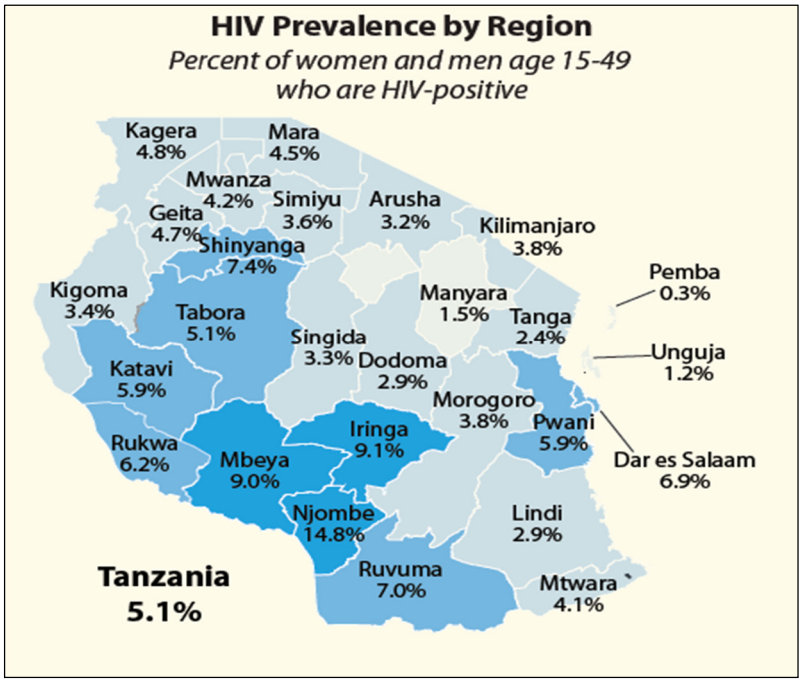
HIV in Tanzania

The first HIV case was diagnosed in Tanzania in 1983 and, like elsewhere in SSA, it quickly attracted the Ministry of Health's attention: HIV testing laboratories and a National AIDS Control Programme were set up by 1986 [53]. The control efforts have benefited from national and international support and Tanzania's current prevention and control activities are within the national and international engagements.

The most recent statistics for HIV however show that the national prevalence is above the global average, at 5.1% [54]. Within the country there are regional differences: the highest reported prevalence is in the south-west with a prevalence of 14.8% in Njombe region, while the lowest is in Pemba region (Zanzibar) at 0.3%. The lowest prevalence on mainland

Tanzania is in Manyara (1.5%). Mwanza, the region where the study presented in this thesis was conducted, has a reported prevalence of 4.2% (Figure 2.4).

Figure 2.4 HIV prevalence in Tanzania reported in 2013



Source: 2011-12 HIV and Malaria Indicator Survey (published in 2013) [54]

Despite increase in the national health promotion prevention campaigns, about 83,000 people were newly infected in 2013 [49] . However, the country has made serious commitments towards new health promotion campaigns and has targeted to avert at least 200,000 new infections by 2025 through male circumcision [49]. This health promotion has raised community awareness of HIV; in 2010, 99.6% of Tanzanian women (N=10,139) and 99.8% of Tanzanian men (N=2,527) aged 15-49 years reported having heard of HIV [55]. However, in the same sample this proportion reduced to 76.4% and 75.8% respectively when the participants were asked whether condoms prevent HIV transmission [55].

The 2010 Demographic and Health Survey (DHS) also reported the uptake of voluntary counselling and testing (VCT) services to be low: only 55.3% of women and 39.8% of men in the above samples reported to have ever tested for HIV and received results [55]. A study published prior to the DHS (in 2008) had reported that only 7% of women (N=4,990) and 12% of men (N=3,990) who had expressed interest in VCT had completed the service [56]. In 2011, a multi-country (Tanzania, Zimbabwe and Thailand) cluster randomised trial comparing community-based with facility-based VCT reported that only 37% (N=6,250) received VCT services in the community-based VCT arm in Tanzania. This proportion was even lower (9%; N=6,733) in the facility-based arm [57].

Access to ART services was also low: in 2007 it was estimated that only 13.5% of people then living with HIV were on ARVs [58]. In 2012, the Tanzania Commission for AIDS (TACAIDS) reported as part of the UNAIDS annual epidemic update that by 2010 that percentage had risen to 53% (N=355,359 adults and 29,457 children) [59] which demonstrated a considerable improvement in the service provision and access. However, almost half of the people in need of ARVs still did not have access to them. In 2013 UNAIDS reported that Tanzania was among the 30 countries where 90% of the people with unmet need for ARVs lived [49].

Therefore, HIV/AIDS is an SRH condition of considerable public health importance in Tanzania. Increased access to and uptake of HIV/AIDS services is an important component of the wider SRH package.

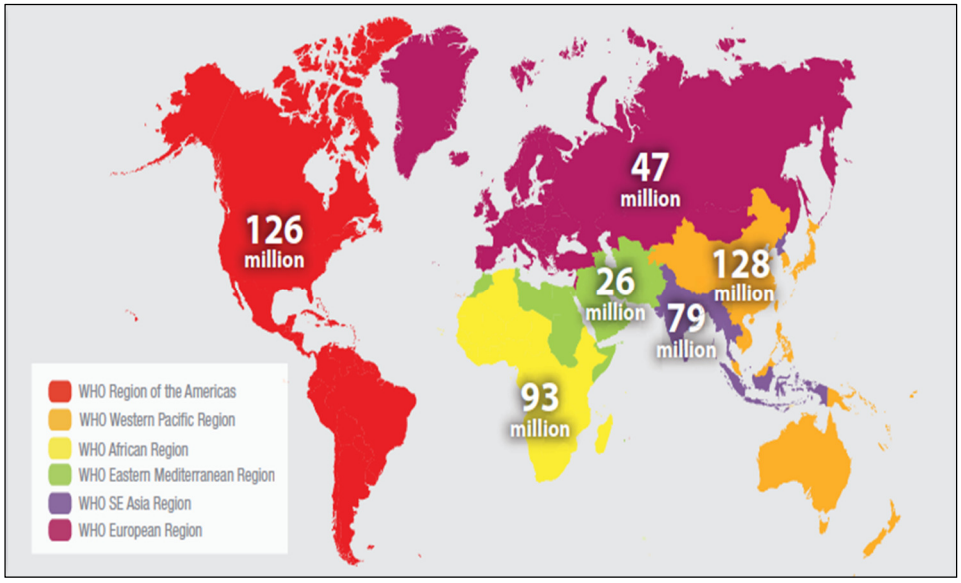
2.5 Sexually transmitted infections (STIs)

STIs are bacterial and viral infections including syphilis, gonorrhoea, chlamydia and trichomaniasis, chancroid, genital herpes, genital warts, hepatitis B and HIV, which are transmitted through intimate exchange of bodily fluids. Some infections (e.g. syphilis and HIV) are also blood borne and can be transferred through blood transfusion or contaminated needles [60].

Global epidemiology of STIs

Over one million people worldwide acquire STIs every day [61]. Most infections occur in low- and middle-income countries. The WHO (2014) suggests that in 2008 most infections occurred in the Western Pacific region with 128 million infections. The lowest number of infections occurred in the Eastern Mediterranean (Figure 2.5). However, the number of infection presented in Figure 2.5 is in absolute numbers, so in terms of proportional disease burden the highest prevalence of infections have occurred in the African region because it has a lower population than the Western Pacific, which includes China (see further discussion on this below). In 2008, 536 million people were living with incurable herpes simplex virus type 2 (HSV-2) and at any given point in time, approximately 291 million women have human papilloma virus (HPV) [62].

Figure 2.5 People with STIs in 2008 in WHO global regions



Source: WHO STI fact sheet 2014 [61]

Globally in 2008, there were 100.4 million people infected with *Chlamydia trachomatis*, 36.4 million *Neisseria gonorrhoea*, 36.4 million syphilis (*Treponema pallidum)* and 187.0 million with *Trichomonas vaginalis*.

Consequences of STIs

The consequences of untreated or complicated STI are severe and include infertility, ectopic pregnancy, chronic pelvic inflammatory disease (in women), urethral strictures (in men), septicaemia, arthritis, endocarditis (in both sexes), eye infections and blindness, stillbirth and low birth weight (in newborns) [63, 64]. In 1990, the World Bank reported that STIs accounted for 8.9% of all disease burden in women aged 15-45 years [65]. In the same year, STIs contributed 18.6 million Disability Adjusted Life Years (DALYs) lost in the Global Burden of Disease and Injury Study [66]. Twenty years later, STIs were reported to still contribute more than 10

million DALYs by an authoritative review of 291 diseases in 21 regions [67]. These numbers demonstrate the great health burden of STIs.

STI prevalence is maintained by lack of appropriate protection during sexual intercourse e.g. improper or non-use of condoms. This is more so in populations where there is already a high prevalence in the population [68]. Improper management, such as lack of treatment of sexual partners, is responsible for reinfections as well as treatment failures [69].

Chlamydia and gonorrhoea are associated with reproductive complications, particularly repeat infections [70]. Forty per cent of untreated gonorrhoea cases will lead to PID, which is a global burden of SRH since 1 in 4 women with PID develop infertility [60].

STI interaction with HIV

STIs are a major risk factor for HIV infection and it has been reported that having an STI increases the risk of getting HIV [71, 72]. A randomised trial conducted in Tanzania concluded that management of STIs in rural settings led to a 40% reduction in the incidence of HIV infection in the general population [73, 74], while in Burkina Faso an observed decline in bacterial STIs was associated with a reduction in HIV infection over a period of 11 years [75].

STI control and management in Africa

As discussed above, STIs have been reported to be more prevalent in Africa than in any other WHO region [76, 77]. The WHO report published in 2012 stated that there were 92.6 million STI incidences (Figure 2.5) in a regional

population of 384.4 million people aged 15-49 years living in 46 countries [76]. This report described the regional statistics for the STI conditions highlighted in Table 2.1 below:

Table 2.1 Prevalence and Incidence of STIs in WHO African Region

STI condition	Prevalence (%)		Incidence (per 1000)	
	Female	**Male**	**Female**	**Male**
Chlamydia	2.6	2.1	22.3	20.9
Syphilis	3.5	3.9	9.4	8.5
Gonorrhoea	2.3	2.0	49.7	60.3
T. Vaginalis	20.2	2.0	146.0	164.8

Compiled from: WHO global incidence and prevalence of selected curable STIs in 2008 [76]

Syndromic management of STIs

In July 1990, a WHO Study Group on management of STIs issued a report with guidelines [78] for STI treatment using a practice of *syndromic management* – a technique that diagnoses an STI by identifying its signs and symptoms that are well known and defined within global aetiologies instead of using laboratory tests [79]. In addition to syndromic management, the report also described guidelines for establishing protocols for STI prevention and control at the national and local levels, as well as providing health promotion and education for disease management [78].

Although lack of infrastructural resources in developing countries for laboratory and clinical tests made syndromic management a necessity, it was soon realised that the approach was actually highly effective in correctly identifying and treating STIs [80]. In 2000, a review of syndromic management sensitivity and specificity data obtained from 26 published and 10 unpublished studies revealed that syndromic management algorithms

correctly diagnosed and treated genital ulcer disease and urethral discharge (sensitivities of 87-99% for urethral discharge and 68-98% for genital ulcer disease) in men. A similar identification and treatment success was also reported among women reporting with symptoms of vaginal discharge syndrome (sensitivity 73-93%)[81].

Due to this evidence, continued renewals and revisions of guidelines by WHO and other groups such as the US Centres for Disease Control (CDC), syndromic management remains a globally practiced model, especially in developing countries [60]. The most recent evaluation of the technique in South Africa revealed that the model has contributed to a reduction in prevalence of treatable STIs, although this is not the case when it comes to asymptomatic STIs [82], where more evidence and investment is still needed. Asymptomatic STIs are particularly an issue among women [83, 84] where they can remain undetected due to lack of signs or symptoms. Accurate diagnostic tests, partner treatment and awareness raising should be among the core management approaches for the asymptomatic STIs [83].

STIs in Tanzania

A cross-sectional study of males and females aged 15-44 conducted in Kilimanjaro region Tanzania in 2005 (published in 2008) reported that only 38% of participants (n=1528) were aware of STIs [85]. Table 2.2 adapted from the DHS 2010 [55] shows the various demographic characteristics of women and men aged 15-49 with self-reported STI-related outcomes. The prevalence of STI, genital discharge/ulcer/sore was reported at 6.9% in women and 6.2% in men of this age group.

The table also reports that STI rates are highest in 25-29 age group and lowest in 40-49 age group in both men and women. Mwanza region (Lake Zone in the table), where the main study of this thesis was conducted, has the highest rates of reported STI/genital discharge or ulcer in the country in both women (11.9%) and men (10.3%) compared to the other regions [55]. Possible reasons for this could be the proximity to a highly lucrative mining industry located within/near Mwanza City and surrounding districts [86] as well as urban dwelling, unemployment and high mobility [87].

Table 2.2 Self-reported prevalence of STI symptoms Tanzania

Among women and men age 15-49 who ever had sexual intercourse, the percentage reporting having an STI and/or symptoms of an STI in the past 12 months, by background characteristics, Tanzania 2010

	Women					Men				
	Percentage of women who reported having in the past 12 months:					Percentage of men who reported having in the past 12 months:				
Background characteristic	STI	Bad smelling/ abnormal genital discharge	Genital sore/ulcer	STI/ genital discharge/ sore or ulcer	Number of women who ever had sexual intercourse	STI	Bad smelling/ abnormal genital discharge	Genital sore/ulcer	STI/ genital discharge/ sore or ulcer	Number of men who ever had sexual intercourse
Age										
15-24	3.2	4.2	3.4	6.9	2,720	3.3	3.2	5.0	7.4	587
15-19	2.3	5.0	4.1	7.4	987	1.5	0.8	4.6	5.0	240
20-24	3.8	3.7	3.0	6.6	1,733	4.5	4.9	5.3	9.0	347
25-29	3.6	4.7	3.6	7.8	1,646	6.1	3.5	4.4	9.6	336
30-39	3.0	5.2	2.4	7.3	2,699	2.6	3.1	2.9	5.1	648
40-49	1.8	4.2	2.3	5.5	1,671	1.1	2.7	2.5	4.1	473
Marital status										
Never married	2.7	3.1	2.4	5.9	1,137	3.0	2.4	4.8	6.9	563
Married or living together	2.8	4.7	3.0	6.9	6,412	2.7	2.9	2.8	5.5	1,317
Divorced/separated/widowed	3.8	5.5	3.3	8.0	1,188	5.7	7.1	6.6	9.8	164
Male circumcision										
Circumcised	na	na	na	na	0	2.7	2.8	2.7	5.2	1,522
Not circumcised	na	na	na	na	0	4.0	4.1	6.4	9.1	522
Residence										
Urban	3.9	4.7	3.7	8.5	2,407	1.6	0.5	2.4	3.5	549
Rural	2.6	4.5	2.7	6.3	6,329	3.5	4.1	4.1	7.2	1,494
Mainland/Zanzibar										
Mainland	3.0	4.7	3.0	7.0	8,520	3.1	3.2	3.7	6.3	2,000
Urban	4.0	4.8	3.8	8.7	2,320	1.6	0.5	2.4	3.6	530
Rural	2.6	4.6	2.7	6.4	6,200	3.6	4.1	4.2	7.3	1,470
Zanzibar	0.8	1.5	0.7	2.2	216	0.7	1.5	1.5	1.8	44
Unguja	0.8	1.7	0.9	2.5	144	0.8	1.9	1.9	2.3	34
Pemba	0.9	1.2	0.3	1.6	72	0.0	0.0	0.0	0.0	10
Zone										
Western	2.9	5.4	3.6	7.8	1,495	2.7	2.4	2.3	5.7	307
Northern	1.2	2.9	1.0	3.5	1,255	1.6	2.6	2.9	4.7	275
Central	2.8	5.2	1.8	6.5	706	2.6	1.8	0.0	2.6	179
Southern Highlands	2.1	3.5	1.6	4.3	1,168	2.7	2.9	7.8	9.2	268
Lake	5.1	7.5	6.0	11.9	1,587	4.8	5.9	6.4	10.3	415
Eastern	3.8	4.9	3.4	8.6	1,427	0.9	0.8	2.1	2.5	341
Southern	2.0	1.8	1.5	3.5	882	6.5	4.9	2.0	7.4	214
Education										
No education	2.6	4.4	3.2	6.6	1,881	4.5	3.6	2.7	7.4	222
Primary incomplete	4.0	5.5	4.4	8.4	1,203	2.6	3.9	4.0	7.2	338
Primary complete	3.0	4.7	2.7	7.0	4,641	3.4	3.6	4.3	6.9	1,128
Secondary+	1.9	3.3	1.7	5.3	1,011	1.2	0.6	2.0	2.6	356
Wealth quintile										
Lowest	2.0	5.2	2.9	6.6	1,530	4.6	4.3	4.0	7.8	341
Second	2.8	3.9	2.4	5.5	1,734	2.2	2.5	3.4	6.3	379
Middle	3.0	4.3	2.2	6.1	1,742	3.5	3.9	4.8	7.2	378
Fourth	3.1	5.5	4.2	8.6	1,811	4.0	4.0	3.8	6.2	458
Highest	3.6	4.2	2.9	7.6	1,920	1.3	1.4	2.6	4.4	488
Total 15-49	2.9	4.6	2.9	6.9	8,736	3.0	3.1	3.6	6.2	2,044

na = Not applicable

Source: Tanzania Demographic Health Survey 2010 [55]

Previous studies, dating back 15 years, had consistently reported a high prevalence of STIs in Mwanza [74, 88]. Table 2.3 illustrates the results of a cluster-randomised trial by Grosskurth et al 1995 post-intervention implementation. Although the risk ratios were not statistically significant after adjusting for individual and cluster variations, in the intervention and

comparison communities the study reported prevalence of 10.4% and 11.4% respectively for syphilis, 2.5% and 3.0% respectively for gonorrhoea and 5.8% and 7.0% respectively for urethritis [74]. Therefore, although the STI prevalence in the DHS is self-reported, Grosskurth et al 1995 [74] and Mayaud et al 1997 [88] reported similar levels from randomised settings. The rates reported in these studies are also consistent with results from the DHS; in the 2005 DHS Mwanza men had a prevalence of 8.9% [89].

Table 2.3 Prevalence of STIs in Mwanza by Grosskurth et al 1995

Marker	Prevalence		Crude RR* (95% CI)	Adjusted RR*† (95% CI)
	Intervention	Comparison		
Active syphilis	445/4260 (10·4%)	516/4539 (11·4%)	0·90 (0·76–1·06)	0·92 (0·78–1·07)
NG/CT‡	52/2052 (2·5%)	66/2187 (3·0%)	0·68 (0·27–1·68)	0·65 (0·26–1·62)
Symptomatic NG/CT‡	19/2052 (0·9%)	26/2187 (1·2%)	0·58 (0·14–2·51)	0·72 (0·25–2·07)
Urethritis‡	119/2052 (5·8%)	152/2187 (7·0%)	0·84 (0·31–2·26)	0·84 (0·32–2·20)
Symptomatic urethritis‡	32/2052 (1·6%)	54/2187 (2·5%)	0·48 (0·09–2·70)	0·49 (0·09–2·55)

NG/CT=*N gonorrhoea/C trachomatis*.
*Geometric mean of pair-specific risk ratios. †Adjusted for age, sex, travel during follow-up period, history of STD (ever) at baseline, and male circumcision.
‡Men only.

Source: Grosskurth et al 1995 [74]

STI health-seeking behaviour and service access in Tanzania

In the 1993 trial [90], 98% of men and 90% of women who reported having had a genital discharge sought treatment. However, among those who sought treatment, only 68% of men and 61% of women accessed that treatment from formal health facilities (dispensaries, health centres and hospitals) [90]. A high percentage of participants (21% of men; 34% of women) with genital discharge symptoms sought treatment from traditional healers. Seventeen per cent of men and 6% of women sought treatment from

places other than formal health facilities or traditional healers. The trial did not specify whether any of these participants sought STI treatment from drugstores. Note that the percentages above add up to over 100%; the study authors explained this to be due to some participants reporting to have sought treatment from more than one provider [90]. In 2006, traditional healers were reported to still be popular when it comes to STI treatment seeking compared to formal health facilities, which were reported (and perceived) to be further away (3-10 km accessible by walking) compared to traditional healers [91]. In 2009, a cross-sectional study published evidence to suggest that STI health seeking behaviour is particularly high in informal drug stores where >60% of antibiotics dispensed [92].

This thesis gives a particular attention to STIs as a component of SRH and outcomes are reported throughout the thesis demonstrating how the tools and systems were designed to ensure data on STI are collected and facilitation provided for STI to attain optimal attention for health facility participants and their patients.

2.6 Family planning and contraception

What is family planning?

Family planning involves action(s) to prevent a male sperm from meeting the female egg to prevent fertilisation either by using a physical barrier or medicines [93]. Family planning methods existing today include pills, injections, patches, rings, implants, condoms, spermicides, natural fertility awareness methods, withdrawal and sterilisation [94].

Family planning as a component of SRH

Family planning has long been considered part of SRH and the relationship between reproductive tract infections, STIs, maternal health and antenatal care has always been recognised, resulting in the 'integration' of family planning services into the wider SRH care [95]. This integration remains a topic of discussion and debates point to a possible success of family planning acceptance when STIs/HIV services and family planning are implemented together in an integrative manner [96].

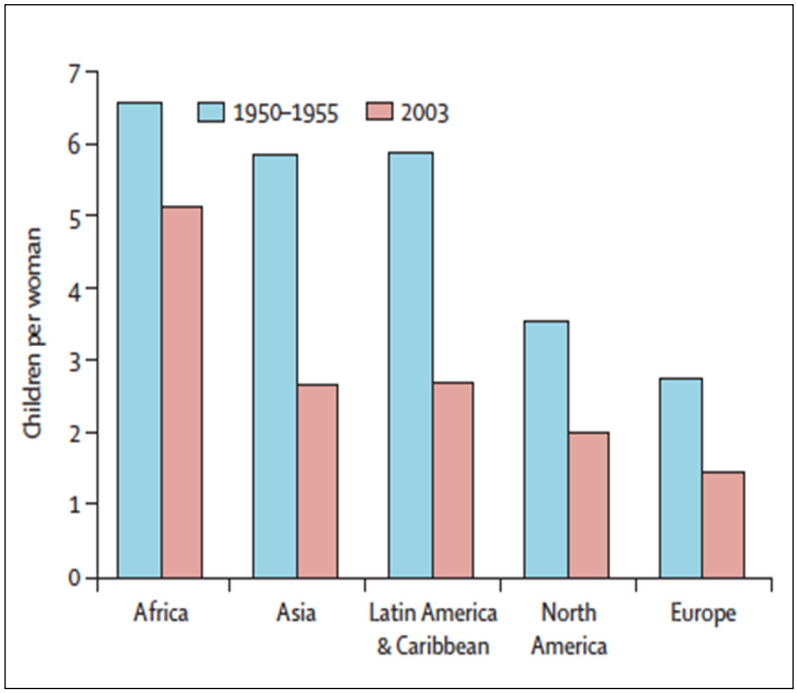
Family planning achievements

Family planning has achieved many global health outcomes: the global use of contraception increased from 10% in 1960s to 60% in 2003 and fertility rates have decreased in 2000s compared to 1950s [97](Figure 2.6). This has contributed to global health: for example, it has been claimed that family planning has increased access to education and literacy for women, led to improvements in child and maternal health outcomes, reduced poverty and increased income savings [98]. Campaigns have led to uptake of family

planning services: there were 645 million people using modern family planning methods in 2012 [98].

However, these outcomes have not been achieved at low cost: in 2012, US$ 4 billion were spent on family planning in developing countries and it was projected that to meet all contraception need in these countries would cost 8.1 billion annually [98]. It is estimated that the absolute number of married women in need of family planning will increase from 900 million in 2010 to 962 million in 2015 [99], a 60 million increase within just 5 years. Therefore, to achieve the family planning global health benefit, availability of resources and financial investment in service access will need to be maintained or indeed increased.

Figure 2.6 Fertility in major world regions

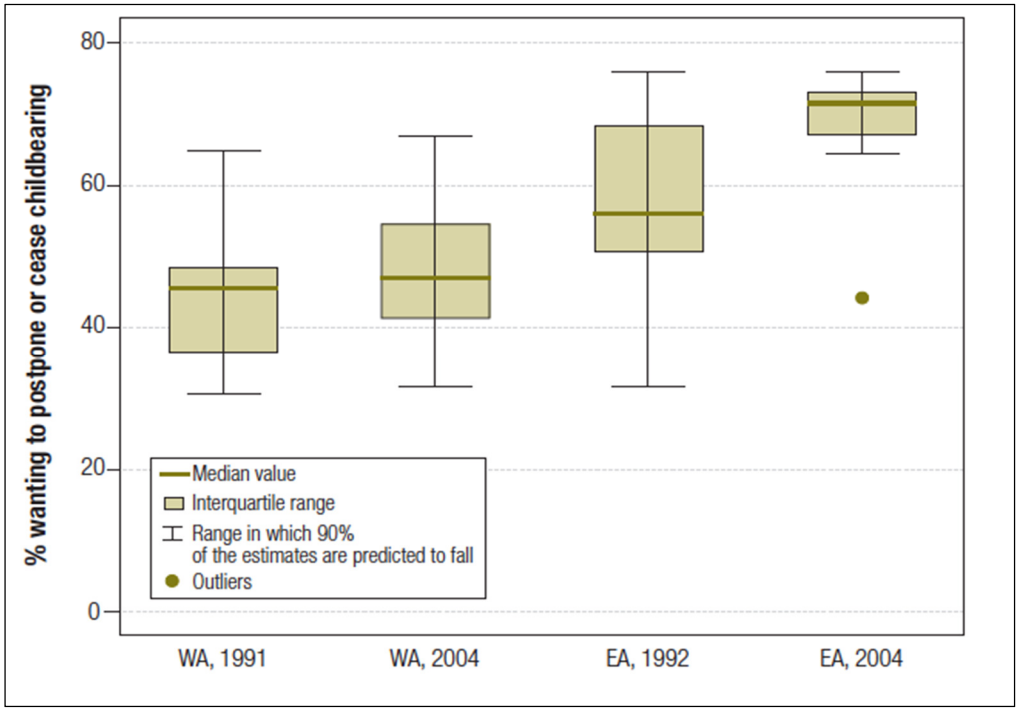


Source: Glasier et al 2006 [97]

Family planning in Africa

In 2010, the WHO published a comprehensive review of family planning trends from 24 countries using data obtained from DHS [100]. The data demonstrated that from 1984 to 2007, SSA had made substantial, though regionally-skewed progress, on family planning: in West Africa the percentage of women approving family planning rose from 32% to 39% and uptake from 8% to 29%. The numbers were slightly better in East Africa, where the uptake improved from 16% in 1984 to 33% in 2007 (with a progressive 1.4% percentage increase annually) [100].

Figure 2.7 Trends in contraception needs (women; percentage)*



Source: Cleland et al 2011 [100]

* in order to stop bearing children or to postpone having another child for at least two years, Western Africa (WA) versus Eastern Africa (EA), 1991/2–2004.

Figure 2.7 is a plot adopted from Cleland et al. 2011 to demonstrate the trend in percentage of women who want to postpone their pregnancy for at least 2 years. It shows a stark contrast between women who want to postpone or cease child bearing in in West and East Africa regions from 1991/2 to 2004. The figure shows that the interquartile range (the percentage range in which estimates were predicated to fall) of women who wanted to postpone or cease child bearing in West Africa had hardly changed in 2004 compared to 1991. The median also remained almost constant from 46% in 1991 to 47% in 2004. Conversely, East Africa showed a significant change in the interquartile range (very narrow), suggesting a higher desire to postpone or cease childbearing in the region. This change

was associated with a higher percentage of women who had this desire, with a median of 56% in 1992 that improved to 72% in 2004 [100]. Discussion on the factors contributing this difference between WA and EA is out of scope of this thesis; however, Cleland et al. 2011 attributed it to a higher proportion of women who wanted to stop having children altogether in EA (data on this outcome were not shown in the publication). In addition, the results plotted by Cleland included data from 13 countries in WA and 11 countries in EA which make half the number of all the SSA countries (48 in total [101]). Such coverage suggests that this trend is a powerful indicator of family planning progress in SSA.

Unmet need for family planning in SSA

Unmet need for family has been described as the inability to access family planning services for those women who are sexually active, fecund and in need of contraception [102]. The national, regional and global rates and trends in contraceptive prevalence and unmet need for family planning publication supported by the UN Population Division authored by Alkema et al 2013 in the Lancet [99] suggests that the unmet need for family planning in Africa (including North Africa) was 23.2% (95% CI= 21.9 – 24.6) in 2010. The absolute number in need in SSA was 20 million (10 million in Eastern Africa and 10 million in Western Africa, excluding North Africa). Comparing these numbers to 146 million married women who have an unmet need for family planning globally [99], the study implied that more than 13% of global unmet need for family planning comes from Eastern and Western Africa alone. Therefore, it becomes more and more important that family planning should be supported in SSA, especially

because this a global region where women/families have been reported to want a high number of children [103].

Family planning in Tanzania

There is a dynamic pattern of family planning outcomes in Tanzania: the country's DHS in 2010 reported that two thirds of currently married women want to have more children, but 44% say they want to wait at least 2 years to have the next child; 30% want no more children (including the 4% who are sterilised) and 5.8% of women with ≥6 children want another child soon (within 2 years) [55].

The evidence by Alkema et al 2013 is consistent with the 2010 DHS: the national prevalence of contraceptive use in Tanzania was 34.3% (CI = 27.4 – 42.2) in 2010, with an increase of 23.2% (CI = 15.1 – 31.8) from 1990 [99]. The unmet need was 25.6% (CI = 21.0 – 30.4), having only changed from 27.2 (CI = 22.9 – 31.8) in 1990 [99].

Within Tanzania there are also regional dynamics: Mwanza region (Lake Zone) has the lowest percentage (7.3%) of contraception use for the purposes of child spacing among women aged 15-49 [55]. This compares with the Eastern region, which has 33.5%, well at par with the national average reported by Alkema and colleagues.

The Tanzania DHS of 2010 also reported that public health facilities were the main source of contraceptive services (65%; N=2,296) [55]. Six per cent of this sample sought contraceptive services from religious or voluntary health facilities, while 4% obtained them from private health facilities. The DHS also reported that up to 23% of the participants sought contraceptive

services from other private sources, including 10% who obtained them from pharmacies and 11% who obtained them from shops and kiosks [55]. The DHS therefore demonstrated that unskilled providers such as shops and kiosks provided contraceptives, a practice that could be harmless if the contraceptives offered where simple to administer (e.g. condoms). However, the DHS also reported that 4% of those who sought oral contraceptive pills (N=521) and 2% of those who sought contraceptive injections (N=860) obtained them from shops and kiosks [55]. This could be a challenge for successful achievements of family planning outcomes as these shops and kiosks do not have skilled personnel to administer such contraceptives.

The reports above place family planning as a priority globally and also in Tanzania, and show how Mwanza region needs to do more to improve its family planning uptake.

2.7 Antenatal care and maternal health

ANC and maternal health globally

Evidence on the importance of ANC in a study of British women undertaken in 1958 suggested a five-fold perinatal mortality for new-borns of women who did not attend ANC compared to those who did [104]. In 1975, Hall et al retrospectively examined ANC case records of 1907 women from Aberdeen (results published in 1980) [105]. The study demonstrated that most obstetric complications could be detected antenatally and recommended a first ANC visit at 12 weeks, with 4 spaced visits thereafter for a normal pregnancy [105]. Since then, it was reported that the UK had only 12 deaths per 100,000 live births in 2010 [38]. Meanwhile in developing countries, more than 500,000 women still die annually due to pregnancy complications [97]. In 1987, a mass global campaign was launched to improve antenatal, delivery and postpartum care for women in developing countries [106]. This campaign led to significant changes that focused resources on improving maternal health outcomes. At the time of this writing, the existing guidelines state that for a normal pregnancy a woman should have at least 4 ANC assessments supervised by a skilled attendant which should be at spaced intervals, commencing as early as possible in the first trimester [107, 108]. In 2000, the UN included maternal health indicators in the MDGs [109] and by 2005, up to USD$ 1.18 per woman was being spent on maternal health activities in developing countries [110].

However, these resources do not reflect achievements made if one examines access to ANC in some countries in Africa. In 2011 Wang et al analysed trends in ANC, skilled birth attendance and postnatal care using 20 years' data (1990 – 2009) from DHS of 38 countries in SSA, North Africa, West Asia, Europe, South Asia, Southeast Asia, Latin America and the Caribbean [111]. Examining the number of women who had live births in the 5 years preceding the countries' DHS, in 24 of 38 countries over 80% of women had made at least one ANC visit to the health facility during their last pregnancy. In 18 countries, more than 90% of women had attended ANC. This statistic might not present a clear picture as it does not specify which global region is predominant in the countries with 80% and 90% ANC attendance. However, the review also looked at regional attendance: interestingly, women in Latin America had a higher ANC attendance than any other global region. More than 90% of women in the region (86% in Haiti) had attended ANC and in the Dominican Republic and Peru, almost 100% of at least one ANC visit was reported [111].

North Africa, West Asia and Europe had over 90% ANC attendance except Egypt and Morocco which had lower attendance at 73% and 68% respectively. Half of the 21 SSA countries included in the review had ANC attendance of over 90%, but there was variation in attendance in this region with some countries such as Niger and Chad having more than half of women without any ANC attendance. Ethiopia had an abysmally low attendance of 28%. Attendance in South and Southeast Asia was over 80% and went as high as 95% in Indonesia [111].

Despite these achievements in ANC, in 2014 the WHO systematic analysis of global causes of maternal death that analysed data on 60,799 (sample 2,443,000) deaths from 115 countries reported that 73% (1,771,000 of 2,443,000) of all maternal death from 2003 to 2009 were caused by pregnancy and childbirth-related complications [112]. At the time of writing, this was the most recent in-depth analysis of maternal mortality data from 115 countries. Its striking report demonstrates that 83.8% of all maternal deaths globally happen in SSA and Southern Asia [112].

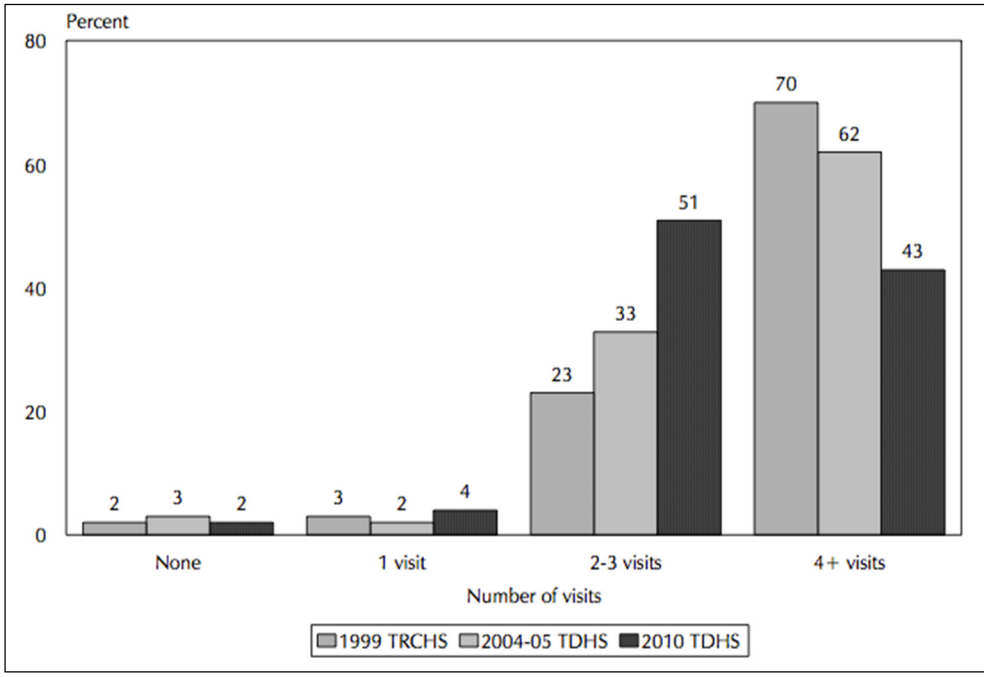
The 2012 analysis of Global Burden of Disease Study reported that maternal disorders rank 40th on the leading causes of global DALYs; at the regional level, maternal disorders rank as low as 133rd in Western and Central Europe and as high as 14th in SSA [67]. The World Health Statistics in 2013 still confirmed this dire situation of maternal health in SSA [38]. Such statistics call for more innovative and pioneering SRH programming and research in the region to meet these challenges.

ANC and maternal health in Tanzania

The Tanzania DHS data used by Wang et al 2011 was from 2004-5. As for the other countries they analysed data of women who had live births in 5 preceding years [n=5,772 for Tanzania] and found that 96.6% of women had attended ANC; 3% of women had not attended, 1.7% had attended one visit, 33.4% had attended 2-3 visits and 61.5% had attended 4+ visits. Data on ANC attendance was missing for 0.4% of women [111]. The 2010 DHS (with more recent data) reported a slightly lower percentage attendance at 95.9% compared to 2004-5 DHS data [n=5,519]. Nevertheless, the 2010

DHS plotted previous data to show that the trend of ANC attendance had improved from a low attendance of 23% among women attending 2-3 visits in 1999 to 51% attending 2-3 times in 2010 (Figure 2.8). Although ANC attendance improved overall, Figure 2.8 further shows that percentage of women attending 4+ visits has declined at a rate of more than ten percentage points every DHS since 1999. Nurses/midwives provided 79.5% of ANC services, maternal and child health aides provided 8.0% of services, clinical officers provided 4.8%, doctors provided 3.5% and village health workers (and other cadres) provided 2.0% of ANC services. In the sample, trained traditional birth attendants did not provide ANC service to anyone. Although they sought ANC at the facility, 1.8% of women had no one to offer them services [55]. The cadre providing ANC attendance is an important measurement to discuss here because as presented in the objectives, provision of SRH services by close to community health workers is among the focus areas of this thesis.

Figure 2.8 Trends in number of ANC visits Tanzania



Source: Tanzania DHS 2010 [55]

Despite the overall high ANC attendance in Tanzania, the World Health Statistics 2013 reported that maternal mortality ratio was high at 460 per 100,000 live births, which is a reduction from 870 and 730 per 100,000 live births in 1990 and 2000 respectively, but still unjustifiably high compared with the UK or Sweden with 12 and 4 deaths per 100,000 live births respectively [38].

2.8 Close to community providers

Close to community providers is a term that emerged recently to include all health service providers based at the grassroots level. It includes nomenclatures of community health workers based in communities and auxiliaries based in health facilities. In 2007, Lewin et al conducted a community health worker Cochrane review and defined community health workers to include all providers of health-related services who may be trained to a certain extent but have no recognised professional qualification from a tertiary institution [113]. In 2012, the WHO expanded on this definition and included auxiliaries, such as nurses and health assistants, as health workers who had got some training and/or on-the-job orientation that culminated into a formal certification [114]. Therefore, CTC providers have a wide definition. They are included in this review because this thesis reports on work that has been performed by drugstore owners and attendants whose professional qualifications fall under the WHO definition of auxiliaries. Drugstores are discussed further in the review below. In this thesis, the term CTC providers has been used throughout to include Lewin et al. 2005 and WHO's definitions and nomenclatures of community health workers.

CTC providers have long been society's force for mass health promotion: the earliest documented programme of CTC providers is the Chinese barefoot doctors, who provided health services in rural communities in China in the 1960s. Peasants were given brief training to equip them with skills to provide health services ranging from environmental sanitation and health education to first aid and immunisation. In factories they were known

as 'worker doctors' [115]. In late '60s the Thai Ministry of Health experimented with training of midwives to provide oral contraceptive pills and showed that uptake of the pill increased in rural areas due to this auxiliary midwives' intervention [116]. By 1980s, it was being debated using social networking and support models, that community opinion and informal leaders could be vital in driving health education and promotion campaigns [117].

In 1990's, Brazil undertook a large family health programme that employed community health agents to provide health education and promotion, which reduced Brazil's infant mortality rate almost to a half from 50 to 29 per 1000 live births from 1990 to 2002 [118]. This evidence published by Macinko et al 2006 after analysing Family Health Programme's data from 27 Brazilian states, also demonstrated that the programme increased from 0% to 36% coverage within 13 years. A 36% increase over more than a decade does not sound impressive enough; however, what is impressive with it is that Macinko et al 2006 also found that for every 10% increase in coverage, there was an associated 4.5% decrease in infant mortality rate, after they controlled for other health determinants ($P<0.01$) [118]. When interpreted in these terms such coverage is valuable and demonstrates early evidence on effectiveness of CTC providers.

CTC providers have since been successfully evaluated in Bangladesh [119], Ethiopia, Malawi, Uganda and Namibia in addition to Brazil [120]. In 2007, the WHO produced guidelines to integrate them into the mainstream health systems through a mechanism coined as 'task-shifting' [121], which in a 2010 systematic review of evidence was reported to be effective [122]. In

2012 new guidelines for increasing CTC providers' outputs in SRH were published by WHO [114], and in 2013, the Global Health Workforce Alliance put CTC providers at the forefront of the Universal Health Coverage targets [123].

In Tanzania, CTC providers started as village health workers through a national village health programme in 1969 [124], tasked to implement the new decentralised national health care strategy. The strategy was based on equitable distribution of health services and community involvement that promoted self-help and empowerment of the rural poor [125]. They have continued to function, although various studies have reported challenges of low motivation and lack of training [126]. In the wake of AIDS and limitations of the formal health providers, CTC providers in Tanzania have gone beyond the original village health worker model and adopted various cadres some of whom initiated and maintained by civil society organisations [127].

Although highly promoted and recommended, evidence on effectiveness of CTC providers is still lacking in developing countries. The Cochrane review, by Lewin et al 2005 and covering 1966 to 2001, found only 15 studies (out of 37) conducted in low-income and minority settings. Although Macinko et al 2006 demonstrated their effectiveness in Brazil, Lewin et al 2005 could only find mild evidence as to the effectiveness of CTC providers: only small improvement of immunisation outcomes in children and adults (RR=1.3; 95% CI= 1.14 – 1.48; P= 0.0001) and improvement of outcomes in selected infectious diseases (RR= 0.74; 95%

CI= 0.58 – 0.93; P= 0.01) [113]. This could be attributed to lack of trials especially in developing countries evaluating CTC provider programmes.

2.8.1 The role of drugstores and other private initiatives

Drugstores are shops that sell medicines to the general public for treatment of various illnesses. They are abundant in many countries. The common name for them is 'drugstore', although they are known by various other names such as, drug seller, informal drug seller, private drugstore and medicine seller. Drugstore is the name used throughout this thesis. Drugstores are licensed to sell non-prescription pre-packaged medicines only. Non-prescription medicines are those that do not need a clinically trained medical practitioner in a facility setting to prescribe and they can be accessed over the counter [128]. Prescription-only medicines, on the other hand, need a qualified professional to prescribe against a confirmed diagnosis and some of them (e.g. antibiotics) are controlled [128]. In many countries, there are various standards required for drugstore licensing, one of which is that the attendants must have obtained a formal training that is recognised in that country [129]. Drugstores are not to be confused with pharmacies; the former do not employ a professional pharmacist.

Drugstores have long been known to be one of the biggest medicine distribution and dispensing resources in developing countries [130-132]. In 1988, the WHO reported that the informal sale and use of medicines was widely used in SSA [133]. That report also underscored the fact that the majority of SSA population had better access to informal medicine shops than the mainstream health facilities. The report also elucidated that even traditional healers (an untrained cadre of CTC providers) had started

incorporating modern medicines (e.g. antibiotics) in their treatments [133]. Decades after that, reports continue to show that access to essential medicines in the region is still supported by informal medicine sellers (i.e. drugstores) [16, 134]. We therefore argue that drugstores are an important cadre of CTC providers since they are the first port of call in remote areas and fulfil that requirement of being 'close to the community'.

Although drugstores can only operate legally after having been licensed, there have been reports that many of them operated illegally and in some areas common grocery shops and kiosks sold medicines alongside soap, salt, batteries and other household items [129]. This practice makes medicine distribution inept and potentially endangers the health of the public.

Evidence of this illicit dealing in medicines has been reported in many countries in SSA. In Cameroon, a study found that more than 30.0% (n=572) of men with STIs (urethritis) went directly to drugstores for treatment [135]. In Nigeria, 69.3% of 720 observations in drugstores showed that attendants sold medicines to customers who have not been to a health facility without asking why and how they intended to use the medicines purchased [19]. In Uganda, 96.0% of 157 surveyed drugstores administered the injectable contraceptive depot medroxyprogesterone acetate without licence [136]. In Kenya, drugstores were the first line contacts for 60.0% of the general rural population in the 1990s [137, 138] and in a recent study, drugstores reported 'customer satisfaction' and increasing comfortable sales in medicines [139]. In Malawi 78.0% of carers who sought malaria treatment for their children reported to have bought them 'from a shop' [140].

These statistics show that drugstores play a big role in distribution of medicines in SSA, irrespective of existing regulations. Furthermore, recent evidence from task-shifting has argued that pharmacies and drugstores can provide some SRH services of the same quality as formal health facilities [141]. In 2014, the private sector was reported to contribute to the achievements of treatment outcomes, for example on ART where pharmacies performed well on providing refills of medicines to HIV patients [142]. Previous research dating from 1970s had suggested efficacious provision of medical services by private providers in Thailand [116] and in Mexico in 2000s [143]. However, constant checks to minimise the flouting of the laws are necessary as this has been argued to affect medical standards [17]. Laws themselves have been reported to have loopholes [144].

2.8.2 Drugstores in Tanzania

In Tanzania, drugstores are called 'drug shop grade II', known in Kiswahili as *duka la dawa baridi*. They are licensed to sell analgesics and antipyretics only and are required to be headed by someone with a basic medical training and a certificate [145]. However, Hetzel et al 2008 found that even general grocery shops sell drugs and that 7% of grade II drugstore attendants had no health related training at all (n=29) [145]. As in the other SSA countries, reports suggest that drugstores in Tanzania illegally sell controlled prescription-only medicines [18, 146]. Also, drugstores are popular like in the other countries, especially because of their expediency, convenience and accessibility [147]. Convenience and accessibility are especially emphasised by the fact that drugstores are able to operate out-of-

work hours and on the weekends [146], something dispensaries and health centres in Tanzania cannot do. Another widely reported factor driving the public to drugstores in Tanzania is the severe medicine shortages and stock-outs prevalent in formal health facilities (dispensaries, health centres) [148, 149].

However, studies have also reported that Tanzanian drugstore attendants do not know medicine dosages or what they treat [18, 150]. For example, 24% (n=75) of drug sellers interviewed in 2005 said that antibiotics can be used to treat viral diseases [150].

The situation was so severe that in 2000 the Tanzania Food and Drug Administration (TFDA) decided to launch a nationwide training programme, re-licensing all drugstores and upgrading them to a cadre TFDA called the Accredited Drug Distribution Outlet (ADDO)[148, 151]. This initiative was part of a larger programme called "Strategies for Enhancing Access to Medicines (SEAM)" that was funded by Bill and Melinda Gates Foundation with technical support from the WHO and World Bank. It was implemented by Management Sciences for Health in what is widely regarded as a step forward in improving public private partnerships in essential medicines distribution [148]. A mid-term review in 2004 found programmatic setbacks and challenges such as limited progress on roll-out, although positive findings on improvement of standards and practices of ADDO attendants were claimed [152].

The ADDO and SEAM initiatives might be positive approaches towards solving the medicines access for SRH in developing countries, but it has

been argued that more needs to be done especially on taking radical stances on regulation, curriculum design and integration of CTC providers into the mainstream health system [153].

Although not previously tried, the ADDO initiative is an attempt at public private partnership in medicine distribution in Tanzania. Evidence shows however that the private sector is highly dependent on profits which is a challenge to the provision of equitable access to medicines [154]. In 2011 ten national representative cross-sectional retail surveys were conducted in 9 countries (Tanzania and Zanzibar included) covering pharmacies and drugstores to assess the public and private malaria diagnostic markets and established that resources for accessibility to the rapid diagnostic tests were still lacking in Tanzania because private medicine stores depended on profits to maintain capital [154].

Apart from public private partnerships initiated by the government, external research projects have previously demonstrated success while partnering with private pharmacies and drugstores in Tanzania. For example, an initiative that trained pharmacy staff and traditional healers in Kisarawe District (Pwani Region) to identify and refer suspected cases of TB reported that after training, smear-positive TB case notification increased by 68% in the district [155]. Medicine distributors in Tanzania are willing to accept public private partnerships: a cross-sectional descriptive study conducted in another district (Morogoro) among drug dispensers of 122 pharmacies and 177 ADDOs revealed that they were willing to work with the mainstream government health facilities and refer their patients for proper TB diagnosis and treatment [156]

Accessibility to and coverage of medicine distributors have also been reported to be extensive in Tanzania: a mixed-methods study using statistical and graphical techniques to analyse data from 2006 to 2009 on medicines production and distribution and established that there was no urban-rural bias on access to drugs manufactured in Tanzania and that national distribution was even for drugs to be accessible in rural areas [157].

The above evidence demonstrates a willingness of Drug stores to work with the government sector and that involving the private sector medicine distributors could improve access to health services in remote areas in Tanzania.

2.8.3 Community referral and integration

Working with CTC providers in SRH services intrinsically requires referral, because of prevailing limitations in skillset within these cadres as described above. Referral is an approach of directing a patient or service user to another doctor or service provider. Most commonly, the provider with fewer skills in the requisite area refers the patient/service user to a more specialised practitioner. In some instances, however, for example in task shifting, referral from more specialised to less specialised health workers (down referral) has been practiced to free the specialist's time for complicated cases [121], and it has been reported to be effective [141].

Referral from CTC providers to specialised providers is important in SRH for example for ART where the lower cadres might lack important skills to initiate patients on treatment [158]. CTC provider referral has not been widely documented in SSA. But in Uganda, malaria drug distributors who

were trained and based in the communities provided referral to formal health facilities [159]. Uptake of services at the health facility after referral in this intervention was just under 10% however [159]. In Mali in 2003, village drug kits were placed in communities and drug kit managers trained in educating mothers on chloroquine home administration and knowledge of malaria danger signs requiring referral. In the intervention group, 42.1% of children were referred while in the control group only 11.2% were referred [160]. The WHO recommendations advise CTC providers to refer their patients to specialised healthcare workers, especially for complications such as pre-term labour, eclampsia and sepsis [114].

In Tanzania, as well is in the wider SSA, there is a dearth of literature on referral from drugstores to health facilities for SRH service access. However, instances of referral that did not involve drugstores were reported in Tanzania where only 10% of HIV-infected women attended care at the treatment centre after referral for ART access [161]. Instead of *upward* referral, it was instead claimed that Tanzanian authorities look the other way and allow drugstores to prescribe antibiotics and other controlled medicines, a practice which is exacerbated by lack of medicines in the formal health facilities [146, 150]. Although it has been argued that integration and training are necessary for improvement of the health systems in the region referral from drugstores to formal health facilities and integration are therefore necessary but lacking in SSA and in Tanzania specifically [126].

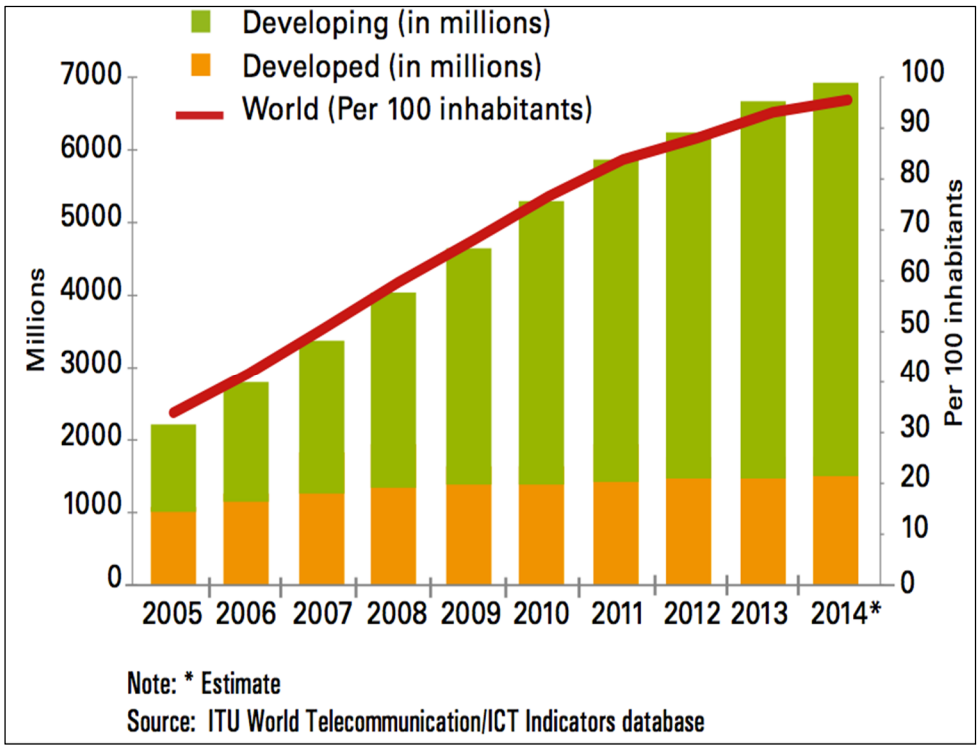
2.9 mHealth

mHealth is a general term used to describe the application of mobile telephones and their features into delivering and promoting healthcare services, research and decision-making [162, 163]. The term was coined by Istepanian et al 2006 in the book "m-Health: Emerging mobile Health Systems", after mobile technologies had started dominating technological applications of health service delivery and development [163].

By the late 2000s, researchers had used mHealth interventions ranging from smoking cessation [164] to emergency medicine [165] in developed countries and from HIV/AIDS care [166] to health management information systems [167] as well as behavior change [168] in developing countries.

The growing number and use of mobile phones globally and the links with economic self-sustenance (the ability to buy a phone) places mHealth at the forefront of many healthcare approaches. It has been estimated that by the end of 2014 the total number of mobile phone subscriptions will equal world population at 7 billion [21] . Figure 2.9 shows that since 2005 mobile phone subscriptions in developing countries have grown faster than in the developed world.

Figure 2.9 Global mobile phone subscriptions 2005-2014



Source: International Telecommunications Union [21]

mHealth has supported health services to improve service delivery. For example, mobile phones have been suggested to be effective in reaching various types of communities and health service users: in Kenya, while HIV stigma posed challenges for reaching HIV patients [169], people newly diagnosed with HIV showed willingness to be followed up through mobile phones before they were enrolled for ART and the researchers suggested that it improved retention [170]. A different project in Kenya that used a mobile phone-based HIV infant tracking system suggested that the system was associated with a successful enrolment (100%) of infants exposed to HIV both in urban and peri-urban settings compared to 14% in urban and 64% in peri-urban areas where the mHealth intervention was not implemented [171].

mHealth has also supported uptake of health services: in Cameroun, a multicentre, single blind, factorial randomised controlled trial using text messages and phone calls to remind mothers with children exposed to HIV of clinical appointments reported substantial improvement in attendance at previously-scheduled appointments (OR=7·5; CI=2·9-19·0; p<0·0001 for the text message and phone call group; OR=5·5; CI=2·3-13·1; p=0·0002 for phone call only and OR=2·9; CI=1·3-6·3; p=0·012 for text message only) compared to the control [172].

mHealth tools have been used in South Africa to improve provision of medical abortion services. In a study that implemented home use of misoprostol in 2014 it was reported that between baseline and follow up of 3 weeks, use of an automated text-message reduced anxiety (P=0.013) and emotional stress (P=0.015) compared to standard of care among women undergoing medical abortion [173]. Another study reported that women undergoing abortion in South Africa were willing to use mHealth tools to respond to assessments on completion of medical regimens [174].

In monitoring and evaluation of initiatives, mHealth tools have also been effective: a microbicide gel applicator fitted with mobile phone tools to transmit gel use events and reminders between the participants and researchers demonstrated that automated transmissions of gel use correlated with self-reported sex acts and gel applicator returns and at 48%, the

applicator opening times were concordant with the number of empty and used applicators that were returned [175].

In a project where the Centres for Disease Control and Prevention (CDC) partnered with the WHO to increase the capacity of WHO-member states for integrated disease surveillance and response, a demonstration project in Uganda successfully used SMS Messages to report suspected cases of infectious illnesses to the District Health Management Information Systems [176]. Although the paper does not report any specific statistics, it states that within 6 months of the intervention there were improvements in the ability of Uganda's health system to detect and respond to the health threats attributable to the use of SMS [176].

To establish whether the use of text message reminders was preferred by patients on ART in Botswana, Reid et al 2014 conducted a cross-sectional survey among participants of a cluster randomized trial that aimed at enhancing adherence to ART [177]. They found that among those who received SMS messages through the intervention, 98% reported that they were helpful compared to only 58% in the control group who approved of the SMS messages ($P<0.001$). In the same survey, only 10% of those who received SMS messages expressed concern about the likely inadvertent disclosure of someone's HIV status compared to 56% from the control group who expressed this concern for SMS messages ($P>0.001$) [177]. This suggests that HIV patients trusted use of mHealth tools for ART. Young people seeking contraceptive services in Kenya have expressed similar positive attitudes towards receiving contraceptive information via mobile

phones, approving of their confidentiality and clarity of language used and stating that there are questions they would have felt shy to ask in the clinic but were able to through SMS [178].

Acceptance of mHealth interventions for contraception have also been reported in Tanzania. During an intervention by FHI360 to disseminate family planning information to general public in a 10-month period, members of the public requested help on contraceptive methods. It was reported that text messaging improved access to contraceptive services especially among the young people [179].

Justification for adoption of mHealth in this thesis also came from other evidence within SSA at the time of the intervention design: for example in Kenya, a cluster-randomised trial involving 107 health facilities in rural areas, where text messages on malaria treatment were sent to clinicians (case management was evaluated immediately and after six months) established that in the intervention group, correct artemether-lumefantrine management improved by 23.7% (CI= 7.6 – 40.0; P=0.004) after sending text messages and by 24.5% (8.1 – 41.0; P= 0.003) after six months [22].

There was also evidence from Malawi which had suggested that sharing reproductive health (RH) and HIV/AIDS information through SMS amongst remote health workers increased communications among providers [180].

A Tanzanian cluster-randomised trial in which SMS and mobile phone vouchers that linked women throughout their pregnancy to health facilities reported increased skilled birth attendance to 60% in a mobile phone intervention versus 47% in comparison. This trial also reported an increase

in skilled birth attendance among urban women (OR=5.73; 95%CI=1.51–21.81) compared to rural women [23].

Prior to the intervention described in this thesis, several other studies using mHealth tools had been conducted in Democratic Republic of Congo [181], Rwanda [182], Nigeria [183], Ethiopia [184] and Zambia [185] to suggest that use of mobile phones could improve access to health services [22], reduce loss to follow up and improve adherence to treatment [186] as well as improve the attitudes of service providers [184, 187].

Several systematic reviews on mHealth have reported success in the use of mobile phone technologies for health service delivery and access across a range of reproductive health settings and target groups. For example, Braun et al 2013 reported on a systematic review which concluded that mHealth systems had potential to improve the range and quality of services provided by community health workers [188]. Citing lack of enough data from controlled trials, Guse et al 2012 suggested that "new digital media" such as mobile phones could improve adolescent sexual health [189]. Another systematic review by Schnall et al 2014 reported that text messaging could be instrumental in reducing HIV risk behaviours and testing outcomes among men who have sex with men [190]. Furthermore, Free et al 2013 analysed data from 42 controlled trials and found that mobile phones improved communication between nurses and surgeons, and that SMS slightly improved appointment attendance (pooled effect RR= 1.06; CI= 1.05 -1.07; I^2= 6%)[25]. However, the review found a reduction in correct diagnosis using mobile phone photos compared to the standard, no

statistical significance in increase of the number of cancelled appointments (pooled effect RR= 1.08; CI= 0.89 – 1.30) and no statistical significance between SMS reminders and other types of reminders (RR= 0.98; CI= 0.94 – 1.02)[25]. As recommended by Free et al, more robust studies are needed to give further evidence on the efficacy of mHealth. Mobile phones remain very popular and applicable in developed and developing countries alike and their usage continues to grow at a high rate [21]; for example in Tanzania there is a phone: person ratio of 1:2 in remote areas of the country [36] and this could continue to grow. The intervention reported in this thesis seeks to contribute to this body of evidence.

2.10 Research framework for the thesis

The action research model

Action research has been described as a process of conducting research "with the people rather than on the people" based on partnerships [191]. Its strength lies in the involvement of the communities where the research is being conducted to bring about change and improvement and primarily involving the people contributing to research on conditions affecting them to help themselves improve their own practices [192]. Action research theory is described here because it underpins the key methodology used in the sub-studies described in the thesis. Using a consultative approach has been argued to be one of the important stages in fostering change [192]. Working with individuals and groups towards solutions for the problems affecting their communities, action research is described as a style that

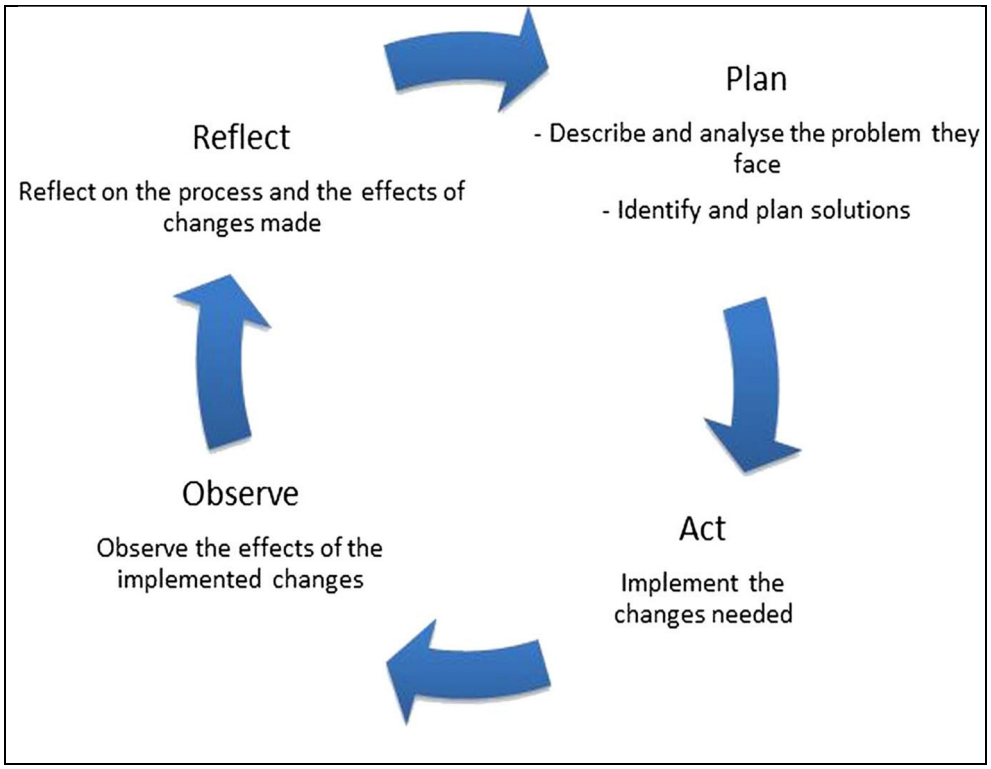
inspires ownership [193]. The approach that research should not be top down but rather democratic and involving the stakeholders of the study settings [191] is adopted within the work presented in this thesis. The geographical areas where the intervention in this thesis was implemented (See Chapter 3) have over several decades welcomed various research initiatives [194]. It was therefore intended in the work presented in this thesis to include their experiences; the model to fit that purpose is embodied in the action research methodology. To fulfill the objective of the PhD as presented in Chapter 1, working with the stakeholders was prioritised. This was considered not only to empower the communities or to include them in the decision-making as has been suggested as the added value for action research approaches [191], but also to give them a chance to reflect on their behaviours and attitudes especially the service providers. The CTC providers as described in the preceding sections of this literature review were considered the key implementers and decision makers that affect SRH at the very grassroots levels. Indeed, it has been suggested that action research could enhance group achievements in such settings [195, 196].

Research conducted with the participants is also considered to be developmental because the design is constantly evolving as negotiations with the stakeholders through open participation e.g. specific actions taken are considered together with the researchers and research participants [197]. This lies at the core of the approaches used in this thesis as described in the later sub-studies.

Action research has also been described as a research style that places the central emphasis to the participants' contribution towards the research results [198]. Although some processes of action research (e.g. instances where the community stakeholders are the key initiators of the research [191]) are not reflected in the sub-studies presented in this thesis, the approaches and systematic use of and consideration of the participants and reliance on their implementation of intervention stages (See Chapter 7) are classified by Meyer (1993) as typical of action research methodology [199].

Researchers such as Hart and Bond (1995) describe forms of action research where study participants are researchers within the study [191]. In fact Hart and Bond (1995) use the term "user" to sometimes refer to research participants, designers and beneficiaries of action research [191]. Action research approaches used in this thesis do not consider close-to-community providers and health facility stakeholders as researchers in our study per se as they do not directly design the primary research tools and objectives of the sub-studies. However they are consulted in various stages especially at the very beginning during the situational analysis sub-studies (See Chapters 4 and 5) to contribute to important decisions which define the direction of the research. Our approaches correspond to the framework attributed to Lewin (1946) as being a cyclic process of action research [191, 199] (Figure 2.10).

Figure 10 The action research cycle



Meyer (1993) argues that the above four-stage framework of planning, acting, observing and reflecting are the basis for modern definitions of action research [199]. It is therefore adopted in this thesis as a model for the sub-studies conducted towards the achievement of the objectives described in Chapter 1. The four stages in the framework above correspond to the typology in this thesis as follows:

Plan – during the planning process the situational analysis sub-studies 1, 2 and 3 (Chapters 4, 5 and 6 respectively) were conducted to identify the CTC providers and communities perceptions on SRH service provision, accessibility and uptake, as well as brainstorm on the prototype intervention for SRH referral.

Act – development of the intervention that was pertinent to the preferences of the close to community providers and the communities and working with them to be the drivers of change through its implementation was done at this stage. It is described in Chapter 7.

Observe – the observation stage in the sub-studies of this thesis happened through discussions and feedback with the close-to-community implementers (Chapter 7) and through the intervention data collection, analysis and discussion (Chapters 8 and 9).

Reflection – looking back at the approaches used throughout the sub-studies and going back to the communities and discussing with the close-to-community implementers, reflecting on the intervention, how it went and what should have been done differently is the conclusion of the implementation cycle (Chapter 10). It was also necessary to reflect on the possible scale up and sustainability of the intervention in similar settings and this was done at this stage and is also described in Chapter (11).

Within the approaches above therefore, it is clear that action research framework is paramount to the work presented in this thesis. It was used as the intervention evaluation conduit where specific quantitative evaluations to establish service uptake through referrals were done. Lewin (1946) argues that this is important as without evaluation it is difficult to judge whether an action 'has led forward or backward' [192].

For more than five decades, action research framework has been used for healthcare research in sub-Saharan Africa [200, 201]. It has been suggested that action research has been responsible for stimulation of these

communities' action through empowerment [202]. Today, action research methodology forms part of the ALPHA Network (Analysing Longitudinal Population-based HIV/AIDS data on Africa), a large research network of research sites in Tanzania, Uganda, Malawi, Zimbabwe and South Africa [194]. Through action research, Miles and Kaplan (2005) used images to stimulate reflection and analysis of practices in schools in Tanzania and Zambia and found that such approaches provided immediate and thought-provoking actions contributing to educational outputs [203]. To include and improve women's participation in implementation development, Marja-Liisaswantz et al (2001) used action research methodologies and reported that this allowed the women to use their own planning to take action through economic empowerment activities such as fishing [204].

The action research theory therefore is a model that has been used in the sub-Saharan African settings before and this contributed to its selection as a framework for this thesis.

The model has however been criticised for its open-ended nature of the process where the separation of the stages within the action research cycle can be lacking, as the participants and the stakeholders are encouraged to reflect at the continuum and refer to the aspects from the previous stages to the next [205]. For that reason and because they rely on dialogue, it has been suggested that action research intervention stages could take longer if effective moderation of the stakeholders is not prioritised [191]. These aspects are considered during the implementation of the research reported in this thesis.

Summary

This chapter described the literature relevant to the topic of this thesis. Key issues were discussed in HIV, STIs, family planning, maternal health, close to community providers, community referral and mHealth. These topics were addressed because they form part of the wider SRH services that are vital for the work presented in this thesis. Evidence on provision of and accessibility to these services has been reviewed in each of the next chapters (from Chapter 4 to Chapter 10), discussed as background sections of the 7 sub-studies presented in this thesis. This Chapter has also discussed the action research framework which has been adopted as model for the sub-studies conducted towards this PhD.

The justification to adopt mHealth as an approach for SRH referral in our intervention lies in the suitability of mobile phones as described above. In the next chapters, the role of various stakeholders in the design of said sub-studies is discussed. How the results from the three situational analysis sub-studies (Sub-study 1 to 3) iteratively influenced the process of the intervention design and implementation is also described. Key SRH issues identified in this literature review are constantly addressed and the rationales for focusing on SRH and using innovative techniques of the intervention are described in a stepwise process through the subsequent sub-studies of this thesis. Results of these sub-studies answer the research questions identified in the aims and objectives outlined in Chapter 1.

3 Project background and description of the research site

3.1 Introduction

This chapter describes the trial in which the PhD project was nested. It gives an overview of the trial design, intervention framework, the PhD project introduction, site location, provides different maps to demonstrate various areas clustered in the main trial and in the intervention arm of the PhD and describes the relationship between the trial and the PhD project. It presents information that originates from the main trial documents and maps that have been drawn using R software (R Foundation for Statistical Computing, c/o Institute for Statistics and Mathematics, Wirtschaftsuniversität Wien, Augasse 2-6, 1090 Vienna, Austria).

3.2 Main trial title and background

The trial in which this PhD project was nested is called IntHEC, which stands for "*Health, Education and Community Integration"*. This trial was funded by the European Union under the 7th Framework Programme for implementation from March 2010 to October 2014. The full title of the trial was: *Evidence-based strategies to increase equity, integration and effectiveness of reproductive health services for poor communities in sub-Saharan Africa*". Its main objective was to "*improve delivery of reproductive health services in Tanzania and Niger by successfully engaging policy-makers and programmers in the generation of new evidence about effective ways to strengthen the provision, uptake, equity*

and effectiveness of adolescent reproductive health programmes". This PhD project designed its own objectives (described in Chapter 1) based on this overall aim of IntHEC.

3.3 Research sites and consortium

IntHEC was conducted at four research sites: two in Tanzania (Mwanza and Iringa regions) and two in Niger (Say and Aguie regions). The trial was implemented by a consortium of researchers and policy makers from eight institutions: the Liverpool School of Tropical Medicine (LSTM), UK; Université Catholique de Louvain, Belgium; National Institute for Medical Research Mwanza (NIMR), Tanzania; Ministry of Health and Social Welfare, Tanzania; Ministry of Education and Vocational Training, Tanzania; Laboratoire d'Etudes et de Recherche sur les Dynamiques Sociales et le Développement Local, Niger; Ministère de la Santé Publique, Niger and United Nations Populations Fund; Niger. The IntHEC Consortium was led by LSTM.

3.4 IntHEC trial design and randomisation

The intervention described in this thesis was implemented in Tanzania. The IntHEC trial design and randomisation techniques described in this chapter only cover the Tanzanian side of the study design as Niger was not relevant to this PhD project. The design and randomisation is illustrated in Figure 3.1.

Figure 3.1 IntHEC trial design and randomisation Tanzania

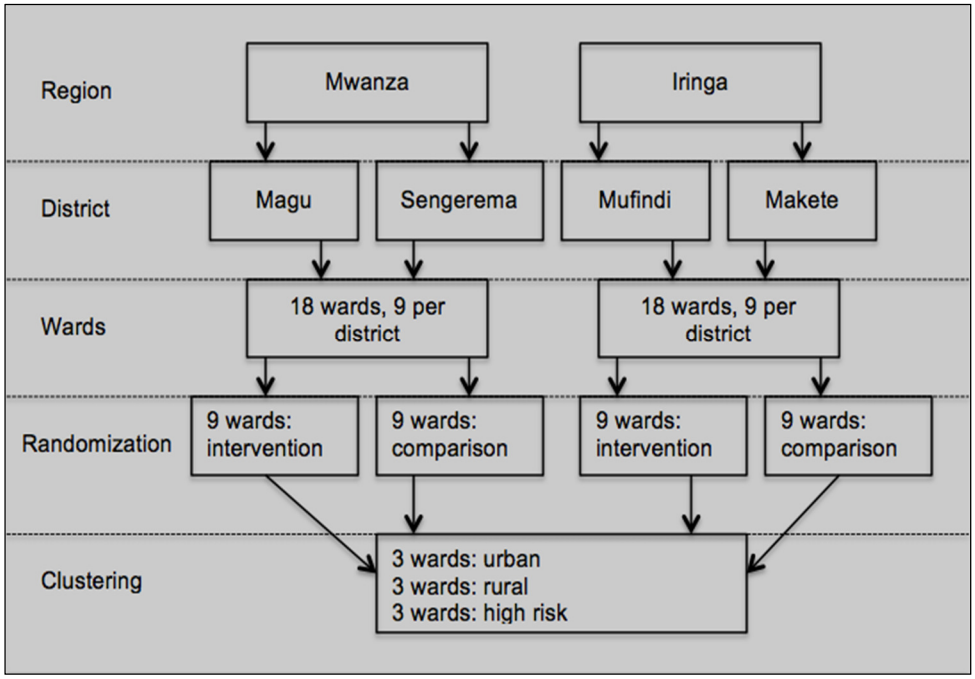


Figure 3.1 describes IntHEC's Tanzania trial design and randomisation in Mwanza and Iringa regions. Trial managers selected Mwanza and Iringa as the preferred sites for IntHEC. In each region, two districts (Magu and Sengerema in Mwanza; Mufindi and Makete in Iringa) with similar socio-economic characteristics were selected. In each of those districts, nine wards were selected. Using specific socio-economic characteristics (listed in Table 3.1), wards from each district were classed into rural, urban or high-risk clusters.

Table 3.1 IntHEC cluster socio-economic characteristics

Cluster	Characteristics
High risk	The wards are either proximal to Lake Victoria lakeshores with fish landing sites, or they have major highways crossing through them, or they have factories/industries. Others are near the mining sites or tea plantations.
Urban	Livelihood in these wards largely depends on non-agricultural sectors, such as trade (petty or large scale), self-employment and manual labour. It's highly commercialised and residences are crowded. There are social interactions and recreational amenities including video halls, bars, restaurants, supermarkets and hotels.
Rural	Residents in these wards live predominantly on agricultural subsistence activities, which include animal husbandry and crop farming. They live far from urban areas and lakeshores. They have no commercial centres except shops and kiosks selling groceries usually near the ward or village centres, schools, health centres, markets or other areas where people gather regularly.

Pairs of wards from each of the clusters were written on pieces of paper, one ward pair per piece of paper. These pieces of paper were mixed, and then picked up randomly one by one from a basket by an independent person unrelated to IntHEC. The selected wards were designated as intervention wards and those that remained in the basket were named as comparison wards. In each district there were 18 wards, nine for the intervention arm and nine for the comparison arm. These were then distributed in threes into rural, urban and high-risk clusters. In some clusters it was not directly viable

to identify wards that fulfilled the criteria described in Table 3.1. Therefore in six instances two neighbouring wards were merged (Table 3.2).

Table 3.2 All IntHEC trial wards in Mwanza

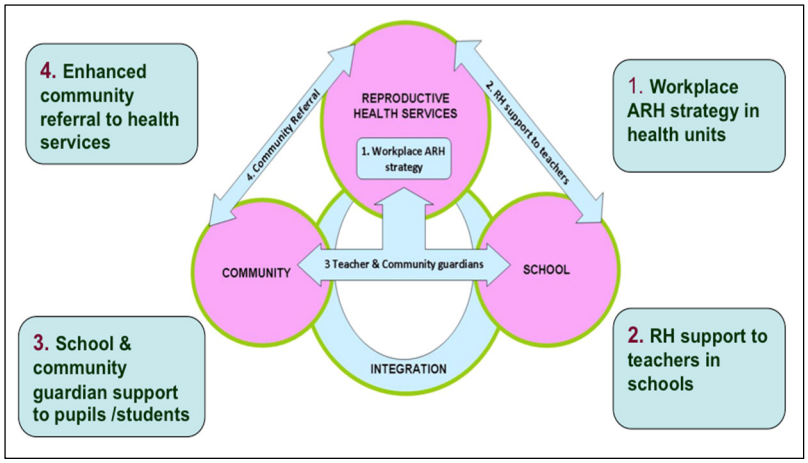
	Randomization			
	Sengerema		Magu	
Clusters	Intervention	Comparison	Intervention	Comparison
High Risk	Busisi & Nyamatongo	Kazunzu & Chinfufu	Kongolo	Mwamanyili
Urban	Buyagu	Nyakalilo	Nyanguge & Kisesa	Kalemela & Kabita
Rural	Igalula	Buzilasoga	Shishani & Mwamabanza	Malili & Shigala
Total	4	4	5	5

3.5 Description of a ward

A ward is an administrative structure in Tanzania headed by a Ward Executive Officer and has a population of circa 10,000 people in an average of five villages. Officially a ward should have at least one health centre and a village should possess at least one dispensary. However in many cases, such as Magu and Sengerema Districts in Mwanza region, some wards have no health centre and not all of them have more than one dispensary (see Table 3.3) even though all wards have more than five villages.

3.6 Intervention framework

Figure 3.2 IntHEC intervention framework



Source: IntHEC trial protocol document, Annex 1 [206]

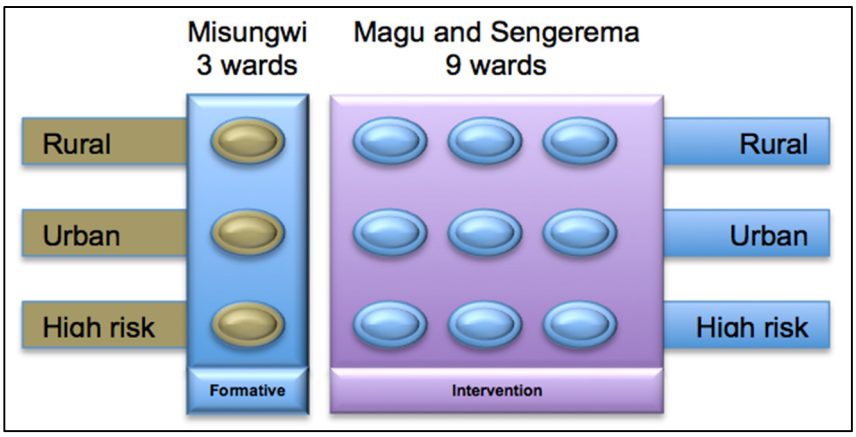
The IntHEC intervention framework (illustrated in Figure 3.2) will not be described in detail here. In brief for the purposes of this PhD, the framework had four key areas, namely:

1. Health facilities – in this area IntHEC aimed to develop a workplace strategy to engage facility-based service providers to improve their attitudes towards adolescent reproductive health;
2. Schools – in this area IntHEC planned to formulate a mechanism for teachers to have reproductive health support within their schools;
3. Communities with schools – in this area IntHEC wanted to link teachers with parents to develop a common understanding of adolescent reproductive health issues;

4. Communities with health facilities – in this area IntHEC intended to integrate community-based health providers with formal health facilities for a reproductive health referral service.

Intervention areas 1-3 listed above were beyond the scope of this PhD. Therefore this thesis focuses on the fourth intervention area only.

Figure 3.3 IntHEC formative wards Mwanza

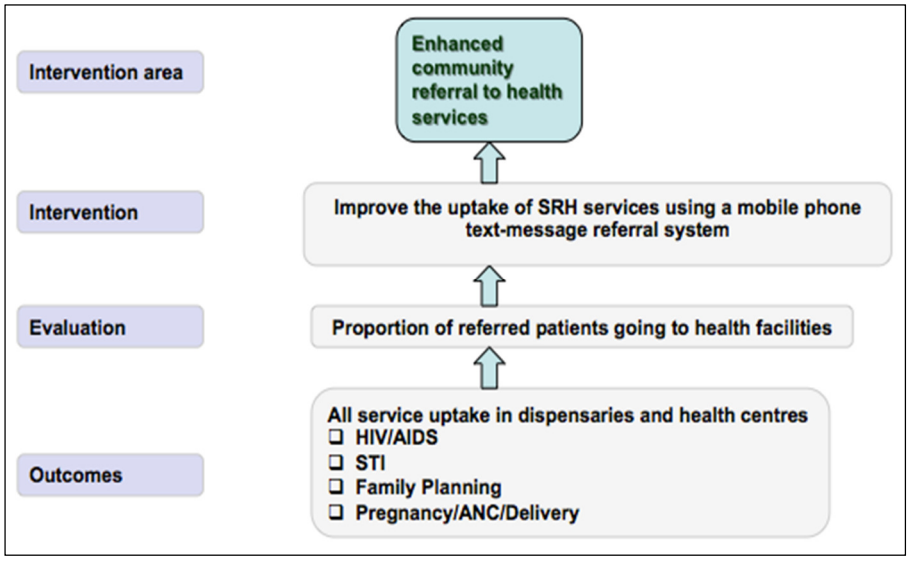


Three wards that were similar to the intervention wards communities were selected to serve as "Formative wards" where intervention components could be developed and pretested before implementation without contaminating the trial communities. The wards of Lubili, Usagara and Misungwi in Misungwi district were selected for rural, high risk and urban clusters respectively (Figures 3.3 and 3.7).

3.7 The PhD intervention

The work reported in this thesis addresses the fourth intervention area of IntHEC intervention framework. Figure 3.4 illustrates the approach used to meet the PhD objectives within this framework.

Figure 3.4 Description of intervention for this PhD



Due to the nature of intervention covered in this thesis (see Chapter 7), evaluating it through IntHEC intervention and comparison wards within the cluster randomised trial design was not possible. This was because the PhD intervention involved using mobile phones and the skill of referral through text messaging. Text messaging served two purposes: (i) to refer patients from drugstores to health facilities; and (ii) to collect referral uptake data from health facilities. Training of health facility clinical officers and drugstore attendants was involved in both (i) and (ii). Collection of comparison data from comparison health facilities would have necessitated the use of text messaging to ensure uniformity of data collection method

across the intervention and comparison wards. This would have required training of comparison health facilities. Such training would have caused a health promotion activity in comparison wards. It also would have raised awareness of SRH issues that were being tested by IntHEC trial in the comparison wards and health facilities. Such activities would have contaminated the IntHEC trial comparison areas.

For these reasons, evaluation of the PhD intervention was restricted only to IntHEC intervention wards. Impact estimates were designed to measure the uptake of SRH services at the health facility after referral from drugstores (Figure 3.4; detailed in Chapters 8 and 9). This approach fulfilled the PhD's specific aims and objectives introduced in Chapter 1 while maintaining IntHEC trial's methodological integrity. A description of the PhD study areas within Mwanza region, elucidating more on the districts, wards and health facilities where the PhD intervention was implemented is given below.

3.8 Description of the PhD study setting

Figure 3.5 Map of Tanzania showing Mwanza

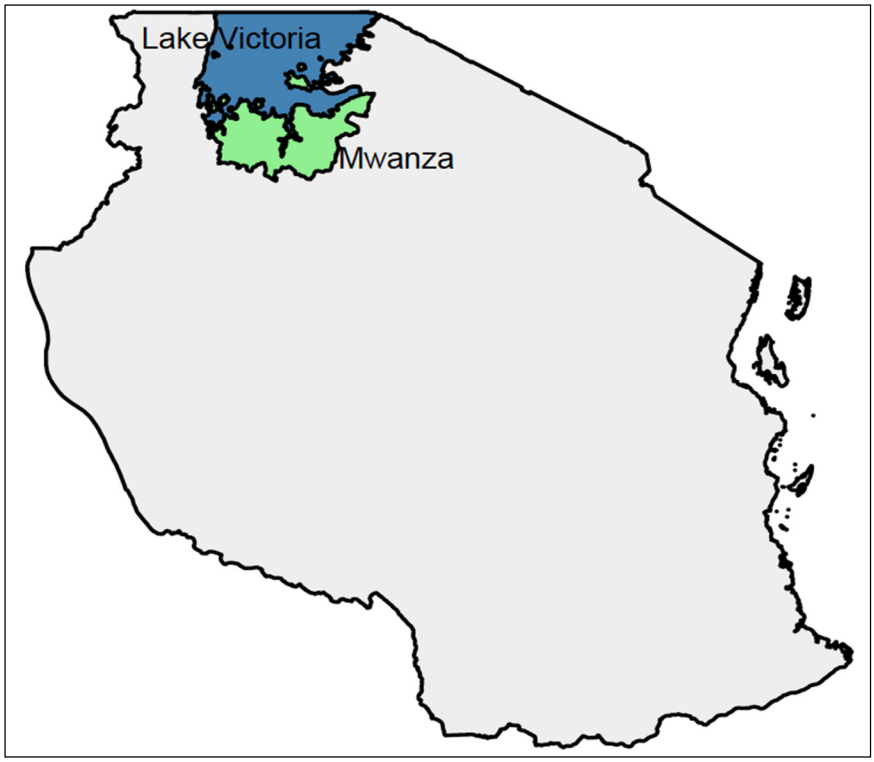
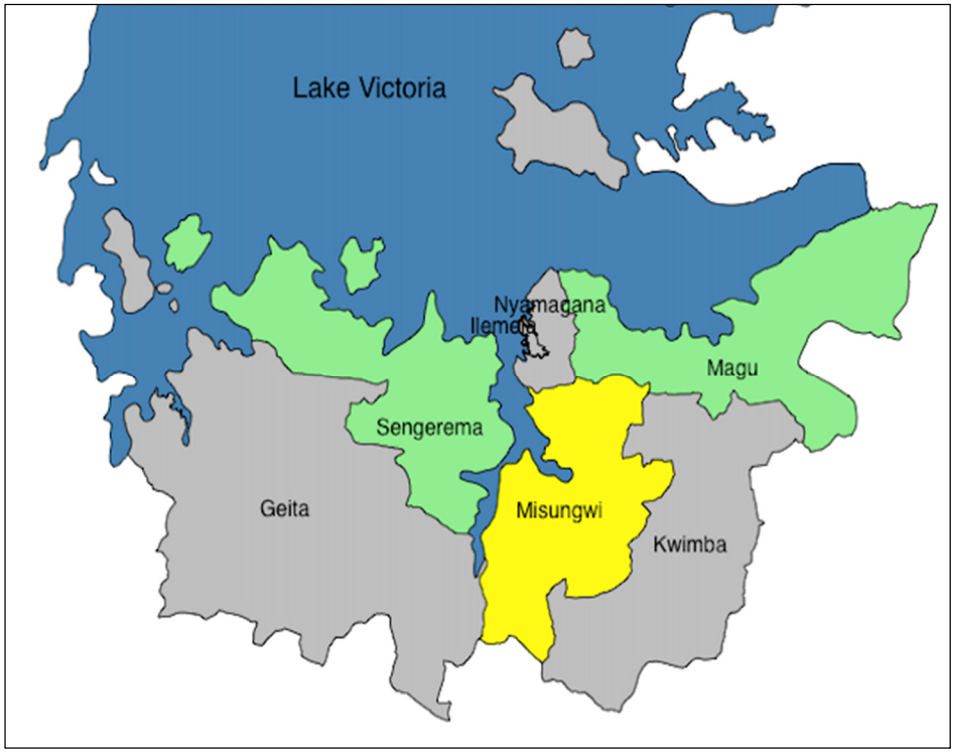


Figure 3.5 is a map showing Tanzania and the position of Mwanza region where this study was conducted. Mwanza, one of Tanzania's 26 regions, is situated in the north of Tanzania near Lake Victoria. It has seven districts (Figure 3.6). Bordering Lake Victoria, Mwanza region has a big fishing industry that supports the majority of its population. It also has several factories, mainly tea processing, mining and cotton processing.

Figure 3.6 Map of Mwanza showing districts of this PhD*



*Districts of this PhD in green colour

Figure 3.6 is a map showing the districts within Mwanza and highlights the districts where this PhD intervention was implemented, namely Magu and Sengerema. The map also shows the formative district – Misungwi (highlighted in yellow). The 'formative' concept was explained before.

Figure 3.7 Map of Mwanza: intervention and formative wards

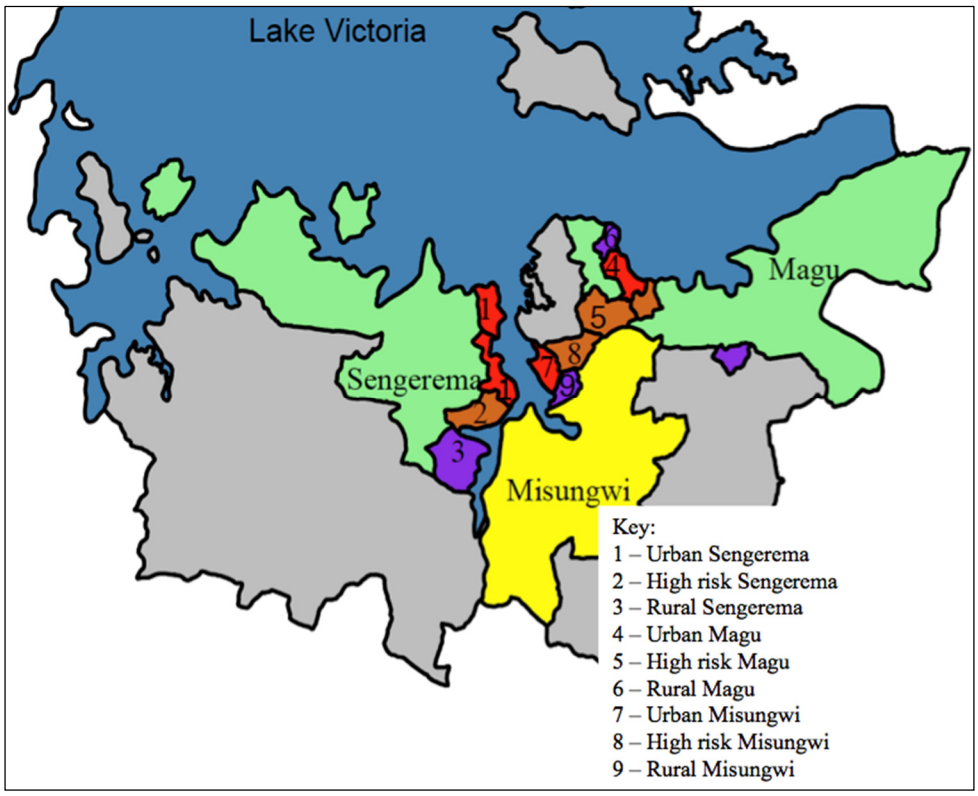


Figure 3.7 is a map showing the wards selected for pre-test (formative) and intervention implementation. The wards shown were the actual IntHEC trial wards for Mwanza region. Rural, urban and high-risk clusters are shown in the map.

3.9 Health facilities

In Magu and Sengerema district, the PhD intervention was implemented at the health facility level. 'Health facility' has been used throughout this thesis as a collective term to mean health centres and dispensaries. All the health facilities situated in the intervention wards shown in Figure 3.7 were automatically included in the intervention. Table 3.3 below describes these health facilities in relation to the wards in which they were located within

the intervention area. The facilities in Table 3.3 (and throughout this thesis) have been anonymised for confidentiality.

Table 3.3 Health facilities of the PhD intervention

District	Ward	Type of ward	Health facilities in the ward*	Type of facility
Sengerema	Busisi	High risk	Disp2	Dispensary
			HC16	Health centre
	Buyagu	Urban	Disp3	Dispensary
			Disp7	Dispensary
	Igalula	Rural	Disp4	Dispensary
			Disp12	Dispensary
	Nyamatongo	High risk	Disp8	Dispensary
			Disp13	Dispensary
Magu	Kisesa	Urban	Disp5	Dispensary
			HC17	Health centre
	Nyanguge	Urban	Disp1	Dispensary
			HC18	Health centre
	Shishani	Rural	Disp6	Dispensary
			Disp10	Dispensary
			Disp14	Dispensary
			Disp15	Dispensary
	Kongolo	High risk	Disp9	Dispensary
	Mwamabanza	Rural	Disp11	Dispensary

*Not actual names of health facilities for confidentiality

There were a total 15 dispensaries and three health centres in the nine intervention wards in Magu and Sengerema districts. As demonstrated in Table 3.3, there was no uniformity in the number and types of facilities within districts or wards. This is because IntHEC randomisation (described in Sections 3.2 to 3.6 above) was done at the population level rather than at the facility level. Facility-level interpretation and comparison of results within wards in Chapter 8 therefore takes this design feature into consideration.

3.10 Ethical considerations

All the sub-studies described in this thesis were implemented in accordance with ethical approval by the Liverpool School of Tropical Medicine Ethics Committee and Medical Research Coordinating Committee of the Tanzania Commission for Science and Technology (Appendices 3.1 and 3.2). The process of taking assent and consent from stakeholders and participants respectively is described in the Methods sections of each sub-study, but Appendix 3.3 shows a standard information sheet and consent form for the study which were adapted and implemented with participants in each of the sub-studies.

3.11 Independence and synergy of this PhD with IntHEC trial

As described above, the intervention and sub-studies reported in this thesis were nested within IntHEC trial. The IntHEC senior research team approved research tools used in this intervention to align with and fulfil IntHEC research protocols and project milestones. Outcomes of this PhD intervention serve as part of the EU final report. However, all tools implemented in this intervention and its sub-studies were developed primarily by the PhD candidate to fulfil the research objectives described in Chapter 1. Implementation of PhD activities was conducted and overseen by the PhD candidate in the field. Independent ethical reviews were successfully obtained for the intervention at LSTM and in-country and awarded its own ethics approvals independent of the IntHEC trial approvals.

The PhD candidate's innovation and ideas were maintained throughout the project. None of the activities reported in this PhD thesis were being implemented concurrently within other IntHEC interventions.

3.12 Role of researchers involved in the intervention of this PhD

IntHEC researchers in the field supported field implementation of activities and sub-studies. All IntHEC partners in Tanzania contributed to the development of tools. The IntHEC global advisory committee reviewed the research before and during implementation. The Tanzania Ministry of Health and Social Welfare's Reproductive Health Section approved the activities, and regional, district and medical officers participated in the conduct of research. PhD supervisors (see Acknowledgements) commented on and approved tools prior to implementation. John Dusabe made the overall decisions on implementation of activities, taking into consideration views from all these stakeholders. The writing of this thesis was solely done by him and the arguments in the thesis are purely his. None of the other individuals involved in IntHEC or otherwise contributed to the first draft of this thesis. However throughout the thesis, the personal pronoun "we" has been adopted to acknowledge the fact that several individuals were actively involved in the intervention at various stages of its implementation.

Summary

This chapter provided an introduction and background to the study and study areas of this PhD project. It described the local, logistical and

management settings of the research conducted. The next chapter, Chapter 4 describes the first of three situational analysis sub-studies conducted before the design and implementation of the PhD intervention.

4 Sub-study 1: Situational analysis with CTC providers

Introduction

As stated earlier, this chapter describes the first of three situational analysis sub-studies conducted to help determine the existing conditions on the ground before developing the intervention. This chapter reports the background, methods and results, and concludes with a discussion of the findings. In the action research cycle (Chapter 2), this sub-study forms part of the first action describing and analysing the SRH situation with the CTC providers.

4.1 Background

Chapter Two describes how the international health community at various levels has invested significant resources to promote SRH. For example, SRH outcomes were included in the MDGs. However, targets for service access, uptake and funding remain unmet [207, 208]. Infrastructural limitations, including health system failures [209, 210], extreme lack of human resources, irregular medicine supply [16], inaccessibility due to long distances [147] and inflexible work routines combined with poor attitudes of government health workers [211], limit the effectiveness of public sector SRH service provision. Against this background and as described in Chapter Two, CTC providers (including those based in the private sector, such as private drug vendors and traditional healers) are often the first port of call for people with SRH needs [212]. Such CTC providers have been reported

to be more convenient than government services [213]. In recognition of this, health planners and researchers have increasingly explored different strategies for community-based and lay reproductive and maternal health service provision through CTC providers [214-217].

Despite the readiness of CTC providers to complement the professional workforce, it is unclear what capacity and access to resources they have to provide effective SRH services. We therefore conducted a sub-study to:

(1) Examine the experience, attitudes and capacity of a range of potential CTC providers in SRH services delivery in Mwanza, Tanzania, as well as their readiness and ability to integrate with the mainstream health sector.

(2) Assess the feasibility of working with one or more CTC providers existing in study areas to implement a community intervention for SRH service uptake. In Chapter 2 it was stated that we worked with drugstores for this intervention. Before we conducted this sub-study, we did not know about what CTC cadre we would work with. We made the decision to work with drugstores based on the results of this sub-study.

4.2 Methods

Study setting

Previous research has shown that a range of CTC providers are active in Tanzania [12]. Due to the informal nature of their operation, it is often unclear 'who is doing what' in communities. Therefore, this sub-study

intended to establish which CTC cadres were operating where, what SRH services they offered, their capacity and skills to provide those services, their attitudes towards SRH and their attitudes towards cooperation with the mainstream health sector, especially community referral of their clients to formal health facilities. In our sample we included formal health service providers from government dispensaries and health centres to triangulate views on community referral and integration. The study was conducted in the study areas of Magu and Sengerema Districts as described in maps 3.2 and 3.3.

Sub-study type and participant selection

In this sub-study we employed Focus Group Discussions (FGDs) to learn the range of CTC providers and to understand the extent of their experiences for SRH service provision. This technique has been shown to provide extensive accounts of experiences from groups of similar characteristics through their interactions [218, 219]. These FGDs were conducted in February 2011 at central locations such as schools, health centres or village offices. The main criterion on which participants were selected was that they considered themselves providers of SRH services. This was an important requirement since we wanted to include all community actors and stakeholders in SRH service provision. To identify these actors, we worked with village executive officers (VEO) in the nine intervention communities within Magu and Sengerema Districts.

The VEO sent information to 8 people per CTC cadre existing in their villages inviting them for the study. Once at the FGD venue, CTCs of

similar cadres were grouped into focus groups. Each FGD comprised of 8-14 participants. It is normally recommended that an FGD be composed of 6-8 participants to achieve optimal group dynamics and exhaust all the representative views of the group [220]. However, this is only a guideline and there are flexible recommendations on group sizes. For example, Folch-Lyons et al 1981 mention that a group could be between 6-12 participants [221]. We had over 8 participants in our FGDs (up to 14 participants in 3 FGDs) because news of the sub-study spread widely by word of mouth after the VEO invited participants. CTC providers invited their colleagues, and we had higher numbers of participants per CTC cadre than needed. We were unable to divide them into smaller groups due to logistics. Some participants had come from far, so we thought it inconsiderate to send them away without allowing them to participate. Therefore, we decided to conduct some FGDs with over 8 participants per focus group.

We divided participants by cadre so that FGDs were conducted with people working in similar roles. We did not further divide by age or sex as we asked participants to focus on the services they provided rather than their own personal use of SRH services (which might have been a more sensitive issue, requiring single sex or single age groups). However, most participants were aged 35-70 years, reflecting CTC provider demographics predominant in Tanzania. The younger people (aged < 25 years old) who participated in this sub-study were from youth clubs (3 FGDs). No quantitative data on participants were collected.

Data collection and analysis

We designed an FGD guide that was tested locally with CTC providers offering SRH services similar to the participants before the actual FGDs were conducted. This was done in IntHEC formative wards (described in Section 3.9) in Misungwi District. After pre-testing, the tool was revised to incorporate the views of the pre-test participants and fed back to the research team to finalise the guide. This validation process was done to ensure that the guide fully addressed relevant SRH issues. After each round of discussion, notes were consolidated and the guide was further tuned to key themes based on reflection from previous FGDs. The discussions were digitally recorded, transcribed in Kiswahili and translated from Kiswahili into English. Using NVivo 9.1 Software (QSR International, Doncaster Victoria, Australia), the transcripts were analysed using a thematic framework. We developed a coding framework and nodes that were deductively drawn from our pre-defined themes designed in the discussion guide [222]. We then coded all relevant texts in the transcripts to those themes to arrive at the analysis summary.

4.3 Results

We found 8 CTC cadres in the wards and districts where the sub-study was conducted. With these cadres (together with dispensary and health centre-based providers), we conducted 35 FGDs with a total of 323 participants. Box 4.1 shows the number of FGDs we conducted per cadre and Table 4.1 gives a detailed illustration of the number of FGDs conducted in each ward and composition of each FGD.

Box 4.1 CTC provider cadres identified in sub-study 1

1. Home based care volunteers – 3 FGDs
2. Community social workers – 2 FGDs
3. Drug store attendants and owners – 4 FGDs
4. Traditional birth attendants – 4 FGDs
5. Traditional healers – 5 FGDs
6. Village AIDS committee – 2 FGDs
7. Village health workers – 7 FGDs
8. Youth club (YC) – 3 FGDs

Table 4.1 also includes the number of FGDs we conducted with the clinical officers. These cadres were automatically identified from FGD participation. We are not aware of any existing cadre that did not participate. After identifying these cadres, the analysis process (described above) was applied to summarise their views and discussions. The themes underlying this analysis are outlined in Box 4.2 and described individually below.

Box 4.2 CTC sub-study themes used in the analysis

1. Knowledge, skills and attitudes towards SRH
2. SRH services offered by close to community providers
3. SRH needs and CTC ability/willingness to provide them
4. CTC training
5. Community referral
6. Preferred referral service

Table 4.1 Number of participants per FGD and cadre

District	Sengerema				Magu				
Ward	Buyagu	Busisi	Igalula	Nyamatongo	Mwamabanza	Nyanguge	Shishani	Kisesa	Kongolo
FGD	12* VAC	10 VHC	8 TH	8 VHW	13 CO + N	7 YC	11 VHW	13 DA	11 DA
FGD	6 VHW	9 VHW	11 VHW	8 CSW	14 TH	12 VHW	10 TBA	7 VHW	9 TH + TBA
FGD	9 TH	9 CO	8 DA	6 TH + TBA	8 YC	7 TH	11 CO + N	7 TBA	5 YC
FGD	12 CO	8 HBC	8 CSW	-	8 VAC	-	-	11 HBC	-
FGD	9 HBC	9 DA		-		-	-	9 TH	-
Total	48	45	35	22	43	26	32	47	25

*denotes the number of participants in one FGD; total number of FGDs = 35; total no. of participants = 323

Key to CTC provider abbreviations:

HBC – home-based care (NGOs: IntraHealth and Relief Agency for Environmental Organisation); CSW – community social workers; DA – drug store attendants and owners; TBA – traditional birth attendants; TH – traditional healers; VAC – village AIDS committee; VHW – village health workers; YC – youth club (Rika Youth Clubs)

Formal health providers
CO – clinical officers (dispensary); N – nurses (dispensary)

Theme 1: Knowledge, skills and attitudes towards SRH

CTC remarks showed that their knowledge on SRH was subject to serious misconceptions. For example, they said that condoms could carry risks. Some stated that they were not ready to advise adolescents to use them. Several providers indicated that condoms were of a different kind stating that some had HIV in them, while others believed that condoms could cause cancer. Participants discussed these issues and some clarified that these were misconceptions.

On the subject of condoms, some CTCs believed that the lubricant in the condom has been deliberately contaminated with HIV to infect people in a drive to reduce the population. Such sentiments were also linked to doubts on the general purpose of family planning interventions:

> *"...people in this village know that using family planning a person won't bear children ever again. So you cannot tell someone who is 18 years old to use it, they can't accept because they want to have children"* FGD #17 Traditional Healers.

They had negative attitudes towards provision of RH services to adolescents and expressed hostility to adolescent reproductive health rights (SRHR). They dismissed as nonsense the right of adolescents to choose when and where to seek RH services or when to use contraceptives. Even some of the government health workers (the clinical officers) were unwilling to give

contraceptives to adolescents because they believed they were too young to use them.

These issues demonstrated poor knowledge and skills for SRH care and negative attitudes towards adolescents among the CTC providers who participated in the study.

Theme 2: SRH services offered by the CTC providers

The most skilled community-level RH service providers were the dispensary staff. Although they lack diagnostic and treatment resources for HIV, they have capacity for syndromic management of STIs. Otherwise, the rest of their service provision is limited to counselling, condom distribution, provision of contraceptive pills and injections, and referral to health centres.

Most did not have any training, except drugstore attendants and dispensary clinical officers who said they had certificates in drug dispensing and clinical medicine respectively. Community health workers, home-based care volunteers and social workers said they had received some types of (unverified) orientations from various civil society organisations promoting HIV prevention in the communities. However, in spite of such orientations, they demonstrated vehement attitudes against adolescents engaging in sexual activity. The others had received no form of training or orientation. This finding questions the level and quality of the following services they claimed to provide.

Drugstores: mainly sell medicines. However, whilst they are only licensed to sell non-prescription drugs and items such as analgesics and condoms, they reported treating STIs and selling antibiotics. They also offered health education and promotion services, as well as counselling.

Home-based care volunteers and social workers: reported their main services to be palliative care, SRH education and SRH counselling.

Village AIDS committees: these are selected by communities and are mostly older people who admitted that if consulted by adolescents on SRH they would tell parents about it. They discussed whether provision of guidance on HIV prevention including condom use, education and informal referral to health facilities in the community is their responsibility. However, clinical officers from dispensaries didn't corroborate that they receive patients referred from village AIDS committees.

Village health workers: commonly known as the community health workers, reported providing a range of primary health services including health education, first aid, collecting vital data (births and deaths) and chairing village health meetings during health promotion activities. Regarding SRH they provide counselling, distribution of condoms and referral to health facilities.

Traditional birth attendants: these said they are called into homes to conduct maternal deliveries and provide advice to pregnant mothers. In one

community, traditional birth attendants reported being called once a week to spend a full working day at dispensaries helping with deliveries. This issue was brought into the FGD with dispensary clinical officers from this community. They confirmed that there is a high pregnancy rate with a limited number of midwives to conduct deliveries.

Traditional healers: were the majority CTC in the community. They were the least likely to have had any form of training despite the range or services that they claim to provide, including complex RH procedures such as infertility treatment, abortions, home births and treatment of STIs using herbal remedies and charms.

Youth clubs: were voluntary associations of young people distributing condoms in the community. Some said they also provide HIV counselling.

Theme 3 – SRH needs and CTC ability/willingness to meet them

All CTCs reported that the main RH need of the adolescents was condoms. The other most requested service was information on HIV prevention, pregnancy and family planning.

The CTCs also discussed a number of specific RH demands they were not able to provide.

Dispensaries can neither offer HIV tests nor complex family planning services, such as sterilisation. Although they can't provide abortion due to its illegality in Tanzania, its need amongst adolescents was discussed to be

on the rise. Youth-friendly service provision was difficult for some due to a lack of space.

> *"To be frank adolescents do not like our dispensary because of lack of space. There is no confidential room where I can take an adolescent and listen to her in private. The consultations are done in an area where everybody has access. Adolescents are scared of coming because the moment they find someone they know, they tend to turn around and go back home.* FGD # 33, Clinical Officers.

The drugstores stated that they were being consulted for STI treatment but are unable to provide it, as they are not licensed to do so:

"We can't treat STIs. Maybe the government should permit us to sell STI drugs so that when people don't get them at the dispensary they can come and buy them from us". FGD #17, DA.

The rest of the CTCs said the demand for information and other RH services can't be met as they lack the ability or resources.

Theme 4: CTC training

Dispensary clinical officers and drugstore attendants felt they had the necessary basic training, although their views were negative on SRH. Verification of the level of training attained by the CTC was beyond the scope of our study. Community health workers, home-based care volunteers and social workers said they had received SRH topic orientations by the districts and NGOs, although the level and quality of such orientations to

provide SRH services was unclear. Traditional healers and birth attendants, village health committees and youth clubs reported that they had not had any form of training at all. All participants, even those who reported having received training, felt that they had limited knowledge on SRH. They requested that we give them further training, although we had explained that our purpose was research only.

Theme 5: Community referral

Our FGDs probed acceptability of establishing community referral mechanisms from CTC to formal health facilities (i.e. dispensaries and health centre). We established that referral is done informally between CTCs and from CTC to the dispensaries:

> *"[…] Patients come saying they have been sent by drugstores to get injections"* FGD # 31, Clinical Officers.

Theme 6: Preferred referral service

CTCs discussed a possible community referral intervention to increase access to RH by adolescents. They all wanted linkages and connections with the formal health facilities, as well as recognition and integration into the health sector.

Dispensaries were also willing to work with drugstores saying:
"...We have skills but lack medicines at the dispensary, but drugstores have medicines they do not know how to prescribe, if we had a linkage, we could fill the gaps". FGD #8, Clinical Officers.

Drugstores said that linkages to dispensaries would be beneficial to them:

"We could refer any patient for prescription before we sell the medicines [...] we need collaboration so that what we tell adolescents is accepted at the health centres when they go there" FGD #17 DA. Table 4.2 illustrates the CTC providers' views within the above themes in relation adolescent SRH.

Table 4.2 Summary of CTC providers views per theme

Provider	Dispensaries	Drugstores	Home-based care volunteers	Village AIDS committees	Social workers	Village health workers	Trad. Birth attendants	Trad. Healers	Youth clubs
SRH knowledge, beliefs attitudes and practices	We do not give ANC services to women without husbands; Adolescents are promiscuous; Adolescents fear us; No facilities to offer confidential youth friendly services.	Adolescents are promiscuous; We can't give condoms to young adolescents as they are not old enough to have sex.	Adolescents should stop bad behaviour of sexual intercourse.	We can reveal to parents when their children ask for condoms; We are a close-knit community, my nephew can't ask condoms and I keep quiet.	Adolescents shouldn't have sex when still young.	It is our prerogative to decide what SRH services adolescents can access; a child is raised by the village.	No reported negative attitude among the participating traditional birth attendants	We can't give fertility information to adolescents because they're still young.	No reported negative attitude among the participating youth clubs.
Services offered	Syndromic STI diagnosis and treatment; Contraceptives incl. VCT; Ante- and post-natal care; Referral; Health education.	Sale of drugs; condoms; Advice on medicines and dosages; Limited referral to formal health services. Health education	Guidance Palliative care; Counselling; HIV test; ART; Adherence counselling; Referral.	Condom and family planning education; Advice and referral to health facilities.	Home visits; Palliative care; Counselling.	Education; Counselling; Health education and promotion; Distribution of condoms; Referral.	Home delivery; Midwife duty assistance at dispensary; Pregnancy education and referral.	Herbal remedies Counselling Infertility treatment Abortions, home births treatment of STIs	Condom distribution; Peer-counselling and education; Advocacy.

		and promotion							
Main SRH needs of the adolescents	Family planning, HIV prevention (mainly condoms); STI treatment; Delivery; Abortion.	Condoms; Pregnancy information; STI treatment.	Condoms; counselling; Welfare support.	Condoms; AIDS information.	Condoms; AIDS information.	Condoms; Information; leaflets on AIDS.	Pregnancy care; Mostly maternal delivery services.	Fertility inquiries and STI treatment.	Condoms and leaflets on AIDS.
Unmet SRH needs of adolescents	Youth friendly services; abortion (illegal); complex family planning; HIV testing; ARV initiation.	STI testing; FP; abortion.	FP	FP; counselling.	FP	FP; STI treatment.	HIV related services; home-based antenatal care; Maternal delivery on 1st or 5th birth.	None	HIV counselling; FP
Community referral	We refer patients to drugstores when there are no drugs at the dispensary, to health centres for complicated services.	We refer to dispensaries for prescriptions.	We refer to dispensaries and village health workers.	We refer to dispensaries.	We refer to dispensaries.	We refer to dispensaries.	We refer to dispensaries.	We don't refer, people come to us from dispensaries.	We refer to dispensaries and village health workers.
Preferred referral intervention	We want to control delivery of all SRH service delivery; All	Our contribution should be recognised; We need	More connections with the dispensaries; Referral	Dispensaries should raise awareness; We need an	We need outreach activities in the communities	We need transport facilitation to accompany	We need training and resources to conduct	We need a formal recognition by the	We want more health education in the communities,

	should refer to us.	formal integration with dispensaries.	forms are not confidential.	ambulance service.	conducted by health facilities.	patients to dispensaries.	home deliveries.	health services.	and facility support for youth initiatives.

4.4 Discussion

Improved integration of CTC into formal health services has been identified as a strategy to strengthen health service provision [126]. Training and involvement of CTC cadres is included in the Tanzania National Strategic Plan 2009-2015 [223]. However our findings suggest that despite commitment by MoHSW to engage this segment of the health sector [224], the capacity of community-based providers to offer effective SRH services is poor. Our sub-study, which spanned a broad range of community providers, corroborates other studies among smaller, specific community cadres [225, 226].

Our results also show that CTC knowledge remains poor and attitudes are predominantly negative, particularly towards adolescent SRH. Misconceptions and mistrust are especially demonstrated through observed perceptions that HIV has been put into condoms to harm the public. These misconceptions date back to the very early days of the HIV epidemic. It is disappointing that they persist despite the substantial and varied community information campaigns that have been implemented over the past two decades [225, 227].

The CTC indignation about adolescent behaviour is based on cultural norms, which are difficult to change. There is a need to develop and model rights-based approaches to reduce judgemental views on adolescents' sexuality.

The increased demand for condoms among adolescents beyond the available supply could suggest that the number of adolescents seeking protection during sex is increasing. Other HIV prevention interventions have reported increases in this demand [228, 229]. However, such trends are difficult to interpret. It may mean that decades of health promotion strategies are finally translating into increased condom use. Conversely, it may represent increasing numbers of sexual encounters among adolescents. The latter could explain the reported high demand for abortion services in this population. Abortion is illegal in Tanzania and not formally offered in health facilities. Our findings suggest that abortions are being sought by adolescents potentially leading to increased numbers of unsafe abortions being carried out. Whilst reported data of this kind is a good indicator of perceptions, they must be interpreted with caution in the absence of quantitative documentation of actual dispensed condoms or abortions conducted.

We found that CTC services are largely fragmented, un-resourced and ineffective. The CTC providers are juggling HIV/STI, family planning and maternal health in large populations with very little capacity. They 'advertise' themselves as providers of these services, even though they are not in a position to offer them effectively. Notwithstanding this, research shows that some CTC providers, such as drugstores, are more popular than the mainstream health services [226, 230]. It means that CTC providers have the potential to powerfully influence health outcomes in the communities. A systematic review of healthcare workforce task-shifting

established that issues identified in our study, such as training and integration, were paramount to increasing health outcomes in communities where low-cadre human resources have worked [122].

The potential of CTC providers to offer effective services is limited by their low capacity and lack of resources. Other researchers have argued that training, integration and provision of resources to CTC providers is important if the health system achievements they contribute to are to be realised [126]. Our findings suggest that currently this training is lacking and that there have been few integration efforts to include the CTC in the health system or to address their lack of capacity and resources.

Overall the CTC providers, especially drug stores, wanted an intervention that enhances recognition of their contribution to the health system and wanted to be integrated within the mainstream health sector (Table 4.2). Unfortunately, dispensaries that have diagnostic and prescription skills often lack supplies of medicines [149, 231], whereas drugstores with no such skills stock them. There is an untapped potential here: at the time of the sub-study, the MoHSW was upgrading drug stores into accredited drug distribution outlets (as described in Chapter 2) with a license to sell controlled medicines. But Mwanza was still behind on enrolment and therefore ADDO was not operational in the region. It is this untapped potential that drew us to a decision to work with drugstores and their attendants so that we could explore it. We explored this in community consultations with adolescents to establish their perceptions of drugstores

and this is described in Chapter 5. Further to this, in Chapter Seven (intervention development) we provide the justification for choosing drugstores over other CTC cadres.

Limitations and strengths

Limitations

The FGDs conducted in this sub-study did not follow up specific issues identified by the CTC (e.g. negative attitudes towards condoms) to establish whether there might be explanations for their views beyond what was discussed. It is possible that the CTC did not fully express their views out of fear of retribution, especially since they had been selected by the village executive officers (VEO), who are the most feared government administrator at the village level. Personal opinions and issues were expressed but it has been reported that FGDs don't fully explore personal views due to fear of group reactions [220]. NIMR researchers who had experience in conducting FGDs moderated the FGDs. However, we cannot determine to what extent they might have biased the discussion, direction of debate and/or saturation of topics. Participant selection involved calling all the cadres to the meeting point through the VEO. We cannot determine within the cadres whether the VEO selected individuals known or favourite to them. There was no gender or age separation within the cadre as we believed service provision to be a topic both male and female participants within a cadre could discuss openly. However, the presence of older male participants could have inhibited younger or female participants from speaking their minds extensively. Finally, this study openly invited all close

to community cadres through the VEO to encourage participation of everybody who considered themselves providers of SRH services. Therefore, our results cannot be generalised in other populations or settings where such cadres do not exist.

Strengths

We believe that the sub-study addressed our objective, that of determining the CTC cadres operating in the study settings and documenting the skills and resources they had to implement SRH resources. This is achieved through the action research approaches of focus groups and discussions with the communities and participants of similar characteristics [232]. Through the adolescents, in the following chapter we discuss the community's opinions about these cadres, their attitudes and SRH services they provide.

Summary

This chapter has established that there are several cadres of CTC providers in Mwanza, whose attitudes towards SRH are negative. It has also established that the CTC providers' skills and capacities to offer these services are poor. They have suggested training, integration and recognition as some of the actions that could improve the way they provide SRH services. This finding was considered during the intervention development (Chapter 7). The next chapter however describes community consultations, which we conducted to determine the experiences the communities make when they seek SRH services from these CTC providers.

5 Sub-study 2: Situational analysis with the communities

Introduction

This chapter describes the second situational analysis (Sub-study 2) which was conducted at the level of the community through consultations with the adolescents in preparation for the design of the intervention. Like Sub-study 1, this Sub-study 2 is also part of the planning stage of the action research cycle described in Chapter 2, through SRH risks and resources description and analysis.

5.1 Background

Uptake of SRH services in Tanzania has been consistently reported as poor [38, 55]. One of the suggested reasons for this is the lack of public's understanding of SRH risks and the resources available at the community level [233, 234]. Also, although communities do not always trust CTC providers [234, 235], reports continue to suggest that these are often the first port of call for health services [150, 236].

Regarding access to SRH services, adolescents have been reported to be significantly disadvantaged in their opportunities and ability to independently access SRH services [237]. Due to this, the calls for provision of youth friendly services that started globally in the 1990s have

been promoted throughout Tanzania [211]. Nevertheless, adolescents' trust of service providers remains low [238]. Perceptions of adolescent SRH risks and resources play an important role [239]. Therefore, within this sub-study we sought to establish what the adolescents in the communities in which we were going to work perceived as risks and resources relating to SRH. This was to enable design of a SRH promotion intervention that met the needs of adolescents. Previous studies have been conducted which target sexual and health-seeking behaviour of adolescents [240, 241]. Although evaluations of such interventions have not shown significant biomedical benefits, their reported impact on health-seeking behaviour and SRH perceptions was significant [242]. Therefore, adolescent consultation regarding the intervention we wanted to develop played a big role in the study design. Research suggests that interventions developed in consultation with the beneficiaries are more likely to succeed [243] and recommendations for procedural iteration of interventions have included stipulations on working with beneficiaries from the early stages of intervention development [244].

Against this background, we wanted to consult with the communities to establish: (1) what SRH risks they perceived the community to have, (2) what SRH resources and service providers they believed they had, (3) what type of CTC providers they preferred and (4) how they thought an intervention could be developed to increase their access to and uptake of SRH services. In order to obtain viewpoints that included the most vulnerable and the least able to seek SRH services, we chose to work with

adolescents in these consultations based on the assumption that their ideas would accommodate all ages, given that theirs is the most vulnerable group [245]. Information gained from these consultations was considered together with that of CTC providers' and data from health facilities to develop the mHealth intervention we implemented to increase referral for SRH services. The specific objectives for this consultation were:

1. To identify norms and practices that affect uptake of SRH services, information and advice by adolescents and young people in the community;
2. To identify norms and practices that affect perceived effectiveness of SRH services;
3. To capture adolescents' ideas for improving the effectiveness of available services.

5.2 Methods

The sub-study was conducted between February and April 2011. In order to avoid introduction of bias to the intervention we conducted this sub-study in the formative wards which are similar to the intervention wards (see Chapter 3).

Mapping

Mapping techniques have previously been used to capture geographical risk locations [246, 247]. We further developed this to capture temporal and spatial aspects of risks in the community. Adolescents mapped:

(i) their perceptions of the key actors in SRH in the communities;

(ii) their perceptions of key activities relating to SRH in the communities;

(iii) their perceptions of key individual level interactions relating to SRH within the communities;

(iv) geographical locations of these interactions;

(v) gender distinctions of these interactions;

(vi) temporal situations of these interactions.

Adolescents drew maps pertinent to all of these perceptions as they discussed issues around the resultant maps. The adolescents were separated by gender and, after an initial introduction, the facilitators helped the groups produce separate risk and resource maps for their villages and gender. Discussions captured how these maps change over time (day, season).

The consultations explored experiences of current SRH activities in the adolescents' communities separately for young men and young women, documenting:

(i) The spectrum of SRH problems and conditions perceived by the adolescents;

(ii) Current patterns of health-seeking behaviour in terms of SRH service provider preferences;

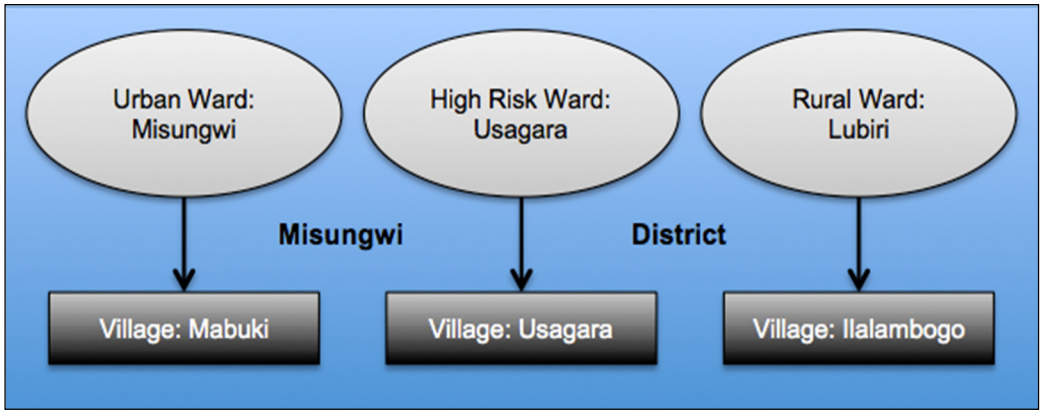
(iii) Adolescents' views on the strengths and weaknesses of SRH service providers and views on uptake among different gender, age and socioeconomic groups;

(iv) Adolescents' views about strategies for improving quality, equity, uptake and integration of SRH activities.

Setting and sampling

As mentioned above, this sub-study was conducted in IntHEC formative wards (described in Chapter 3; shown in Chapter 3, Map 3.2) to allow deeper understanding of the SRH issues affecting the community.

Figure 5.1 Village selection for community consultations



One village corresponding to each stratum (as shown in Figure 5.1 above) was selected to represent the cluster characteristics in the sub-study.

Selection of adolescents

The level of education is reported to be a determinant of a person's likelihood to use health services [248]. Therefore we stratified the groups by education status. In addition, we stratified the groups by motherhood (or fatherhood) under the assumption that having given birth is a determinant for seeking SRH services (e.g. ANC). At the ward offices, the Village Executive Officers (VEOs) from the three selected villages and the Ward

Executive Officer (WEO) met with the research team and determined how the youth should be selected as follows:

Girls:

1. 6- 8 school attendees/leavers aged between 15-19 years
2. 6-8 young mothers (aged < 20 years)
3. 6-8 young women who had not attended school or left school below Standard 5 (equivalent to Key Stage 2, UK)

Boys:

1. 6- 8 school attendees/leavers aged between 15-19 years
2. 6-8 young fathers (aged < 20 years)
3. 6-8 young men who had not attended school or left school below standard 5

Participatory FGDs

The participants did the mapping activity themselves through discussion and drawing on flip charts. The third group (never been to school or stopped below standard 5), were not able to draw or write on the maps, because they could not read nor write. The facilitator did this for them with the group's guidance on where features in their villages were located.

Female groups were led by female facilitators and male groups by male facilitators in order to encourage the participants to speak freely. In order to

gain the most from their full participation, the adolescents led themselves through the process with minimal guidance from the research team. The setting was simple and easy to make the participants feel welcome. The procedure taken for the participatory FGDs/consultations is outlined below:

1. Introductions by research team and adolescents (names, age, residence)
2. Discussion of the study, information sheet and consent statement
3. Signature of the consent statement
4. Introduction and summary of the session
5. Session start adolescents' lists of health problems they have in the village
6. Adolescents' list of RH related problems
7. Adolescents' ranking of RH health related problems' importance (in accordance to those affecting them most)
8. Drawing of the village map by the adolescents
9. Mapping out areas considered to be risky by the adolescents reflecting on RH problems
10. Mapping out the actors involved in areas identified
11. Putting on the map the activities and interactions that happen between all the actors identified
12. Temporal mapping of those activities and interactions
13. Discussion to identify actors or interactions the group thinks are missing
14. Discussion on perceptions of actions to be taken to solve the problems identified
15. Break (with refreshments)
16. Draw another map
17. Put the resources that are available in the village they think are helping in dealing with issues identified in 7-14
18. Facilitators' prompts to answer all key questions
19. Discussions on the strengths and weaknesses of the resources in 17 above
20. Reflect again on the resources map – any missing issues and ideas

After the maps were drawn, the SRH problems, risks and resources pointed out on the map (Figure 5.2) were discussed in a FGD manner.

Figure 5.2 Example of maps by participants (untranslated)

Analysis

Data was analysed separately for (1) risks and (2) resources. As for the CTC provider consultations presented in Chapter 4, the community consultations were digitally recorded and transcribed in Kiswahili, and then translated into English. Transcripts were entered and analysed in NVivo 9.1 (QSR International, Victoria, Australia). Thematic analysis was conducted by:

1. Reading all the transcripts, familiarising with the data and identifying apriori themes emerging from the data;
2. Coding the issues identified in the transcripts into the apriori themes and;
3. Summarizing and discussing observations in the themes in accordance to the objectives of the sub-study.

Ethical considerations and consent

Ethical approval for this sub-study was covered by the ethics approvals presented in Chapter 3. Before the FGDs, participants were read the consent statement (Appendix 3.3) and signed the consent form (Appendix 3.4). Some participants were under 18 years of age. In these cases, consent was sought from parents and guardians before discussions commenced.

5.3 Results

Nineteen participatory FGDs (Table 5.1) were conducted with 156 participants.

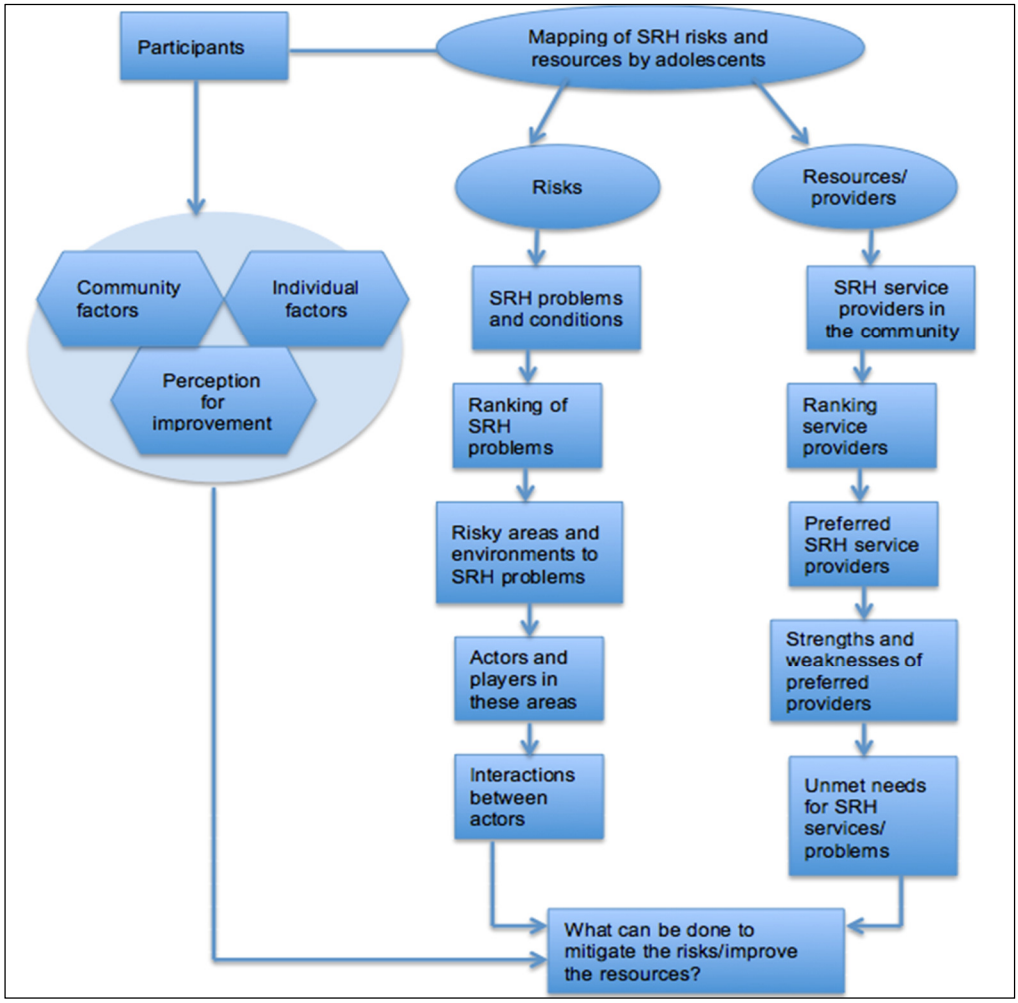
Table 5.1 Number of participatory FGDs

Village*	**Usagara**		**Mabuki**		**Ilalambogo**		**Total**
Type of study	**FGDs**		**FGDs**		**FGDs**		
Description of participants	**F**	**M**	**F**	**M**	**F**	**M**	
School attendees/leavers aged 15-19 years	1	1	1	1	1	1	6
Young mothers/fathers aged < 20 years	2	1	1	1	1	1	7
Young women/men who had never been to school or left below standard five (15-19 years old)	1	1	1	1	1	1	6
Total	4	3	3	3	3	3	19
*Villages have not been anonymised as no participant data is presented							

Data from these FGDs were triangulated in 11 apriori themes (Figure 5.3)

that were used to analyse the SRH risks and resources from the transcripts.

Figure 5.3 Apriori themes from consultation transcripts



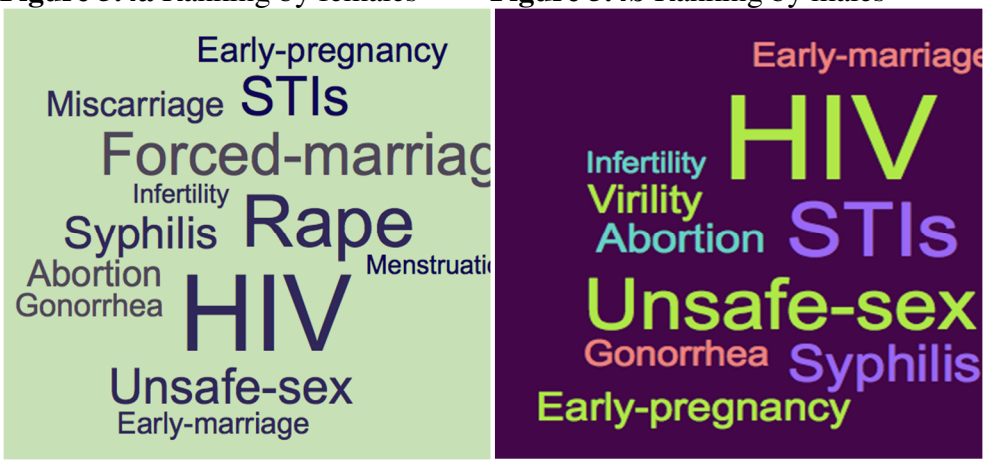
Perceptions of risks

The ranking is illustrated in Figure 5.4. There was no difference between the participants from rural, urban or high-risk villages in terms of disease ranking and perception of SRH problems. Also, there were no differences regarding marital status and how SRH problems were identified. We could not estimate different views pertaining to different age groups as all the participants were aged between 15-19 years. Also, clusters did not have any attributable difference in the understanding or ranking of SRH problems.

Participants from all three villages (rural, urban and high risk) identified the SRH problems in the same way and ranked them as equal. However, there were differences between males and females. This is described below.

Figure 5.4 SRH problems and their ranking

Figure 5.4a Ranking by females* **Figure 5.4b** Ranking by males*



*Ranking made during analysis using NVIVO query search tool

Above is a word cloud showing the conditions that were reported in the FGDs and their ranking. In Figures 5.4a and 5.4b, the size of the term representing an SRH problem in the word clouds signifies the ranking of the SRH problem. The highest ranking is written in large font while the lowest ranking is in the smallest font. The number of times a word was mentioned in the ranking in the 19 FGDs determined its overall size in the word cloud. There is no significance of the position (right, left, up or down) of the term in Figures 5.4a and 5.4b.

In all three villages, both females and males in the FGDs ranked HIV to be the biggest SRH problem in their villages. The second biggest SRH problem according to female participants was rape, while according to male

participants it was STIs. STIs appeared as a general name and specific STIs (e.g. gonorrhoea) were also mentioned. These were kept in the rank to reflect what the participants perceived. Forced marriage was the third biggest SRH problem according to female participants whereas unsafe sex was the third biggest according to male participants. The ranking of the other problems is not significantly visually different to demonstrate a striking difference between males and females. However, there are some problems that did not appear in the rank for both sexes. For males, rape, miscarriage, forced marriage and menstruation were not mentioned. For females it was virility – which males reported to be a problem that drives them to seek sexual encounters and leads them to risks.

Table 5.2 SRH risks, actors and interactions

Setting	Environments	Risks/interactions	Actors	Temporal mapping
Rural	Farms Ranches Markets Fairs Roadsides Bushes Water-wells Boreholes Homes Walking to school Collecting firewood	Fighting Alcohol Local brew Verbal abuse Unprotected sex Rape Unwanted sex Humiliation Offered money Being groped Injury Infections	Men Hunters Boys waiting Schoolmates Relatives Farmers Drunks Robbers Disco owners Older women Vendors	At lunch time In the evening After 8pm Any time

		Sexual rewards (males only) Being propositioned Intimidation		
Urban	Markets Fairs Roadsides Cafés Guesthouses Boreholes Homes Bars Trading centres At school Under the bridge Nightclubs At church	Fighting Smoking (cigarettes) Smoking (marijuana) Cannabis Alcohol Local brew Verbal abuse Unprotected sex Being seduced Unwanted sex Humiliation Offered money Being groped Injury Infections Name-calling Pregnancy Rape Intimidation Coercion	Men Boys waiting Barmen Schoolmates Teachers Relatives Marijuana smokers Drunks Pimps Robbers Shopkeepers Travellers Disco owners Business men Vendors	At lunch time In the evening After 8pm Any time
High risk	Roadside Guesthouses Markets Fairs Homes Bars At the hill Mines	Fighting Cigarettes Marijuana Cannabis Alcohol Verbal abuse Unprotected sex	Men Hunters Boys waiting Miners Barmen Relatives Marijuana smokers	At lunch time In the evening After 8pm Any time

		Being seduced Unwanted sex Humiliation Offered money Being groped Injury Infections Name-calling Pregnancy Rape Being propositioned	Drunks Pimps Robbers Shopkeepers Travellers Disco owners Women Girls Vendors	

Table 5.2 illustrates the risks, environments, actors and interactions that took place in rural, urban and high-risk settings. Many risks, such as verbal abuse and rape, were recorded in every setting whereas others, such as use of illicit drugs, were particular to given settings.

Environments that were specific to settings shown in Table 5.2 were farms and firewood chores that were associated with various types of sexual abuse in the rural village. In the urban village, guesthouses and trading centres were identified to be major risky environments. Also, there is a bridge that was identified as a camping ground for drug users who assault adolescents. The church was identified as a risky area in the urban village. The high-risk village had a gold mine that was particularly a risky environment for the adolescents where several SRH interactions take place (Table 5.2). There was also a hill that was perceived as a dangerous area where marijuana

smokers wait for girls passing by from school. The other risks (e.g. adolescents' own homes) were inherently similar to every village irrespective of the cluster.

The actors were specific individuals who adolescents reported to be active in those environments. For example, farmers were implicated at the farm whereas vendors were implicated in the market environment.

The interactions happening between adolescents and the actors were mainly verbal and physical abuse (Table 5.2). Specific interactions, including catcalling, propositioning and groping, were particularly reported in every village. However in some areas there were specific interactions, such as smoking marijuana and drinking alcohol in the high-risk and urban villages. Temporal mapping revealed that time was an important factor in some areas. Evening and night/dark times of day were more associated with the risks and interactions. In all of the villages, those that mentioned home as a risky area reported the whole day as being dangerous regardless of time of day. Others, such as those at school, reported break times as critical risk periods.

Both male and female participants identified these issues, although males reported them in relation to girls. They did however report that such areas were risky for them in terms of being robbed or beaten. In addition, males had specific issues such as being offered sex as rewards or payments for

manual labour instead of money. For example, males in the rural village reported that older women ask them to collect firewood or burn charcoal for money, only to be propositioned for sex as payment after completing the work. Being seduced and propositioned therefore were the only similar interactions between male and female participants, although for males no violence was reported to be associated with them. Males being targeted by fellow men in either of these sexual interactions were not reported.

The environments and interactions identified here were only suggestive of what adolescent males and females perceived as risky. We did not ask the group or individuals whether any of the reported interactions happened to them in this sub-study. Therefore, deeper assessment of individual risks was not part of this study as the objective was to explore preference of SRH service providers and health-seeking behaviour.

Resource mapping

Figure 5.5 Ranking of health providers

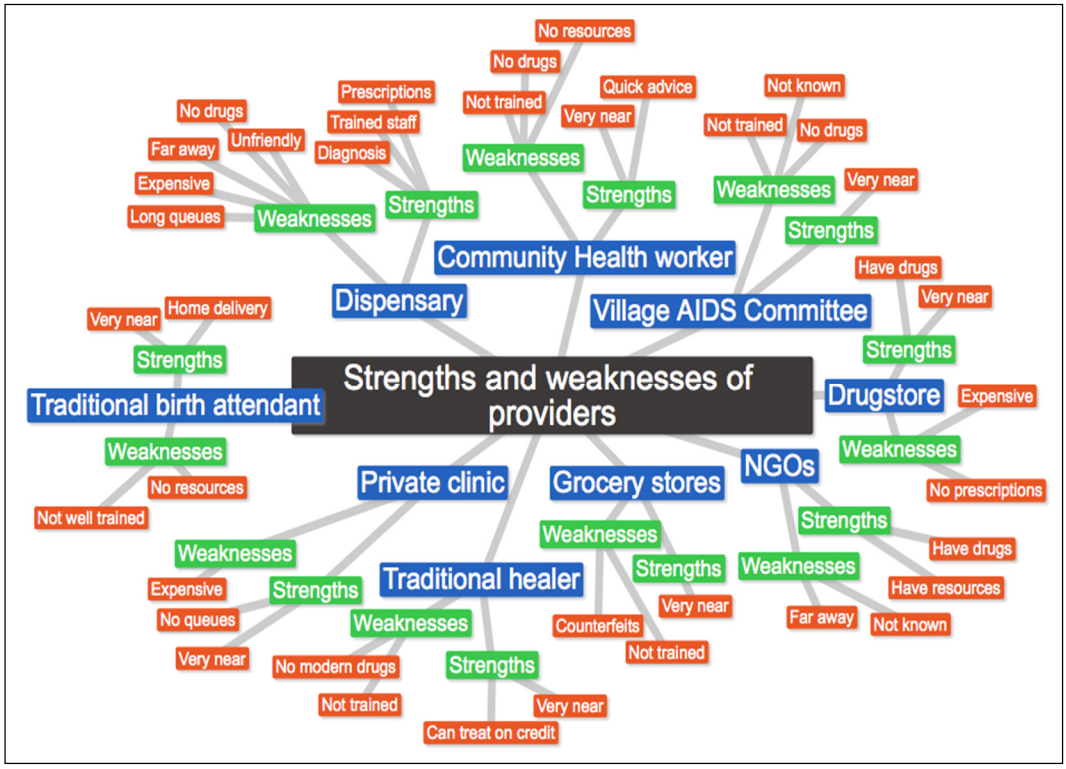
Figure 5.5 shows the ranking of village-based health providers according to male and female participants. In the ranking, the larger the font size, the more preferred the provider. In Figure 5.5 therefore, the ranking is as follows:

1. Dispensary
2. Private clinic
3. Drugstore
4. Traditional healer
5. Traditional birth attendant
6. NGOs
7. Community health workers
8. Village AIDS committees and grocery shops

Adolescents favoured dispensaries (first in the rankings), but private clinics and drugstores were popular. Traditional healers were more popular than

traditional birth attendants. NGOs (including CSOs) were more popular than community health workers. Village AIDS committees were the least preferred by adolescents and were equated with grocery stores. Figure 5.6 below shows what participants considered were the issues pertinent to their ranking of SRH service providers.

Figure 5.6 Strengths and weaknesses of SRH service providers

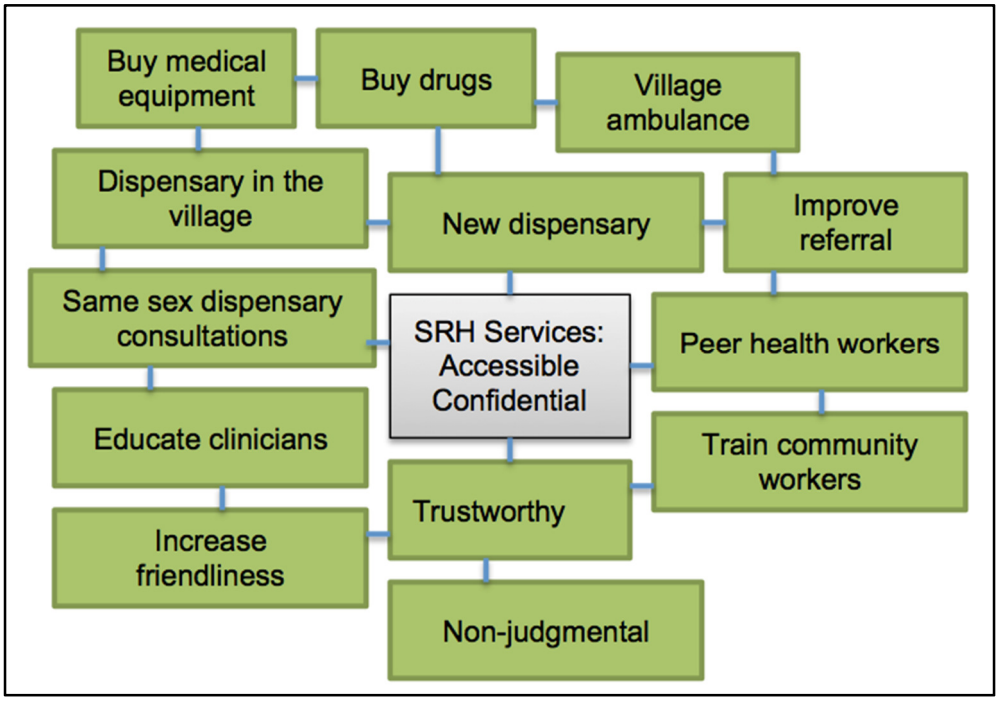


As Figure 5.6 illustrates, the participants discussed several issues as the reasons why they would prefer various providers. Dispensaries (ranked as the preferred provider in Figure 5.4) were found to have many weaknesses including being expensive, unfriendly, far away, having no drugs and long queues. Traditional healers (who were ranked highly in Figure 5.5) were identified with a positive strength of having the ability to treat patients on credit with a view to pay later when the family gets the money. Drugstores had weaknesses of being expensive and lacking prescriptions, but having drugs and being nearby were stated as strengths. Grocery stores were identified with a specific weakness of selling counterfeits drugs.

Mitigation actions and referral

The participants discussed various mitigation preferences. These ranged from constructing new health facilities in the village to having same-sex consultations in dispensaries. Figure 5.6 shows a matrix of interconnectedness of various ideas the participants had, under the central tenet of confidential and accessible SRH services.

Figure 5.7 Participants' ideas for improving SRH services



Community referral

Participants reported having no experiences of SRH referral from the village level. Referral at the facility level (i.e. from one facility to another) was reported for malaria and health conditions other than SRH. Pregnant women and women who had given birth had been referred from dispensaries to

hospitals, but experiences of this had not been particularly positive for some:

"*When I arrived at the health facility the nurse told me to wait outside for 2 hours although there was no other patients waiting, then referred me to Magu [District hospital*]". Experience shared by one out-of-school married young mother, FGD #10.

5.4 Discussion

SRH problems and their ranking

The adolescents identified SRH problems that are commonly reported in developing country settings. The perception of SRH problems demonstrates that HIV is considered among the biggest health problems in these villages. In Mwanza, HIV prevalence is 4.2% [54] and STI prevalence (self-reported) is above 10% [55]. However, in our sub-study HIV was identified as the most pressing SRH issue in this population of 15-19 year olds. This may be due to HIV promotion that has been spreading through Tanzanian villages [72, 91], and this has also been confirmed by the DHS 2010 which reported that at least 99% of the participants were aware of HIV [55].

STIs were also identified as a key SRH problem in these communities. They were identified through either the collective term STIs (known as *magonjwa ya ngono* in Kiswahili) or by naming individual STIs such syphilis and gonorrhoea. Other studies have reported that Mwanza participants perceive STIs as a major SRH problem in their communities [227, 249].

As in the CTC provider consultation (Chapter 4, Section 4.4.3), abortion was identified by both males and females to be an important SRH issue in these villages. Literature demonstrates that abortion could be performed secretly and illegally, happening unsafely at the community level through traditional healers. In the Kagera region neighbouring Mwanza, it has been

estimated that 62% of rural and 63% of urban women [N=278 and 473 respectively] had undergone clandestine abortion, 46% and 60% of which being performed by an unskilled provider [250]. Therefore, it is unsurprising that our sub-study found this was an issue in this population.

Males and females in our sub-study didn't only differ on their views of forced marriage and miscarriage. Also virility was mentioned by males and menstruation was identified by females. Both of these have been reported as issues in adolescent populations previously [251, 252]. We believe it will remain as such in this age-group where biological body changes influence perceptions on sexual and personal characteristics [253].

Interestingly, area of residence did not matter in terms of SRH problem finding and ranking, yet this demographic is a key determinant of SRH [254]. However, this too could be attributed to the health promotion activities that have been conducted in Tanzania, leaving everyone in remote rural and urban areas aware of HIV/AIDS, STIs and other SRH conditions, which is a positive outcome.

Perception of risks

Although profiling of SRH risks was not a focus of this sub-study, it is important to mention the risks identified. The similarities identified for risky environments identified in rural, urban and high-risk areas conforms with the MoHSW policy to implement SRH promotion in all areas in Tanzania [255]. However, the Ministry of Education and Vocational Training (MoEVT) policy on SRH in schools does not allow some SRH interventions in schools (e.g. condom distribution [256]). Therefore we wonder whether this stand should be revisited, given our sub-study and other studies' findings that schools remain an SRH-risky environment for pupils [257-259].

In this sub-study we found that there were particular risks associated with particular settings. For example, farms and forests were risky areas in the rural setting. This will remain an issue because these areas are sparsely populated and will always have farms and forests. High-risk areas had gold mines, which were associated with acts of sexual exploitation and risk of abuse. Gold mines have been found to be problematic for SRH by other researchers [86]. Urban areas had specific risks demonstrated in the presence of entertainment places and amenities, such as night accommodation and entertainment. Other researchers have also reported this and interventions have been implemented to target these areas, such as putting condom dispensers in bars and nightclubs [260].

Our finding that older women might be using sexual payments for manual labour is interesting. Cross-generational sexual intercourse has previously been reported particularly in cases of young female adolescents [261, 262]. A concept of 'sugar daddy' (where older men offer gifts to younger women for sexual relationships) is well known [263]. To our knowledge, older women-younger men sexual relationships have not been reported before in these settings, especially as a form of payment for labour and chores. Future studies should therefore explore this issue using more detailed methodologies to determine its prevalence.

Our temporal mapping did not explore in-depth issues regarding the time of the likely risks as reported by the adolescents. However, it is evident that the risks identified pertain to particular active times of the particular settings. The majority of them are at night or in the dark because entertainment is likely to be in the evening. Also the dark could be favourable for clandestine activities. SRH interventions to target nights and darkness temporal settings could be difficult. However, raising of awareness through posters, leaflets and other Information Communication and Education (IEC) materials, as well as infection prevention services, could still be the way forward [264].

Service provider ranking and preference

The ranking of service providers by adolescents showed that adolescents who participated in the FGDs preferred dispensaries for SRH needs.

Although not specific for SRH only and over 15 years ago, Masatu et al 1998 reported that adolescents' preference for modern health facilities in comparison to traditional healers was high [265]. A study covering Burkina Faso, Ghana, Malawi and Uganda reported in 2007 that adolescents consistently preferred to go to public facilities for SRH services, similarly to what we found in this sub-study [266]. However, it is unclear to what extent this positive report on provider preference conforms to Hawthorne effect reported elsewhere [267, 268], especially since evidence continues to establish that adolescents are going to other places, such as traditional healers and drug stores [92, 250] and find public facilities untrustworthy and costly [269] .

Drugstores are the third option for adolescents after the private clinics and dispensaries. This finding is welcome because they are likely to be more knowledgeable than the traditional healers or community health workers. However, self diagnoses and use of medicines without prescription is a big issue in this setting as drugstores lack diagnostic and prescription knowledge.

Traditional healers were ranked higher than NGOs, traditional birth attendants and village health workers in this population. Yet these three are more likely to have exposure to SRH training and orientation compared to traditional healers (See Chapter 4). The reason why adolescents chose this provider in this population was that the traditional healers provide regimens (like drugstores and dispensaries) which traditional birth attendants and

village health workers cannot do. In addition, as shown in Figure 5.6, traditional healers were said to treat people on credit. Other researchers have reported that traditional healers are particularly popular because they advertise themselves as having medicines to cure all diseases and often claim to add supernatural or spiritual enforcements to their treatments [270]. It has been argued that this added to the fact that formal health facilities do not have medicines, are not private, are not confidential and because of stigma attached to STIs, the majority of community members end up seeking treatment from traditional healers [270].

Weaknesses identified with the village AIDS committees and NGO facilities were specifically related to a lack of knowledge of where they operate. Adolescents reported not knowing where these committees and facilities are located within their villages. Also the informal nature of their work and lack of fixed base of operation was reported in Chapter 4 of this thesis. This fact also contributed to our decision to work with CTC providers who had specific addresses of operation – i.e. the dispensaries and drugstores. This was also in addition to referral from drugstores to dispensaries corroborated by dispensaries in Chapter 4 (although not reported by adolescents). Therefore, we considered drugstores in comparison to other CTC providers whose referral was neither corroborated by dispensaries nor reported by adolescents.

Adolescents' recommendations to improve the service provision and access in their community included 'long-term' solutions, such as building new dispensaries in the villages, and 'immediate' solutions, such as ensuring

confidentiality and trustworthiness of providers. We picked upon the 'immediate' suggestions for our implementation due to lack of capacity to implement the 'long-term' solutions.

Sub-study limitations and strengths

Limitations

This study used FGDs, which are known to be subjective [220]. The weaknesses we identified in sub-study 1 apply to this sub-study as well. For example, the participants could have feared to express themselves fully worrying about confidentiality, or they might have given similar answers or marked similar risks or resources on the maps due to peer pressure. Therefore, their views could not be generalised to other settings. We did not have sufficient time and financial resources to explore deeper issues of SRH risks and prompt individual participants to tell their experiences in in-depth interviews.

Strengths

The sub-study used mapping techniques which encouraged active participation during the discussions. Despite the acknowledged weaknesses of FGD methodology, the inclusion of a range of participants stratified by gender and sex is likely to have strengthened validity of our findings. We used same-sex discussion moderators and separated males and females during discussions, in order to create an environment conducive to participation. We selected a narrow range of age groups to enable participants to relate to each other's understanding of risks and resources.

These approaches embedded within the action research methodology helped to achieve the outcome of this sub-study, which was to establish the participants' perceptions on SRH risks and views on preferred SRH service providers, in order to prepare for the intervention.

Summary

This chapter has demonstrated that the communities have SRH risks that are bound by temporal and spatial factors. The communities have also reported that they have negative experiences of seeking SRH services both at the CTC providers' level and at the health facility (dispensary) level. These communities have however identified the dispensary as their most preferred source of SRH services. In the next chapter, we examine the SRH service infrastructure and uptake of these services at the health facility level (dispensary and health centre).

6 Sub-study 3: facility infrastructure and service uptake situational analysis

Introduction

This chapter presents the third and final situational analysis Sub-study conducted with the health facilities in the intervention communities. The sub-study focused on two specific areas:

(1) Availability of infrastructural resources for effective provision of SRH services such as (i) buildings and in-patient rooms and beds; (ii) SRH diagnosis, treatment and care equipment; and (iii) human resources to attend to SRH patients and service users.
(2) Statistics on the use of SRH services at the health facility level looking at the numbers and proportions of patients received in these health facilities reporting various SRH conditions.

This sub-study was also conducted before the intervention development and also falls under the planning stage of the action research cycle. The chapter discusses the background and justification of the Sub-study, methods used, results obtained and a discussion of these results in terms of prototype intervention development.

6.1 Background

6.2.1 Infrastructure for SRH services

Lack of infrastructural resources is a long-standing problem reported in health facilities in Tanzania [271, 272] and has been documented as one of the factors hindering SRH services access [234]. In particular, poor infrastructure has been associated with poor indicators on provision of confidential youth-friendly services [237], lack of hospital beds for in-patients [273] even more recently for national campaigns such as male circumcision [274], for maternal health services [275] and for lack of ART treatment facilities including equipment and drugs [276]. Furthermore, lack of human resources has been argued to be a major factor influencing poor outcomes in provision of and accessibility to SRH services [277].

In order to develop an intervention geared towards improving SRH service uptake through CTC linkages with the mainstream health facilities, we aimed to establish how severe these issues were in health facilities situated in the communities where the intervention was to be implemented. In this way we could determine how such an intervention would affect provision and uptake of these services.

6.2.2 Uptake of SRH services

As discussed in Chapter 2, uptake of SRH services in health facilities in Tanzania is low: only 57% of men and 45% women who reported having a STI symptom sought treatment from a formal health facility. A high proportion (21%) of people who had a STI sought treatment from an NGO

or drugstore and only 43% of men and 59% of women aged between 15-49 years had ever tested for HIV [55]. In Mwanza, only 38% of women and 35% of men aged 15-24 years had a comprehensive knowledge of AIDS and only 46% of pregnant women delivered in a health facility (a figure that is below the 50% national average), despite overall ANC attendance of >90% [55]. We wanted to take into account these factors during the intervention development so that we could observe how different the estimate of intervention achievement is to the national and regional statistics.

6.2 Methods

Setting

The sub-study was conducted in 18 health facilities (described in Chapter 3). The facilities included 15 dispensaries and 3 health centres in Magu and Sengerema Districts, Mwanza Region, covering IntHEC clusters of rural, urban and high-risk wards (see Chapter 3 for details).

Infrastructural resources

Their data were collected using a checklist tool (Appendix 6.1) developed, pretested in Mwanza health facilities and revised to collect data on infrastructural resources available for provision of SRH services. The tool was primarily developed to capture all resources and equipment for general SRH services including hospital beds, microscopy, medicines and human resources.

The tool was applied using trained interviewers who went to the health facility after making an appointment and interviewed the facility in-charge

or representative. Questions were asked about these resources and figures were entered into the tables of the checklist tool. The pretesting was particularly important to determine the number and training of health workers and their cadres as collected by tool.

Uptake of SRH services

These data was collected using a tool (Appendix 6.2) developed, pretested in health facilities in Mwanza and revised to collect all SRH-related data from the health facilities. Secondary data was collected from MoHSW national registers existing at the time in all health facilities in the intervention wards. These registers are called '*Mfumo wa taarifa za Uendeshaji wa Huduma za Afya'* (MTUHA) – which stands for "the system of reporting implementation of health services". The registers collect numbers of health service uptake for SRH, covering HIV and STIs, family planning, ANC and maternal delivery. The tool was designed to collect these SRH data from all health facilities in the intervention. Research assistants with local Kiswahili knowledge went to all health facilities (supervised by John Dusabe) and after making appointments, requested the MTUHA books and recorded the data from them into the sub-study research tool.

Ethical considerations

The infrastructural and service uptake tools introduced above were implemented concurrently because indicators for both these topics were needed from similar health facilities. Before the start of this sub-study in June 2012, health facility in-charges read the sub-study information sheet

and signed a consent form permitting us to collect these data. The data was collected in June 2012. After data collection, the filled infrastructural and service uptake checklists for 18 health facilities (15 dispensaries, 3 health centres) were scanned at NIMR Mwanza and emailed to LSTM. At LSTM, the data was double entered: first by an MSc student who transferred the data from the scanned hardcopy forms into the MS Access database; second by John Dusabe re-entering the data and searching for discrepancies between the data entered and the hard-copy forms. The database was then transferred into STATA 13.1 (StataCorp, College Station, Texas) and analysed.

6.3 Results

6.4.1 Infrastructure

Table 6.1 Infrastructural resources in the health facilities

Health facility*	**Buildings**	**Rec rooms**	**Consul rooms**	**Couns rooms**	**YFS rooms**	**OPD rooms**	**IPD rooms**	**IPD rooms Male**	**IPD rooms Fem.**	**IPD beds M/F**	**Labour/ Delivery rooms**	**Phar macy**	**Micro scopes**	**Stethos copes**
Disp1	1	1	1	0	0	1	0	N/A	N/A	N/A	1	0	1	1
Disp2	2	1	1	1	0	1	0	N/A	N/A	N/A	1	0	1	1
Disp3	1	1	1	1	0	1	0	N/A	N/A	N/A	1	0	1	1
Disp4	1	1	1	0	0	1	0	N/A	N/A	N/A	1	1	1	2
Disp5	1	2	1	1	0	1	0	N/A	N/A	N/A	1	1	1	2
Disp6	1	0	1	1	0	0	0	N/A	N/A	N/A	1	0	1	1
Disp8	2	2	0	0	0	1	0	N/A	N/A	N/A	1	0	1	0
Disp9	1	0	0	0	0	1	0	N/A	N/A	N/A	1	0	1	1
Disp10	2	1	1	0	0	1	0	N/A	N/A	N/A	1	0	1	2
Disp11	1	1	1	1	0	1	0	N/A	N/A	N/A	1	0	1	0
Disp12	1	0	0	0	0	1	0	N/A	N/A	N/A	1	0	1	1
Disp13	1	0	1	1	0	1	0	N/A	N/A	N/A	1	0	1	0
Disp14	1	0	1	0	0	1	0	N/A	N/A	N/A	1	0	1	0
HC16	12	2	0	1	0	2	3	1	1	0/0	2	2	1	3
HC17	6	1	3	2	0	1	1	1	1	4/11	1	1	2	4
HC18	1	1	1	1	0	1	2	1	1	5/5	1	1	1	0

Key: *Infrastructure data was missing for Disp7 and Disp15 and therefore those two facilities have been excluded from Table 6.1 above; Rec Rooms – reception or waiting rooms; Consul rooms – consultation rooms; Couns rooms – counselling rooms; OPD – out-patient department; IPD – in-patient department; YFS rooms – youth-friendly service rooms; M – male patients; F – female patients.

Buildings

Of 16 health facilities, 11 (10 dispensaries and 1 health centre) had only one building at the facility premises. Three dispensaries had 2 buildings each. There was no significant difference in the number of buildings on the dispensary site across all dispensaries. There was however a significant difference in the number of buildings at the health centre site: the first [HC16] had 12 buildings, the second [HC17] had 6 and the third [HC18] had only one building onsite. Facility building sizes and their measurements were beyond the scope of this sub-study.

Reception rooms/waiting rooms

Thirteen health facilities had at least one reception room. Two dispensaries and one health centre had two reception rooms, five dispensaries had no reception room and the remaining health facilities (six dispensaries, 2 health centres) had one reception room each. A lack of reception room could mean a lack of a patients' waiting area. We asked the interviewee whether there was any other room or any other name by which they called the room e.g. patient waiting room or sitting room and there was none.

Consultation rooms

Three dispensaries and one health centre (HC16) had no consultation rooms. Therefore, it is questionable how confidential patient consultation would take place in those facilities, especially in health centres that are larger and serve a bigger catchment population and receive referrals from dispensaries. However, this particular health centre had a counseling room, so it is unclear whether that was where consultations took place.

Counselling room

Seven health facilities had no counselling room. All others had one counselling room except HC17 which had two. Counselling rooms were asked in terms of voluntary counselling and testing (VCT) and PITC (provider initiated testing and counselling) which is provided as a service before HIV testing and all other SRH consultations respectively.

Youth friendly services (YFS) rooms

None of the dispensaries or health centres had a YFS room. This was asked to establish whether the facilities provided confidential YFS.

Outpatient department (OPD) rooms

All facilities had one out patient department (OPD) room except HC16 which had two. There was one health facility (Disp6) without an OPD room. It is unclear what the difference was between an OPD and a reception room. This is because some facilities which didn't have an OPD had a reception and vice versa.

In-patient department (IPD) rooms

No dispensary had an IPD room. Predominantly, dispensaries are small health facilities and therefore do not admit inpatients, reserving admitable patients for referral. Therefore this could explain the lack of IPD rooms. All three health centres had IPD rooms. HC16 had three IPD rooms. However, when asked to specify how many were for males and how many were for females, one was for male and another for female in-patients. It's unclear what the third IPD room is used for, as telephoning the facility at the

analysis stage was unsuccessful. HC17 had only one IPD room but once asked to specify it said it had one for male and one for female, which also could be either an error or a misunderstanding of the question. Stratification of IPD rooms for different sexes was not applicable for the dispensaries, as they reported not having any IPD rooms. Among the three health centres which had IPD rooms, HC16 did not have any IPD beds, which casts doubt on its ability to admit in-patients. HC16 and HC17 both had IPD beds for male and female in-patients.

Labour/delivery room

All facilities had at least one delivery room. HC16 reported to have two.

Pharmacy

Eleven out of thirteen dispensaries did not have a pharmacy room or drugstore within the premises. This could suggest that either they refer all their patients to drugstores to buy medicines or to health centres for medicines. All other facilities had at least one pharmacy, with HC16 reported as having two.

Microscopes

All health facilities had at least one microscope; one health centre (HC17) had two microscopes.

Stethoscope

Although not as relevant for SRH as the other resources, lack of stethoscopes in the facilities could be a measure of how resource-poor these

facilities are. Five dispensaries and one health centre did not have a stethoscope in the facility. The remainder had at least one; the highest number being four at HC17.

Number and cadre of staff in the health facilities

Table 6.2 Human resources in the facilities

Health facility *	MO/ Asst	CO/ Asst	NO/PHN/EN	NM	MA	NA	Pharmacist /Asst	Pharm Tech	Lab Tech/Asst	Receptionist	Guard	Messenger/ other staff	Total
Disp1	0/1	1	1	1	0	3	0	0	0/1	1	1	0	10
Disp2	0	1	0/1	1	1	0	0	0	0	0	1	0	5
Disp3	0	0	0	2	0	0	0	0	0	0	1	0	3
Disp4	0	1	0	0	2	0	0	0	0	0	0	0	3
Disp5	0	1	0	0	2	0	0	0	0	0	0	0	3
Disp6	0	0	0	0	1	0	0	0	0	0	0	0	1
Disp8	0	0/1	0	2	1	0	0	0	0	0	0	0	4
Disp9	0	1	0	0	2	0	0	0	0	0	0	0	3
Disp10	0	1	0	1	1	0	0	0	0	0	0	0	3
Disp11	0	1	0	0	1	1	0	0	0	0	0	0	3
Disp12	0	1	0	0	2	0	0	0	0	0	1	0	4
Disp13	0	1	1	0	2	0	0	0	0	0	0	0	4
Disp14	0	0	0	0	2	0	0	0	0	0	0	0	2
HC16	0/1	0	1/0/1	1	2	1	0	0	0/2	0	1	2	11
HC17	0/1	3	0	3	10	0	0	0	1	0	2	0/1HO	21
HC18	0/1	1	0	4	6	0	0	0	0/1	0	2	0/1HA; 1RCHA; 1D	18
Total	4	14	4	15	5	5	0	0	5	1	9	4	98

MO/Asst – medical officer or assistant; CO/Asst – clinical officer or assistant; NO/PHN/EN – nursing officer/public health nurse/enrolled nurse; NM – nurse midwife; MA – medical attendant; NA – nursing assistant; Pharm Tech – pharmacy technician; Lab Tech – laboratory technician; HO – health officer; HA – health assistant; RCHA – reproductive and child health aide; D – driver.

Medical officer and assistant medical officer

This is a cadre of health personnel who are trained doctors. In Tanzania, doctors are usually at the hospital level but some big health centres have doctors. All three health centres had an assistant medical officer at the facility. However, there was one dispensary which was reported to have an assistant medical officer.

Clinical officer and assistant clinical officer

Clinical officer is a cadre below the doctor and has a diploma in clinical medicine. In general most health facilities below hospital level are operated by clinical officers. However, there were three dispensaries without this cadre. One had an assistant clinical officer.

Nursing staff

All facilities had at least one nursing staff of some cadre. Only Disp1 and HC16 had a nursing officer. Disp2 and HC16 had an enrolled nurse. Eight health facilities had at least one nurse midwife. This cadre had been identified to have qualifications equivalent to being a midwife but also carries out nursing duties. The rest of the health facilities had either a medical assistant or a nursing assistant.

Pharmacy staff

None of the health facilities (including the two dispensaries and three health centres with pharmacies) had either a pharmacist, pharmacist assistant or pharmacy technician.

Laboratory staff

Only one dispensary and all the three health centres had a lab technician.

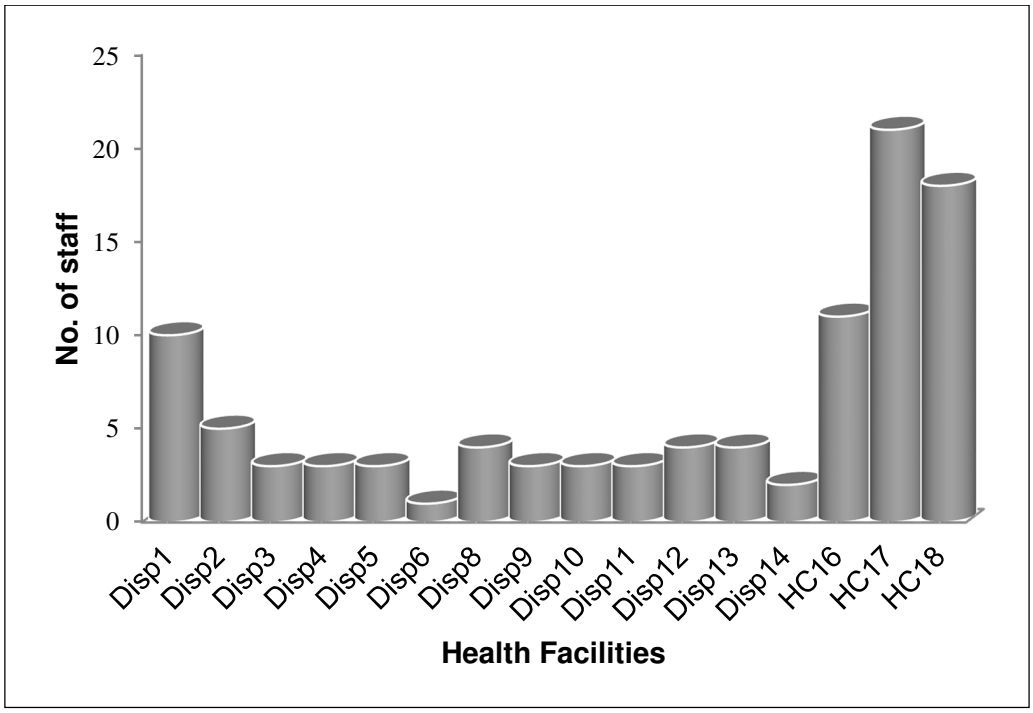
Other health staff

HF17 had a cadre of health officer. HF18 had a health assistant and a reproductive and child health aide. The rest of the facilities had no other health staff.

Support staff

One dispensary had a receptionist, three had guards (one in each dispensary) and all three health centres had a guard. During pretesting it was suggested that most health facilities had a messenger as a staff member, but only HC16 reported having that cadre in their staff.

Figure 6.1 Graph showing number of staff in health facilities



Total number of staff

Figure 6.1 depicts the total number of staff per facility for all the 16 health facilities. The majority of dispensaries had under five staff, with the average number of staff being three. Disp6 had only one staff member. This data was rechecked and verified that only one medical attendant was employed in this health facility at the time of the study.

6.4.2 SRH service uptake

As described in Chapter 3, clustering was based at the ward level to evaluate IntHEC community-based interventions. Health facilities were therefore not matched. For this reason, we could not estimate the effect of ward and district characteristics on SRH-seeking behaviour at the health facility level. Results presented below therefore are basic range of values and proportions of SRH service uptake in the health facilities.

Table 6.3 SRH service uptake in the health facilities

SRH service uptake from March to May 2012 by males and females aged 15-34 years in 16 health facilities in Mwanza

	Disp 1	Disp 2	Disp 3	Disp 4	Disp 5	Disp 6	Disp 8	Disp 9	Disp 10	Disp 11	Disp 12	Disp 13	Disp 14	HC 16	HC 17	HC 18	Overall Total
Conditions	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**	**M/F**
Have HIV	0	0/1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0/1
Don't have HIV	0	1/6	0/10	0	0	0	0	0	0	0	0	0	0	0	0	0	1/16
Need ARVs	0	118/295	3/37	0	0	0/2	0	0	0	0	0	0	0	0	0	0	121/334
ARVs-Returns ψ	0	0	4/15	0	0	0	0	0	0	0	0	0	0	0	0	0	4/15
HIV Total	0	119/302	3/47	0	0	0/2	0	0	0	0	0	0	0	0	0	0	122/351
Have STIs	0	0	0/16	0	13/26	3/7	90/0	0	6/15	3/0	0	0	0	0	0	0	115/64
Don't have STI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STI Total	0	0	0/16	0	13/26	3/7	90/0	0	6/15	3/0	0	0	0	0	0	0	115/64
Pills for FP*	0	5	6	4	5	20	11	4	7	0	28	3	5	0	32	0	130
Injections for FP *	0	61	23	17	2	61	18	53	30	0	53	73	16	72	59	0	538
Implants for FP*	0	59	40	1	31	17	1	0	4	0	0	1	0	0	5	0	159
Other FP*	0	0	0	0	8	0	0	0	7	0	0	0	0	0	0	0	15
Total FP	0	125	69	22	46	98	30	57	48	0	81	77	21	72	96	0	842
ANC *	0	254	116	32	84	101	66	92	147	0	70	104	13	64	0	48	1,191
DELIVERY *§	0	198	100	24	8	92	35	31	14	0	22	21	3	13	9	14	584
Obstetric total	0	254	116	32	84	101	66	92	147	0	70	104	13	64	9	48	1200□
Total without obs. and FP	0	119/302	3/63	0	26/52	3/9	90/0	0	6/15	3/0	0	0	0	0	0	0	237/415
Sex total: Male Female	0	119 681	3 248	0 54	13 156	3 208	90 96	0 149	6 210	3 0	0 151	0 181	0 34	0 136	0 105	0 48	237 2457
Overall total	0	800	251	54	169	211	186	149	216	3	151	181	34	136	105	48	2694

*Female only (not applicable to males)
Note: Disp7 and Disp15 were excluded in the table as data for these facilities were missing
Ψ Numbers from this row were not included in the Disp3 total of 3(M)/248(F) and the overall total of 237(M)/2457(F) to avoid double counting
§ Numbers from this row were not included in the overall total as they were counted under ANC
□Includes 9 women who delivered in the health facility but did not attend ANC

Uptake of services per health facility from Disp1 to HC18 is presented in Table 6.3. Two dispensaries (Disp7 and Disp15) are missing. One dispensary (Disp1) did not receive patients requesting any SRH services for the three-month period. HC18 did not receive any patient except for ANC and delivery.

Table 6.4 No. of patients received in 3 months

	With FP and MH*			Without FP and MH		
	Number	Per cent	95% CI	Number	Per cent	95% CI
Male	237	8.80	0.07 – 0.09	237	36.35	0.32 – 0.40
Female	2457	91.20	0.90 – 0.92	415	63.65	0.59 – 0.67
Total	2694	100.00		652	100.00	

*FP – family planning; MH – maternal health

A total of 2,694 patients were received in 16 health facilities from March to May 2012 (Table 6.4). Of these, 91% (95% CI 0.90 – 0.92) were female, when all SRH services are included in the denominator. When SRH services that are only pertinent to women are excluded from the denominator, the total number of patients received was 652, of which 64% (95% CI 0.59 – 0.67) were female.

Age groups

The MTUHA records used did not collect age group data for most of the SRH services provided. For example, the age of people seeking STI and HIV services was not recorded, only names and the village of origin. Therefore the statistics presented do not stratify per age.

Tables 6.5, 6.6 and 6.7 describe the proportion of sex and SRH condition as a proportion of the total.

Table 6.5 No. of patients and sex proportion per condition

HIV	Number	(%)	95% CI
Male	122	25.79	0.21 – 0.29
Female	351	74.21	0.70 – 0.78
Total	473	100.00	
STI	Number	(%)	95% CI
Male	115	64.25	0.56 – 0.71
Female	64	35.75	0.28 – 0.43
Total	179	100.00	

As shown in Table 6.3, the majority of patients who sought HIV services were reported at Disp2: 90% of all HIV services (421/473) sought within the 3 months were accessed at Disp2, and 98% at this health facility were for ARVs (413/421). Table 6.5 shows that overall more females sought HIV services (74%; 95% CI 0.70 – 0.78) compared to males (26%; 95% CI 0.21 – 0.29). Table 6.3 shows that 19 patients using ARVs returned to the health facility (mainly Disp3) to collect medicines. These patients were therefore excluded from the HIV total and overall total number of patients to avoid counting them twice. Within the three month period, only one patient tested HIV positive (at Disp2). The research assistants looked through the records to establish whether there was a record of patients who tested for HIV and got negative results. There were none. It is also possible that this data was not recorded at the health facilities visited.

More males sought STI services (64%; 95% CI 0.56 – 0.71) than females (36%; 95% CI 0.28 – 0.43). However, 50% of all male STI patients (90/179) came from one health facility (Disp8). We tried to establish whether data for STI counseling and condoms for STI/HIV prevention were recorded but no data were available. It is not clear whether it is because

those services are not sought or whether the facilities do not record that data.

Table 6.6 No. of FP service uptake – women only

Family planning	Number	%	95% CI
Pills	130	15.44	0.13 – 0.18
Injections	538	63.90	0.60 – 0.67
Implants	159	18.88	0.16 – 0.21
Other	15	1.78	0.01 – 0.02
Total	842	100.00	

In this sub-study, family planning/contraception was categorized as an only-women service. This is because during tool pre-testing it was established that health facilities do not receive men seeking family planning services. Therefore their records (MTUHA) did not have provisions to record them.

Overall, 842 women sought family planning services, i.e. 31% of all SRH service uptake (842/2694) (Table 6.6). As Table 6.3 and 6.6 demonstrate, among the specific services given by the health facilities, contraceptive injections were the most sought after (64%). Implants were chosen by 19% of patients, whereas 15% selected the contraceptive pill. Data on implants included the IUD. The tool collected data on condom seeking for family planning but MTUHA registers did not record this data.

Table 6.7 Obstetric service uptake

Obstetric services	Number
ANC	1191
Delivery	575 (Subset of 1191; +9 non-ANC deliveries)
Total	1200★

★The total number of obstetric service uptake equals the total number of ANC uptake. However, nine women who had not attended ANC delivered at HC17 and were therefore added to this total.

ANC comprised the highest proportion of people seeking a single SRH service at the health facilities, 44% of the total (1191/2694, Table 6.3). All health facilities, except Disp1, Disp11 and HC17, catered to women in need of ANC services. On average, each health facility provided ANC services to 74 women in the three months' period. Since the data covered a period of three months only, all ANC attendance data were for only one visit and no returns as ANC visits are within at least an interval of 3 months (WHO recommendation). Collection of data on women who completed more than one visit were therefore beyond the scope of the sub-study. A total of 584 women (48% of 1191) delivered in the health facility within the three months. However, this percentage cannot be interpreted as the proportion of women attending ANC who delivered in the health facility as ANC attendance and delivery was being collected at the same time. It is possible that an unknown proportion of the 575 could be among the 1191, for example if women sought ANC during the last trimester and delivered between March and May at the same health facility. There was no record to substantiate this assumption. For this reason, this number (575) has been assumed under the total 1191 ANC to avoid double-counting errors.

6.4 Discussion

This sub-study was conducted with the intention of obtaining data on health facilities that could be used to:

(i) Design the CTC community referral intervention;

(ii) Serve as a situational analysis to estimate the standard level of SRH service uptake before the intervention implementation.

In this section we discuss how the results presented in this chapter impacted upon our intervention development discussions prior to intervention development. Also we outline how the results align with literature on infrastructural and human resources, as well as service uptake from studies that have been previously conducted in Tanzania.

6.5.1 Infrastructural resources

The results of our sub-study confirm what has been previously reported on the lack of infrastructure in Tanzanian health facilities. Gilson et al 1995 reported that a lack of infrastructural quality in dispensaries and health centres caused serious challenges to provision of effective curative services [271]. From 1995 up to 2014, when this sub-study was conducted, the majority of dispensaries and health centres still lacked these resources. The majority had only one building structure on the premises that encompassed all health facility requirements. All dispensaries and health centres lacked youth-friendly service facilities, the majority didn't have patient waiting areas and some had no consultation rooms. These results corroborate Renju et al 2010, who reported that even where consultation rooms existed there were no doors. Therefore clinical consultations took place in open areas and privacy was seriously compromised [211]. This finding therefore

highlighted a need to design an intervention that would maximize patient confidentiality during consultations.

All health facilities had labour or delivery rooms. This could suggest there was building infrastructure to provide maternal health and obstetric care services. Boller et al 2003 also reported that both public and private health facilities in Tanzania had good structural quality for ANC provision [278]. Indeed, ANC uptake is at an excellent level of 97% in Tanzania [111]. However, facility delivery still remains low at just 50%[55] and lack of infrastructure has been suggested to contribute to this [279].

Lack of laboratory infrastructure was one of the main reasons why the WHO adopted guidelines in 1991 that promoted use of syndromic diagnosis of STIs in developing countries' health facilities [78]. However, many of the health facilities in this sub-study lacked even simple medical equipment such as stethoscopes, suggesting the situation was still severe in these health facilities.

As reported in our results the majority of dispensaries did not have a pharmacy or drugstore within the premises. A lack of pharmacy or drug rooms suggests no medicines were at these facilities. Lack of medicine is widely reported in Tanzanian health facilities [16, 233, 234]. Communities have reported this as one of the reasons why they do not want to go there, mainly because they believe they will not get medicines [234]. In our sub-study this predicament was also confirmed by the fact that none of the health facilities employed a pharmacist or drug-dispensing personnel of any cadre. This finding was one of the major determinants in our decision to

design a CTC community referral intervention that integrated community drugstores with formal health facilities.

Human resources

Our sub-study found a severe shortage of health personnel in all health facilities surveyed. Some health facilities (e.g. Disp3, Disp6 and Disp14) lacked core clinical staff (clinical officers) to perform diagnostic and treatment decision making. Poor human resource availability in health facilities in Tanzania is an ongoing discussion in research [280]. In 2008 MoHSW reported that nationally only a third of posts were filled in health facilities[281]. The report emphasized that dispensaries and health centres were worse off, with staff shortages of 66% in dispensaries and 72% in health centres.

Our sub-study found that often the only staff available in the health facilities were the nursing staff. Other studies have also reported that there are more nursing staff in health facilities than any other cadre, that nursing staff are predominantly conducting advanced clinical duties without the skills needed and that they are constantly overworked [282, 283]. Some researchers have suggested that this work burden contributes the unfriendliness that has been reported for this cadre [284].

The lack of laboratory, pharmacy and other auxiliary staff we found in this sub-study could be related to lack of specialist equipment and tools for these professions to use, coupled with general lack of resources in these facilities. The situation was severe in rural areas; for example, Disp6 is based in a very rural area and had only one Medical Attendant as the only person

operating a whole dispensary. Disparities in rural versus urban healthcare workforce has been reported by other researchers in Tanzania [285]. We found this an important finding as it emphasised the need to develop an intervention that minimised overuse of the scarce manpower in the health facilities.

6.5.2 SRH service uptake

In Tanzania a dispensary covers a population of 6,000 to 10,000 people and a health centre covers a population of 50,000 people [35]. Based on that catchment it can be estimated that the 16 health facilities presented in our sub-study covered a population of 80,000 to 150,000 people. We have described above the situation of human and infrastructural resources for provision of health services. Below we discuss what could be the implications of this lack of resources for service uptake.

The results presented were collected over a three month period using records from registers in health facilities that were not matched or structurally selected but default due to their location in IntHEC community trial. In addition, data on socio-demographic characteristics of patients (such as village of residence and age) were not in the registers. Apart from basic proportion computations, no statistical comparisons could be performed on the data. Therefore this discussion elaborates on the numbers we obtained from the facilities.

Number, sex and age of the patients

Our sub-study suggests that women seek SRH services more than men. However, the percentage of women seeking SRH services is inflated by

family planning, ANC and delivery services which are specific for women. This makes the overall totals of women and men contrastingly incomparable (i.e. female uptake of SRH service is 91%). However even when we excluded 'women-only' services to investigate whether there was still a sex-specific difference in SRH service-seeking behaviour, we still found that the proportion of women seeking SRH services was higher than that of men. In 2010 the DHS found a similar sex distribution on SRH service uptake, where more women sought HIV testing services than men (59% versus 42% respectively) [55]. However, because the numbers for HIV services in our sub-study are from one health facility (Disp2) and numbers of STI services are almost all male from another health facility (Disp8), we could not perform any statistical test to determine whether being male or female was associated with any likelihood of seeking these services.

Patient age was missing from the records for most services especially family planning, STIs and HIV service. The tool used was designed to collect data from people aged 15-34 but due to lack of age data on those services we did not have sufficient data to disaggregate patients per age groups.

HIV services

At the time of the sub-study, dispensaries and health centres in Tanzania did not have the capacity to initiate HIV patients on ARVs [286, 287]. It is therefore interesting that 95% of HIV services sought were on ARVs, especially at Disp2 which provided 87% (413/475) of all ARV services. It can be assumed that all these patients were not using ARVs for the first time. Data on return of these patients showed that all ARV service users at

Disp2 only attended once. As Disp2 was a health facility situated in a high-risk ward in Sengerema District, it is likely that either there was an NGO operating ARV services at this facility in the district or there was a district-operated outreach service to provide ARVs at that level in this high-risk area. At the time of data analysis and writing up no investigation was performed to ascertain whether there was an NGO or outreach activity for ARV services due to lack of resources. However there have been pockets of vertical ARV service provision programmes, such as *Tunajali* – a PEPFAR funded project [288], which have targeted small geographical areas in Tanzania.

STI services

Of the 16 health facilities, it is unclear why Disp8 had 50% of all STI-confirmed cases over the three month period. Previous studies have reported that schools take pupils for mandatory SRH services e.g. pregnancy tests [258], so it is unclear whether an intervention of the same nature was done for STIs in the case of our sub-study. No intervention was reported to have been implemented exclusively in the ward where this dispensary is located. However, Disp8 is in a high-risk ward in Sengerema District, therefore it is possible that the arguments presented for high ARV uptake at Disp2 are the same for STI at Disp8. High uptake of STIs services in men compared to women however has also been reported previously in Mwanza communities [289].

Family planning services

We did not collect data on the number of men who came for the contraceptive pill because, although for achievements in family planning involvement of men has been recommended [290], the pretest of our tools showed that men do not come with their wives for family planning. Also the MTUHA books do not collect data on men therefore this was a non-applicable data to collect. It has also been previously reported that men's participation in family planning was poor [291]. For these reasons we decided to restrict the family planning section of the tool to focus on women only.

Our sub-study showed that the most sought-after FP method was contraceptive injection (64%; 95% CI 0.60 – 0.67). This is in line with DHS reports that injection was the most frequently used modern family planning method [55]. Global evidence suggests the same [292].

Although condoms are one of the family planning methods [292], it has been reported that they are not a popular contraception in Tanzania [55]. Our sub-study could not obtain data on condom usage because data is not recorded on men who seek condoms for family planning. Regarding women, the health facilities stated that women cannot ask for condoms when they come for family planning because if they take them home their husbands would assault them, accusing them of cheating (personal communication with in-charge, Disp3). There have been discussions supporting this observation [293]. It was also suggested that condoms are not discreet in cases where women wanted to hide family planning decisions

to men they were sexually involved with and that condoms gave family planning power to men who are known not to be in favour of contraception or protection during sexual intercourse [227].

ANC and delivery

We found that ANC is the most SRH sought service overall, and among women specifically. Several studies have reported success in increasing ANC service uptake globally and in Tanzania [111]. Within the three months, the number of pregnant women who delivered in the health facility was also high.

A rough estimate would suggest that the proportion of women who attend ANC and deliver in the health facility is also high. However as our numbers were collected within the three month period that does not cover the whole gestational period, we used a formula to estimate the possible proportion of facility delivery, which we estimated at 15%. This is below the national average of 50% [55]. It is expected to be higher since this is a self-selecting population at the health facility level compared to the DHS population, which is obtained randomly at the household level. However this sub-study only looked at three months and therefore with over a full gestation period it could be higher.

In this sub-study, 1.5% (9/5840) women never attended ANC but delivered in the health facility. This indicator is not collected by the DHS, but other researchers have reported it [294]. In contexts other than Tanzania, women who do not attend ANC comprise a large proportion of women who deliver in health facilities [295]

The results we report on therefore give an impression on low service uptake of STI and HIV services, coupled with a lack of facility resources to provide these services. There is a high uptake of family planning and ANC services, whereas delivery services are still low. These results give a background on what to expect through the community referral intervention. It will be interesting to interpret the achievements of the intervention through comparisons with the general uptake of services in the facilities where the intervention was later implemented. This is later discussed in Chapter 10.

Strengths and weakness of the sub-study

Weaknesses

The results of this sub-study should be interpreted with caution as it has the following biases:

Firstly, we used a tool that was inherently designed only to pave the way for intervention development as opposed to standard hypothesis testing. It is therefore not generalisable to uptake of other health services and health-seeking behaviour.

Secondly, due to lack of randomisation, matching or clustering at the health facility level, the data obtained are skewed towards certain aspects e.g. sex of the patients or certain facilities. Therefore they cannot be subjected to advanced statistical tests to establish whether there's an association with socio-demographic or other analytical factors.

Thirdly, the tool used by our sub-study obtained secondary data collected by the health facilities' MTUHA books that did not record certain data. This challenge makes comparisons across various settings difficult.

Finally, the data we report on focused on a three-month period from March to May. These are busy months for economic and subsistence activities of farming in Tanzania. During these times people are less likely to seek healthcare [90]. Therefore another study conducted in the same facilities over different months could give a different SRH service uptake picture.

Strengths

Despite the above limitations, this sub-study gives an estimate of the general uptake of SRH services. It was conducted to guide the design of an intervention to improve the uptake of SRH services through CTC community referral into the health facilities. It identifies key issues that are inherently predominant in these health facilities and points to an estimated level of uptake of services in these facilities to show what achievements to expect after the intervention.

The sub-study used data collected directly from the health facilities and their systems. This maximizes the focus and inclusion of facility-level limitations in record keeping; the results show the actual picture of data available in the health facilities. This, combined with the CTC providers (sub-study 1) and community consultation (sub-study 2) results strengthened the cohesion of intervention development and implementation processes.

Summary

This chapter has presented the last of the three situational analysis sub-studies and it was conducted in the health facilities. It has established that the health facilities lack SRH infrastructure and that the uptake of SRH services is poor. It complements the two preceding sub-studies and the next chapter puts into consideration the results from all the three sub-studies to develop a suitable intervention for SRH referral from communities to health facilities.

7 Sub-study 4: intervention development

7.1 Introduction

This chapter summarises results from the three sub-studies and demonstrates how these results were used in decision-making regarding the intervention that was implemented. Through the second stage of the action research framework, the chapter also outlines the intervention design and pre-testing, target audience, participants and implementers. Within the action research cycle, the ideas collated from the three situational analysis sub-studies are put into action to implement the changes needed to initiate referral from drugstores and boost the uptake of SRH services at the health facilities. The work presented here therefore falls under the "act" stage of the action research cycle, but due to the interactions, dialogues and feedback taking place throughout the implementation, the "observation" stage of the action research cycle is also covered here.

7.2 Background

As presented in Chapter 1, the objective of the intervention was to establish a referral mechanism from CTC providers to health facilities using mHealth techniques. Development and implementation of the intervention therefore as presented in this chapter emphasised working with CTC providers and health facilities addressing some of the issues identified previously in Sub-studies 1, 2 and 3.

The various stakeholder cadres consulted were described in the three preceding Chapters (Sub-studies 1, 2 and 3). Results from these sub-studies

have already been described. In brief, Sub-study 1 provided evidence on the CTC providers that existed in the intervention communities. Sub-study 2 provided evidence on the community's preference of CTC providers, while Sub-study 3 provided evidence on the SRH service uptake in the health facilities.

From Sub-study 1 we determined that most of the CTC providers were inconsistent in their service delivery, had limited or no training in SRH service delivery and had no provider physical address. This was also confirmed by the community consultations in Sub-study 2. Because of the multiplicity and range of provider cadres (see Chapter 4) no single intervention could effectively engage them all.

From the CTC provider consultations (Sub-study 1), drugstores were identified as some of the key CTC providers with faint links to health facilities. From community consultations (Sub-study 2), the first three preferred SRH service providers were dispensaries, private clinics and drugstores. Sub-study 3 gave evidence to suggest that SRH service uptake was generally low in health facilities. Although private clinics ranked the second (after dispensaries) as a source of SRH services in Sub-study 2, our Sub-study 1 had not identified this cadre. For this intervention therefore, drugstores were considered because they were one of the CTC providers in Sub-study 1, they were identified by communities in Sub-study 2 and there was evidence to suggest that they treat patients with SRH conditions, sometimes inadequately (as discussed in Chapter 2). Amongst the other CTC providers identified in Sub-study 1, drugstores also fulfilled the

requirements for our community referral intervention because of the following five factors:

(1) Stability: they had a physical address
(2) Competence: some attendants had already obtained some medical training (dependent on whether the drugstore was registered)
(3) Coverage: they appeared to be the major provider of treatment for STIs and other SRH conditions
(4) Status: their attendants were commonly described as "doctor" by community members and were more respected than any other CTC providers
(5) Governance: they were the only informal CTC providers that were registered by the Ministry of Health and were regulated by a body (Tanzania Food and Drug Administration – TFDA) that monitors their practices.

Sub-study 3 had established that there was a general scarcity of human resources in the health facilities. We therefore wanted to develop an intervention which used minimal time resources of health staff at the facility and which did not add extra burden of work beyond the reasonable adjustment to provide SRH services to referred patients.

Working with CTC providers based right in the community was part of the core strategy in the intervention protocol. Existing policies and research suggest that health promotion interventions are more likely to be successful if they are based within the primary healthcare setting [248, 296]. Drugstores in the communities are at the lowest of level of healthcare

delivery and therefore ideally placed to influence the health outcomes of the communities.

The process of designing our intervention followed a framework recommended by Campbell et al in their paper of 2000 [297]. The steps involved identifying evidence that the intervention can work, defining the components of the intervention, designing and implementing the intervention and finally evaluating it to measure its impact [297].

Integrating the CTC provider implementing the intervention (i.e. the drugstore) with health facilities (i.e. dispensaries and health centres) was one of the key outputs of the intervention. It also had to fulfil the community's needs as earlier discussed. Before the start we therefore summarised the views from the community, drugstores and health facilities in Figure 7.1 on their preferred prototype of the intervention. Figure 7.1 formed a model of what we followed during the design and implementation of the intervention.

Figure 7.1 Prototype of intervention preferred

7.3 Intervention rationale

The key intervention preferences identified by stakeholders, as summarised in Figure 7.1, were analysed and used to design an appropriate intervention. The use of mobile phones as a medium of referral was identified as a possible option to implement such an intervention, i.e. one that would enable easy referral to dispensaries. This was decided by the research team and fed back to the drugstores and health facilities seeking views about mHealth [process not described here]. The drugstores and health facilities' positive response enabled the adoption of mHealth tools as described in this

Chapter. As discussed in Chapter 2, mobile phone interventions had been successfully implemented in Kenya [22, 298], Uganda [299], Tanzania [23] and other SSA countries [300] before our intervention. Also discussed in previous chapters, mHealth was viewed as an innovative and accessible intervention that would be confidential for the service users and link health facilities to drugstores through mobile phone service delivery exchange. During site visits, further consultations with the drugstores and dispensaries demonstrated that every drugstore owner/attendant and health facility clinical officer owned a mobile phone. An intervention protocol was therefore designed and iteratively reviewed with NIMR and MoHSW partners in constant consultations with the CTC providers, health facilities and communities.

7.4 Intervention design

The intervention was designed to specifically link drugstores with clinical officers, targeting patients who seek SRH services at the drugstore level in Magu and Sengerema districts (see Chapter 3).

Intervention Objective

The intervention needed to take into account the views of all of the stakeholders and overcome the systemic limitations in existing SRH service provision and access. We therefore prioritised the following key components: referral to proper diagnosis and treatment; confidentiality; and accessibility.

The main aim of the intervention was to increase the patients' uptake of SRH services after referral from a drugstore with specific objectives to measure the proportion of referred patients:

a) Attending HIV and STI prevention and treatment services
b) Attending contraception services including the pill, intra-uterine devices, injections, female condom and sterilization where available
c) Testing HIV positive (where there is a testing service)
d) Diagnosed with STIs (syndromic diagnosis)

Target participants of the intervention

Due to design limitations described in Chapter 3, age and sex were considered to be the key factors that would be used to measure differences in patients accessing services described in the above objectives.

In the intervention, drugstore attendants and health facility clinical officers were to be engaged electronically using their own mobile phones to provide SRH services. Patients at the drugstores were targeted in the intervention because they were seeking SRH services at the drugstore, which is not as qualified as the health facility to provide SRH services. Using patients' phones in the design was not considered an option because it would have limited the intervention to those who owned mobile phones.

Process of the intervention

The intervention was designed such that mHealth referral should take place as per the three steps below:

(i) If a patient comes to the drugstore to buy medicines for an SRH related condition that may require a prescription drug e.g. antibiotics, the drugstore explains the need for referral and available referral system. If the patient accepts, the drugstore sends a text message with the patient details to a toll-free number connected to a web-system.

(ii) The system receives, processes and forwards the patient details including a password to a dispensary matched with the referrer drugstore. At the same time, the password is sent back to the referrer drugstore so that it can be passed on to the patient.

(iii) While at dispensary, patients with passwords are received, matched with details received in the text messages, and given fast track SRH service, after which the dispensary sends a text message to the toll-free number confirming patient treatment has been completed.

Details of the message requirements were originally determined as described in Box 7.1.

Box 7.1 Original requirements of the text-message referral system

1. A patient comes to the drugstore asking for drugs that are SRH related. The drugstore identifies that such a patient needs referral and sends a text message to the dispensary specifying:
    - initials of the patient
    - Date of birth for the patient
    - Gender of the patient
    - Symptom (or the required service) of the patient

2. An electronic system would then receive such a text message and screen the text message and refer it onwards to the dispensary with the details from the specific details drugstore.

3. The dispensary would receive the text message and archive it. When the referred patient comes the dispensary would look at the text message and ID the patient, treat them or provide prescription and send a text message to confirm this treatment with details of:
    - Initials of the patient
    - Date of birth for the patient
    - Gender of the patient
    - Service(s) given: e.g. diagnosis, drugs given, further, down or back-referral if any and medical advice.

4. The system would receive the message from the drugstore, archive it, match the details from the drugstore and the dispensary and complete the referral. The system was also required to have the ability to export data into MS Access or Excel for further analyses.

Sourcing the mHealth software application

Based on preliminary requirements in Box 7.1, an mHealth electronic solutions provider was sourced to translate those requirements into an ICT platform.

Minoxsys Ltd, a UK based Technology Company that provides mHealth solutions was chosen to design the mHealth platform. This was done in partnership between LSTM and the Sainsbury Charitable Trust which provided funding for this mHealth intervention development and

implementation. Engaging Minoxsys Ltd led to discussions that eventually led to the development of the system as presented in Figures 7.2 and 7.3, using the company's Snapshot® software.

Figure 7.2 Text-messaging referral system design

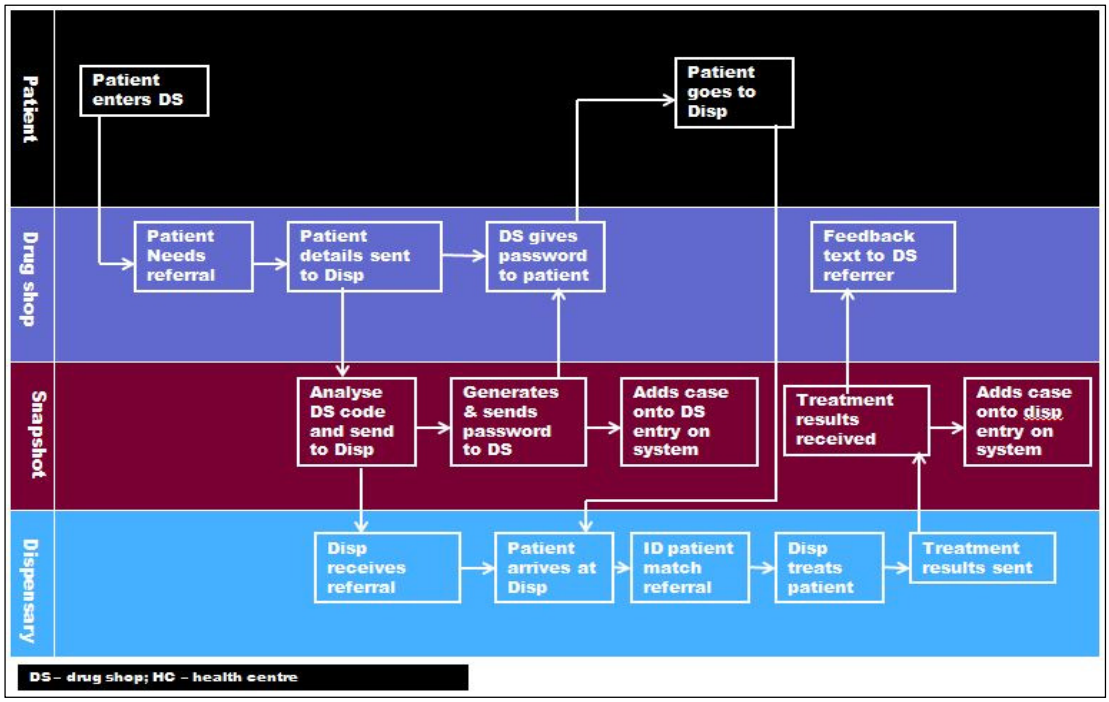
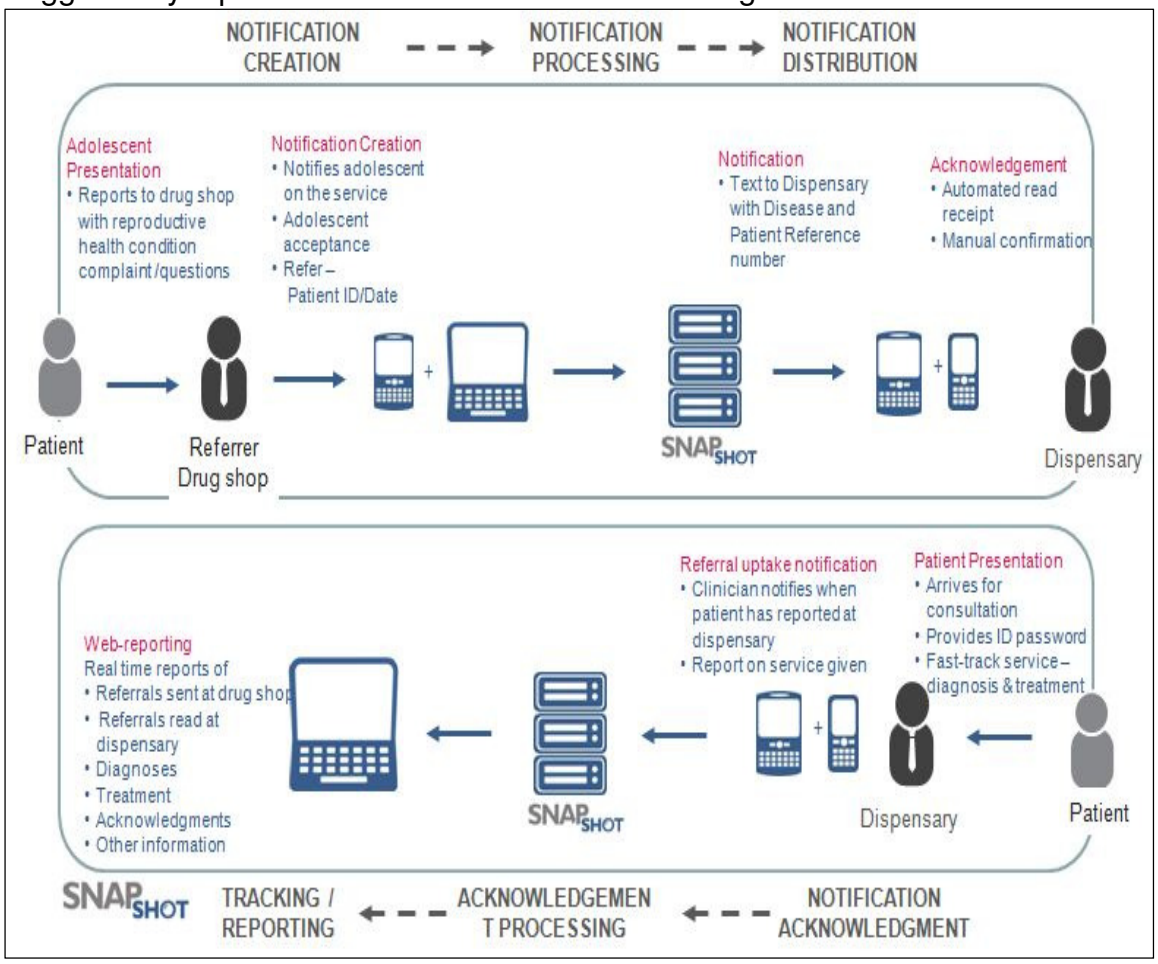


Figure 7.3 Interface aggregation of actions*

*triggered by a patient with SRH condition at the drugstore...



mHealth software requirements and compatibility with mobile phones

The system had a requirement to be compatible with the most basic mobile phones, such that all necessary information should be codable for transmission within 150 characters. A cue card was therefore designed test how drugstores and dispensaries could be guided to use and interpret text message codes. These cue cards were designed using MoHSW and WHO's guidelines on syndromic management of STIs and treatment of RH [301, 302]. Please see Appendices 7.1 and 7.2 for the drugstore and health facility cue cards respectively.

In addition to the system's requirement to send and receive text messages from drugstore attendants and health facility clinical officers, it was also required to provide data access within and outside Tanzania at NIMR, MoHSW and LSTM to retrieve data for discussion, analysis and dissemination. A *Data Transfer Agreement* was signed between LSTM and NIMR to allow electronic data export from Tanzania to the UK.

Toll-free number and configuration onto all mobile networks

To make the service free for the drugstores and dispensaries, a toll-free number had to be obtained from Tanzania Telecommunications Regulatory Authority (TCRA). Selcom Wireless Ltd, a telecommunications company providing SMS in Tanzania facilitated the application and award of the toll-free number hosting service. The number was issued as 15543.

Tanzania has five mobile telephony providers in Tanzania; figure 7.4 below gives a brief description of each. To avoid bias associated with the choice of mobile telephony provider in the study, the system had to accommodate all mobile phone subscriptions. We therefore configured all mobile phone providers existing in Tanzania at the time to the toll-free number awarded by TCRA. This was done to allow drugstores and health facilities regardless of telephone number subscription, to have access to the referral system. Minoxsys Ltd sub-contracted Selcom Ltd to perform this configuration. Selcom's responsibility in the contract was to direct all text messages from all the service providers and all the telephone numbers to our enhanced web-system through the toll-free number.

Figure 7.4 Profiles of mobile network operators in Tanzania

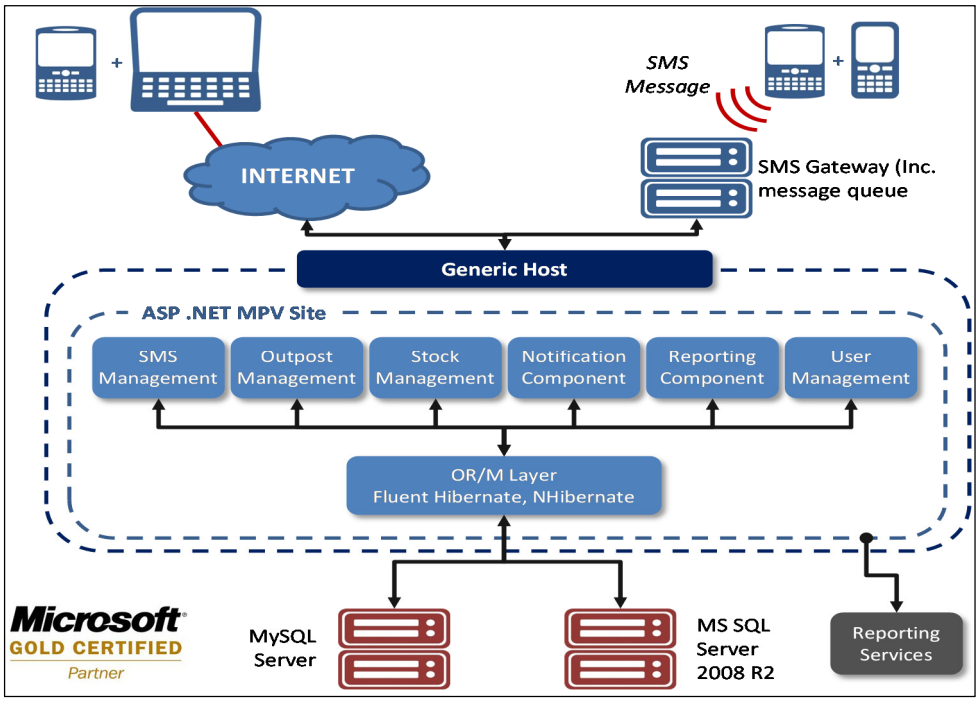
	Tigo is part of MIC Tanzania Ltd, which is the oldest Tanzania's mobile network. It has considerable subscriptions in Mwanza and is popular with students.
	Vodacom is the most popular mobile provider in Mwanza and throughout Tanzania. It has the biggest coverage including in remote rural areas.
	Zantel is the newest mobile phone provider and has a big customer base in rural areas.
	Airtel is the second biggest mobile telephone provider in Tanzania and has the second biggest coverage in Mwanza.
	Tanzania Telecommunications Company Ltd (TTCL) is the oldest provider of telephony services in Tanzania, originally through landline. It has diversified to provide mobile services nationwide.

Technical description of the mHealth software

The software was tailor-made to transmit the required data (Box 7.1) and to give reports pertaining to the objectives of the study directly. It was developed with a user interface for a standard computer, but could also be accessible on other devices with 'online' capabilities. It was designed with a local MySQL database that stored cached information powered by Microsoft frameworks (ASP.NET MVC3). These frameworks facilitated the software's connection to the Internet. The user interface was developed using HTML, CSS and Javascript, which allowed access to the system from any Internet browser. The application was easily configurable and had a customizable user interface (Figure 7.5). In addition the application provided a central repository for data; allowed for the configuration and management of messaging episodes and

data collection; provided administration and security functions; and generated reports, graphs and maps.

Figure 7.5 Minoxsys' technical design features: back-end



Messages sent when there was no mobile connectivity could be stored on the phone's system and delivered on restoration of the network. The system also had a high level of confidentiality that required password access (Figure 7.6).

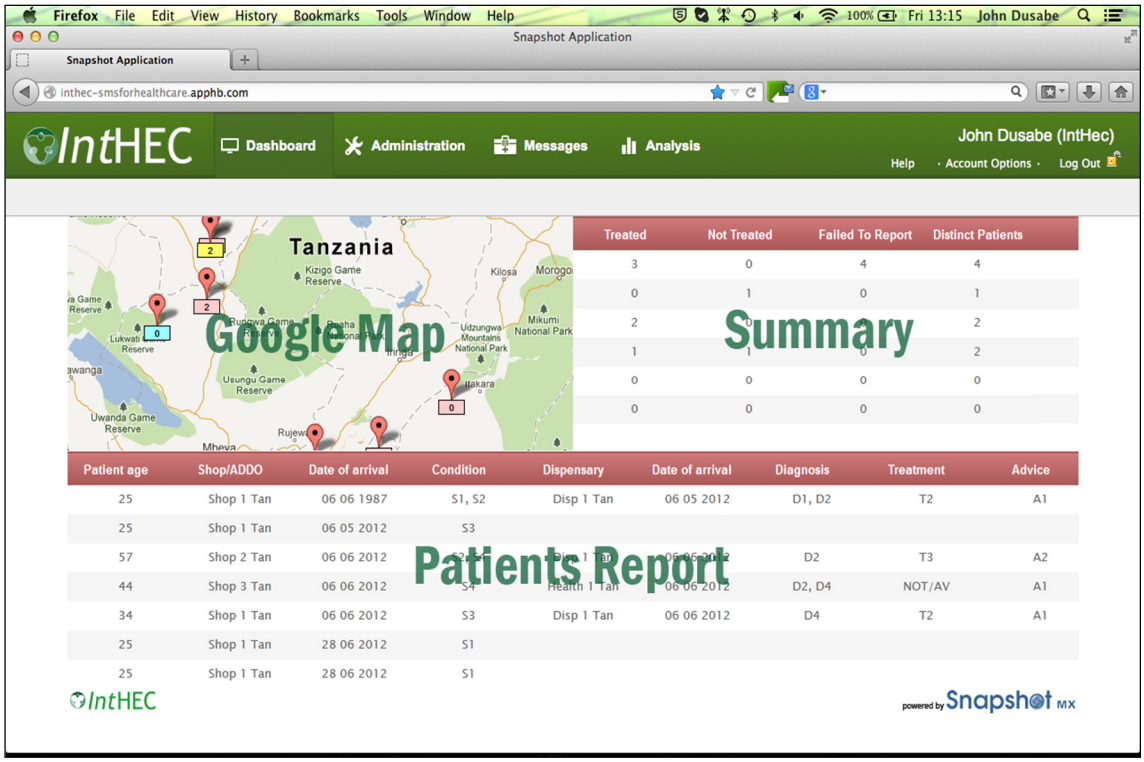
Figure 7.6 System login for security

mHealth data access

Once on the system, the interface had options to access various features on the website (Figure 7.7). It had a dashboard (homepage) that led to various reports, administration that controlled adding new regions and districts, health facilities and drugstores, diseases and treatments. The "*Messages*" section navigated to all messages sent from the drugstores and dispensaries, whereas the "*Analysis*" section gave rough statistics of the system usage including reports that could be accessed via filters (e.g. per dates, gender, specific conditions and health facilities). The system also showed a Google Map location of all the health facilities. The main report given by the system was the "*Patients' Report*", which contained the patients' initials, ID (random, automatically generated), sex, age, name of drugstore, date of arrival to the drugstore, appointment choice, symptom (as told by the patient to the drugstore attendant), name of dispensary, date of arrival at the dispensary, clinician's diagnosis, treatment and advice. The report had an

export feature into MS Excel to produce a file with data automatically merged, with all records and tables in one worksheet. This facilitated further exports into STATA for detailed analyses.

Figure 7.7 mHealth system's website interface



The system's website (http://inthec-smsforhealthcare.apphb.com) was hosted fee-free through *Siemens App Harbour* to minimize the intervention costs.

Text-message design

Drugstore text message

The drugstore text message was designed to capture details described in Box 7.2 below:

Box 7.2 Text message instruction at the drugstore

- Type: **afya**
- Put **[space]**
- Ask the patient's name
- Type patient's initials e.g. for the name Zana Rafiki, the initials are: **ZR**
- Ask the patient's age
- Type the date of birth in form of: ddmmyy e.g. for DOB 17/02/1991, type: **170291**
- Type the patient's sex in form of: **F** for Female, **M** for Male
- Note, do not ask: what's your sex? Observe it?
- Put **[Space]**
- Type code(s) for the symptoms told by the patient, check codes on the cue card:
- **S1 S2 S3** etc. Put space after every symptom if more than one.
- Put **[Space]**
- Ask the patient when he/she will go to the dispensary/health centre. Check cue card for H code: **H1**, **H2**, **H3, H4 or H5.**
- Double check the whole text message – verify with the cue card and press send.
- Example of a complete text message: **Afya ZR170291M S1 H2**

Details of the content of drugstore text message

Afya – this code was necessary because Selcom shared the toll-free number with other SMS-based activities conducted by Selcom. The *afya* code was used to direct all relevant messages to the referral system.

Patient's initials – these were necessary to identify the patients at the drugstore and within the system. Initials were also used for confidentiality. Because the patients did not want to be traced by the drugstores or anywhere within the system, only their initials were used.

Date of birth and sex – these were needed for identification of patients at the dispensary and for stratified analyses of the data at a later stage.

Symptoms – these were needed to establish why the patient was being referred. They were not taken to be the final diagnosis as the dispensary

symptoms were the only diagnosis accepted as correct. The symptoms codes were programmed in a cue card (see above and appendix 7.1).

Appointment – the drugstore text message also specified the patient's preferred time to go to the dispensary. The drugstore attendants asked the patients when planned to attend and added the corresponding code from the cue card (see details of appointment – H codes on appendix 7.1).

Spaces – these were designed to indicate where the system should separate data between different columns in the reports and tables.

Message received at the drugstore

The drugstore was replied to with a text message specifying the password to be given to the patient. That password would be given to the patient to take to the dispensary.

Dispensary text message and password

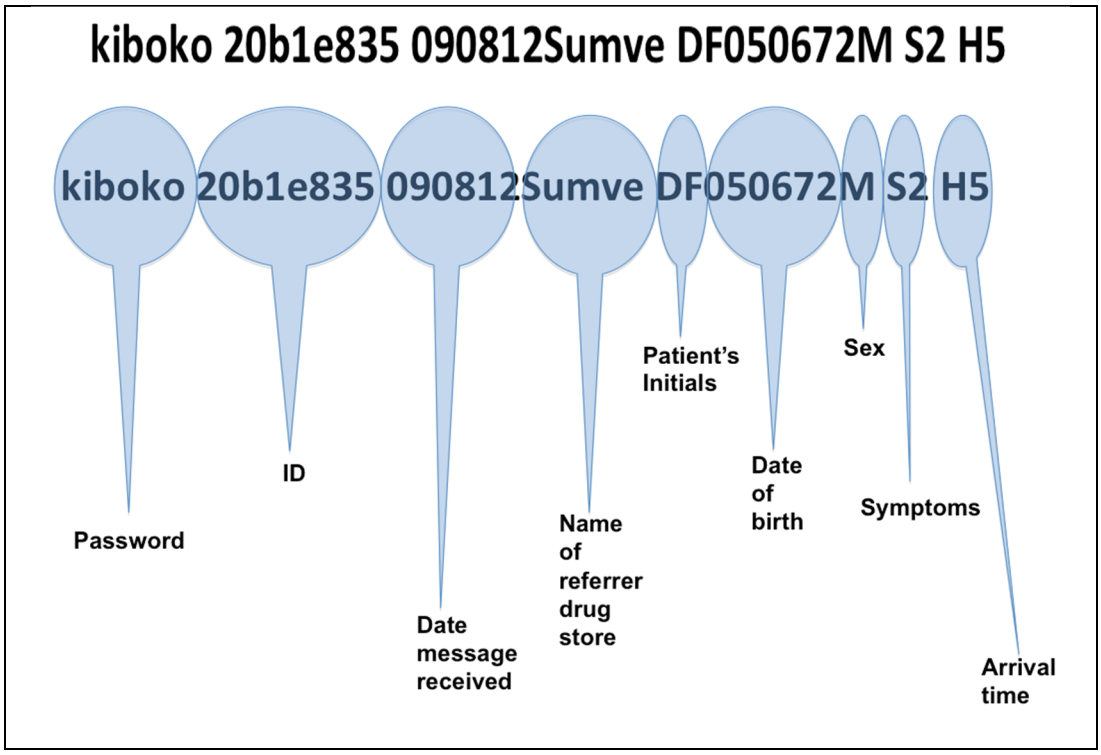
The message was not received at the dispensary in the same format as it was sent from the drugstore. This is because the Snapshot system transformed the message by producing a random patient ID number and password. Passwords were designed to be names of wild animals in Tanzania national parks (Box 7.3). The choice of animal password was reached to minimise password-recall bias influenced by the ability to recall complex numbers or words. For confidentiality the password was not meant to be written anywhere, although this happened later in the implementation. The ID and password were automatically generated after receipt of the message from the drugstore; these were attached to the message to be forwarded to the

dispensary. A further message would be sent back to the drugstore as confirmation of the correct receipt of the referral. This message also contained the password which would be given to the patient for identification once they arrived at the dispensary. The message received at the dispensary therefore had different content to that of the drugstore (Figure 7.8).

Box 7.3 List of password pre-programmed in the system in their Kiswahili names

1. Simba (Lion)
2. Tembo (Elephant)
3. Twiga (Giraffe)
4. Chui (Leopard)
5. Nyati (Buffalo)
6. Duma (Cheetah)
7. Fisi (Hyena)
8. Kiboko (Hippo)
9. Kifaru (Rhino)
10. Sangura (Rabbit)
11. Swala (Antelope)
12. Fisi (Hyena)

Figure 7.8 Content of the SMS received at the health facility



Text message report form

Upon receipt of the text message in Figure 7.8, the dispensaries added it to the *Text Message Report Form*. This text message report form contained tables for filling in the details of the text messages at the dispensary level the way they appear on the phone. The purpose of this step was to ensure that in case the phone loses battery as the dispensary is waiting for the patient, they could easily check on the text message report form and treat the patient. Also, the text message report form served the purpose of ensuring that the clinical officers' phones did not get filled up with the system's text messages. As soon as messages were recorded on the form, the clinical officer was at liberty to delete it from their phone.

Text message sent from the dispensary to the mHealth system

When the patient arrived at the dispensary, the dispensary asked the patient's name/initials, password, date of birth and symptoms and matched these details with the details received in the text message/recorded in the text message report form. After the clinician's formal consultation and treatment, the dispensary then sent a text message to the system confirming the completion of referral (Box 7.4).

Box 7.4 Text message instruction at the dispensary/health centre

- Type: **afya**
- Put **[space]**
- Type patient's ID received in the text message e.g. **20b1e835**
- Put **[space]**
- Type a code of the condition you have diagnosed e.g. **UDS+**
- Put **[space]**
- Type a code of the drugs you have prescribed e.g. T1
- Type **[space]**
- Type a code of further clinical advice given
- If you diagnosed more than one condition, prescribed more than one drug, put as many separated by **[spaces]**
- Double check the whole text message – verify with the cue card and press send.
- Example of complete text message: **Afya 201e835 UDS+ A2**

Details of the content of dispensary store text message

Dispensary codes were similar to the drugstore's (e.g. afya) and can be explained as follows:

ID – the ID in the text message was to inform the system that it is dealing with same patient so that their details could be merged into the relevant tables.

Diagnosis – this code represented the formal diagnosis made by the clinician and was obtained from the dispensary cue card (appendix 7.2) e.g.

UDS+ stands for urethral discharge syndrome. If no UDS was diagnosed, UDS- code was entered.

Treatment – this code stood for the drugs prescribed by the clinician and was obtained from the cue card. E.g. T1 stood for *"drugs for treatment and management of gonorrhoea: Ciprofloxacin 500mg oral stat and Chlamydia: Doxycycline tabs 100mg b.i.d 7/7, educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days"*. If no drugs where prescribed, an appropriate code was entered.

Advice – this represented any advice on health education as well as the indication of whether drugs were available and given at the facility, whether the patient was referred onwards for further treatment or back to the drugstore to buy the prescribed drugs. E.g. A2 stood for *"Patient was given HIV/STI prevention and family planning information and options then treated and sent home"*.

These text messages from drugstores and dispensaries populated the patient report form on the Snapshot system.

Facility and drugstore logistics

Clinical officers and drugstore attendants who are on leave (or who leave the facility for good e.g. due to government transfer) were trained to demonstrate the procedure of the intervention to their replacements. They were instructed to text "*Afya Wezesha*" (Afya activate) to the toll-free number, so that the original phone number could be deactivated and a

number belonging to the new clinical officer or drugstore attendant could be activated.

Intervention approval by the Tanzania Food and Drug Administration

The intervention was presented at the Tanzania Food and Drug Administration (TFDA) headquarters in Dar es Salaam, who recommended that we work only with registered drugstores. This was based on the assumption that the registered drugstores would be more likely to meet the Accredited Drug Dispensing Outlets (ADDO) requirements, which TFDA was in the process of implementing in Mwanza. The TFDA recommendation was communicated to the drugstores and it was emphasised that participating in the intervention would be considered an element of adherence to TFDA regulations. The ADDO programme was rolled out 12 months later in Mwanza.

Intervention implementation

This section describes the steps we followed during the implementation of the intervention based on the design process described above. Table 7.2 is a timeline describing what activities were conducted each month during the 18-month implementation.

Drugstore and dispensary selection and matching

All health facilities situated in the nine intervention wards were enrolled on the intervention. To qualify for the intervention, health facilities had to meet the following four requirements:

- The dispensary had to have at least one clinical officer who owned a mobile phone;
- The clinical officer had to be willing to facilitate the health facility's collaboration with one or more drugstores;
- The clinical officer had to be willing to send referral text messages using their personal phones;
- The clinical officer had to be willing and able to provide fast track service to patients referred from drugstores.

To ensure text messages and patients from a given drugstore did not end up in the wrong health facility, drugstores were matched using algorithms in Box 7.5.

Box 7.5 Algorithms for dispensary-drugstore matching

Distance – health facilities were only allowed to choose drugstores situated within 2 miles of their catchment area.
Choice – Dispensaries were at liberty to choose any drugstore of their choice, based either on their previous collaboration or without stating a reason.
Registration status – only registered drugstores were eligible to be included on the intervention, because it was stipulated in the protocol not to work with unregistered drugstores operating illegally.

Table 7.1 shows a list of health facilities and their selected drugstores. The original plan was that every health facility would select three drugstores of their choice in accordance with the algorithms in Box 7.5. However, due to distance and geographical location, one dispensary (Disp6, Shishani Ward, Magu district) had no drugstores to partner with. Conversely due to the

same reasons, some dispensaries had more than 3 planned drugstores per facility. This was identified during the drugstore-health facility matching in the field, because the intervention became popular and all registered drugstores wanted to participate. Also it was envisaged that if two drugstores were operating the same village and one was selected and the other was not, unforeseen consequences (e.g. people in the neighbourhood refusing to use the drugstore that was known to send people away to health facilities) could arise. It was therefore decided that all registered drugstores in the intervention wards would be eligible to participate. Some health facilities therefore had more than 4 drugstores (e.g. Disp12 had 5). With this plan therefore, all registered drugstores operating in the wards of the intervention were enrolled.

Generally health centres had more drugstores than dispensaries. Apart from HC16 that had only two drugstores due to the algorithms shown in Box 7.5, HC17 and HC18 had 9 and 7 drugstores respectively. Additional reasons for this (in addition to those mentioned in Box 7.5) could be that health centres were situated in urban settings where many drugstores were based. In addition, health centres served bigger populations than dispensaries (see Chapter 1), which could explain their popularity with the drugstores and communities.

Table 7.1 Intervention health facilities and their drugstores*

District	WARDS	DISPENSARY/HC	DRUGSTORE
Sengerema	BUSISI	1. Disp2	1. DS18 2. DS46
		2. HC16	3. DS30 4. DS40
	BUYAGU	3. Disp3	5. DS3 6. DS8 7. DS17 8. DS19 9. DS33
		4. Disp7	10. DS5 11. DS24
	IGALULA	5. Disp12	12. DS20 13. DS25 14. DS28 15. DS44 16. DS50
		6.Disp4	17. DS45
	NYAMATONGO	7. Disp13	18. DS2
		8. Disp8	19. DS15 20. DS16
Magu	KONGOLO	9. Disp9	21. DS9 22. DS14 23. DS22 24. DS27
	SHISHANI	10. Disp14	25. DS13 26. DS41 27. DS51
		11. Disp10	28. DS26 29. DS32 30. DS47
		12. Disp6	No drugstore
		13. Disp15	31. DS6 32. DS11
	NYANGUGE	14. Disp1	33. DS21 34. DS48
		15. HC18	35. DS1 36. DS7 37. DS12 38. DS29 39. DS35 40. DS36 41. DS49
	KISESA	16. Disp5	42. DS39
		17. HC17	43. DS4 44. DS10 45. DS31 46. DS34 47. DS37 48. DS38 49. DS42 50. DS43 51. DS52
	MWAMABANZA	18. Disp11	52. DS23

*Drugstores were anonymised for confidentiality

Table 7.2 Intervention implementation timeline

Yr	Mth	Activity
	Jul	Pre-test
	Aug	Pre-test. Selection and training in intervention facilities
	Sep	Start of the intervention. Text-messaging: COs* and DSAs*
	Oct	Text-messaging: COs and DSAs
	Nov	Text-messaging: COs and DSAs
2012	Dec	CO and DSA re-orientation at the district
	Jan	Text-messaging: COs and DSAs
	Feb	Text-messaging: COs and DSAs
	Mar	CO and DSA re-orientation at the district using DMOs
	Apr	Text-messaging: COs and DSAs. Toll-free no. off (23rd)
	May	Toll-free no. off (till 15th). Text-messaging: COs and DSAs. Masters' student
	Jun	Text-messaging: COs and DSAs. Masters' student.
	Jul	Text-messaging: COs and DSAs. Masters' student. Re-orientation
	Aug	Intensive intervention. Text-messaging: COs and DSAs
	Sep	Intensive intervention. Text-messaging: COs and DSAs
	Oct	Intensive intervention. Text-messaging: COs and DSAs
	Nov	Intensive intervention. Text-messaging: COs and DSAs
2013	Dec	Intensive intervention. Text-messaging: COs and DSAs
	Jan	Intensive intervention. Text-messaging: COs and DSAs. Impact evaluation
2014	Feb	Intensive intervention. Text-messaging: COs and DSAs. Data collection stop

*COs – clinical officers; DSAs – drugstore attendants

Ethical considerations

Ethics for the health facilities and drugstores

Drugstores and health facilities signed a consent statement to assert their willingness to participate and allow their data to be collected and used in the study. They also kept the information sheet to refer to throughout the intervention and were encouraged to communicate with the intervention team if they decided to withdraw their participation in the intervention.

Ethics for the patients

None of the research team had direct access to patients. Drugstores were the first health workers to meet participants. As part of the introduction of the intervention to the patient therefore, drugstores were asked to read to them the ethics statement and those who agreed to be referred consented to their data being used for the purposes of the research for scientific dissemination nationally and internationally. Some participants did not give consent to this and were therefore not included in the study (See details in Chapter 8).

Intervention pre-test

Before implementation of the system in the health facilities and drugstores (shown in Table 7.1) the intervention was pretested. This was done using IntHEC trial pre-testing procedures in the formative wards (see Chapter 3 for details on formative wards). Selection and training of pre-test health facilities and drugstores was conducted as per the intervention protocol following the guidelines described above, using the same procedure as planned for the intervention. The pre-test therefore took place in Misungwi

District (see Chapter 3) for 52 days (from 1st July 2012 to 21st August 2012). Thirteen drugstores, matched to 3 dispensaries and 1 hospital participated in the pre-test.

During the pre-test, the intervention website (http://inthecsmsforhealthcare.apphb.com/ accessed by a log in as described above) captured the text messages and generated reports as per the intervention protocol. From 19th July to 20th August participating health facilities and drugstores used the system. From this use the following field implementation issues were identified:

- Lamination of the cue card is necessary to maintain the integrity of the information;
- One-off training is not enough to sufficiently grasp the text messaging procedure
- Entry of phone numbers into the system is prone to errors

Nevertheless, the pre-test successfully validated the system's functionality. The error probability (the probability of a drugstore or health facility sending a wrongly coded text message in a one-week period) was less than 15% at the drugstore and 20% at the dispensary and therefore this was taken as a positive outcome to increase the number of training session in the intervention wards.

Training of clinical officers and drugstore attendants in the intervention wards

All facilities in Table 7.1 were registered on the Snapshot System. Registration involved entering correct telephone numbers of dispensaries and drugstores matched to the region, district and ward they were based in. This stage was done prior to the training day, using previously collected phone numbers of the facilities. On the day of the training, facilities were invited to double-check the system to see whether the numbers and names of dispensaries/health centres and drugstores were correctly registered on the system.

Training took place between 16th and 17th August in Magu and Sengerema, the sites of the text messaging intervention implementation. The main participants were the clinical officers from the health facilities, and the drug sellers/dispensers from the drugstores that were participating.

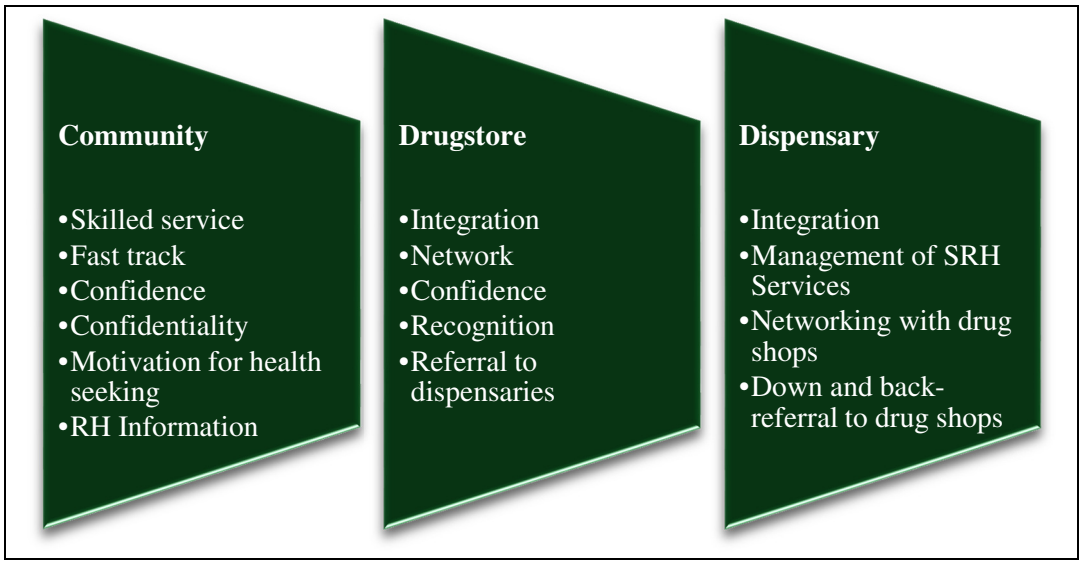
Mobilisation for training was done by the NIMR intervention team (the intervention coordinator and intervention officer) and District Medical Officers (DMOs). In turn, the clinical officers mobilised drugstore attendants from their selected drugstores. Training took place at the district medical office, therefore all the participants had to be formally invited to the district. The invitations for participation in the training were sent by the DMO at the district level to all health facilities existing in the intervention wards and their selected drugstores as listed in Table 7.1. Because the health facility in-charges and clinical officers were leaving their stations of work, the DMO had to endorse the training and give them permission to leave the facilities. This was achieved by bringing the DMO on board and requesting

his office to send the invitations. We also hoped that using DMOs to coordinate these training activities would increase their sense of ownership in preparation for developing the long-term sustainability of the intervention.

In addition to inviting the participants, the DMOs participated in the beginning of the training by opening the workshop. This is a standard practice; no meeting can be conducted at the district health office without the approval of the DMO. The government procedure also requires all meetings to be formally opened and closed by the DMO.

At the start of the training the IntHEC project was introduced and discussed. All participants had been informed about the text messaging intervention by their DMOs and by NIMR team during the collection of their telephone numbers and preliminary mobilisations. They still had questions however, most of which pertained to their roles in the intervention and the benefits or losses if they did/did not enrol onto the intervention. These issues were discussed and the benefits of enrolling (see figure 7.9) were explained. They were also assured that there was no loss or discrimination at all if they did not want to participate. They all consented and appeared happy to participate.

Figure 7.9 Benefits of participating in the intervention



Overview of training content

Training was conducted using a previously prepared power-point presentation translated into Kiswahili, because the majority of the participants, especially those from the drugstores, are more conversant with Kiswahili than English. The main content of the training was on the use of system. Major topics included the benefits of using the system, how phone numbers are registered onto the system, how the system works including step-by-step instructions for how to deal with patients at all levels, how to ask and record names and age, symptoms, appointments, use of the toll-free number (15543), how to receive and pass on the password to the patient, how to retrieve it at the dispensary/health centre when the patient comes and how to use the cue card. To facilitate record keeping and avoid loss of information in case text messages are accidentally erased from users' phones, health facilities were also taught how to keep record of and updated

Text Message Report form. Cue cards were distributed and certificates awarded to all participants.

Due to lack of Internet access at the district level (no internet connection at the district headquarters), an external modem (dongle) from local mobile telephone providers was used to access Internet during the training.

We organised participants to sit in groups with their partners i.e. each dispensary/health centre with its drugstores. This was done to observe and foster the partnership existing between them, which was effective: they often helped each other when asked questions and identified problems together. Dispensaries were generally quick to understand the process and tended to be able to explain it to others in the group when they had not understood.

During the training a number of errors arose, mainly pertaining to the correctness of the telephone numbers' entry into the system. Other errors pertained to the strictness of the texting mechanism, where extra spaces, commas or full stops rendered the text invalid. The clinical officers found it harder to compose the message with the patient ID (the 8-character code) at first but this was solved through emphasis on use of the cue card.

At the end of the training, certificates of recognition were issued to all participating individuals in their capacities. This ceremony was presided over by the DMO who closed the training after awarding the certificates.

Thirty seven drugstores and 7 dispensaries were present in Magu and 16 drugstores and 7 dispensaries in Sengerema. The NIMR intervention coordinator was responsible for the training and supervision the untrained

facilities. Troubleshooting of major issues arising – e.g. the facilities forgetting how to text, was also her responsibility. This was done using prepared guidelines for the training of clinical officers and drugstore attendants. We conducted a training-of-trainers workshop with the intervention team (NIMR Intervention coordinator and intervention assistant) to be able to conduct the training themselves (attach 2 photographs: (1) showing the training; (2) showing certificates).

Passwords (see Box 7.3 above) drew a lot of discussion as one animal was particularly disliked among communities in Mwanza. Hyena "*Fisi*" was described as being used in practices of 'witchcraft' so participants advised that no person would want to identify with it. It was changed in the system.

Incentives

During training, the participants were told there was an incentive of 1 free text message per week (equivalent to Tsh 150, GBP 0.05) that would be offered to all participating health facilities and drugstores sending at least 10 patients per week. This amount would be automatically credited by Snapshot® to their telephone numbers. At the time, this level of incentive was comparable to another mHealth project running in the area which provided four text messages to clinical officers per week and to doctors and pharmacists [303]. The decision to incentivise with only 1 text message per week was reached after it was determined that the other project provided 4 text messages after an intensive exercise that took much of the clinicians' working week. None of our clinical officers were part of the other mHealth project but it was advised by NIMR that an incentive proportionate to the one

being given in the area should be offered. However, it was advised that increasing the amount of incentive would draw negative attitudes towards the other project and was not setting a good example. NIMR and the IntHEC project also considered providing large incentives an act of 'buying data' that against their research policy. In addition to this argument, we had started sustainability discussions and were aware that the government ability to pay for incentives would be limited. Should our intervention be successful and taken over by the government after the pilot, we were not sure whether the government could take on an intervention which paid significant incentives to health workers. Furthermore, this amount of incentive had worked well during the pre-test: the participating facilities used to make private phone calls and send text messages outside of Snapshot® system. During training of the intervention facilities, the level of incentive was discussed and nobody expressed any concerns with it at the time, possibly because there was general enthusiasm about the project from the start. We also agreed with participants that the level of incentive could be revisited as the intervention progressed.

Intervention 'go-live' and implementation

After the training, it was agreed that the drugstores should start referring their patients on 20th August 2012. The dispensaries would start as soon as the patients came thereafter. Participants were happy with this in spite of Monday being a public holiday (Eid), which demonstrated their enthusiasm with the intervention. On the day of the start of intervention we also advised the pre-test health facilities and drugstores to stop texting.

Although texting started right away after the training the official start of the intervention on the implementation calendar was eventually marked as September 1st 2012, as the last week of August was used to train the untrained clinical officers and drugstore attendants as well as answering questions to further their intervention understanding. However, between August 20th and September 1st the system was live and those who had patients had already started sending referring them.

The following sections describe the main events in the progress of the intervention:

September to November 2012

In September and October 2012 the drugstore attendants and clinical officers started off with high numbers of correct referrals through the system, but towards the end of October the number of patients had reduced and the error rate had increased (see monthly analysis of patient numbers and error rates in the Chapter 8). In November therefore, a re-orientation activity was organised to retrain them again.

December 2012: Re-orientation and follow up

All participating dispensaries and drugstores were invited to come and participate in a follow up meeting/re-orientation at the districts. The main objective of this re-orientation meeting was to:

1. Discuss the progress of the intervention with the clinical officers and drugstore attendants. This was important as the errors in the system were increasing.

2. Identify the challenges using local tools and ideas and suggest community-based solutions to those challenges. The emphasis here was to improve motivation and ownership of the intervention and establish why there were so many errors and fewer patients.
3. Re-train the participants on the text-messaging process and answer their technical questions on how the text-message referral system should work

The re-orientation took place on 11th (at Magu District Medical Office) and 12th (at Sengerema DMO) December 2012. The logistics and mobilisation for this training were similar to the previous approach of the original training. In total, 72 facilities attended the training. Table 7.3 is a breakdown of participants' attendance per cadre.

Table 7.3 No. of text-messaging training participants

District/Health Facility	Drugstore (attendants)	Dispensary (Clinical Off.)	Health centre (Clinical Off.)
Magu	24	6	2
Sengerema	14	8	1
Total	38	14	2

Attendance of this training was high: 73% of drugstore attendants and 93% of dispensaries and all 3 health centres attended. In some cases however (especially in the drugstores and health centres), new clinical officers came instead of the old ones. In one of the dispensaries, a clinical officer had been redeployed to another dispensary and a new one came. Also, in one of the health centres, a different clinical officer came (reason not recorded). These new participants were trained using the original procedure so that they could understand how the system works. For the others, the orientation was a 3-step process:

Step 1 Participants were re-trained on how to use how to use Snapshot® referral software, roles and permissions of different users, benefits of the system to each user, text-messaging codes, disaggregation and follow-up, errors and updates, national mobile networks and their configurations, SMS sending, aggregation and processing.

Step 2 Participants were divided in working groups (based on their health facility/drugstore partnerships) to discuss implementation challenges so far and to suggest solutions for them.

Step 3 A one-to-one session for the health facility/drugstore teams with the principle researcher to discuss questions on specific technical issues.

Feedback from the re-orientation showed that participants found the sessions helpful to improve their implementation of the intervention. Table 7.4 describes discussions about the problems the participants found and solutions they suggested to counter them.

Table 7.4 Problems and solutions in a self-evaluation discussion

Question	Problems/Reasons	Solutions
Why do we still make errors during texting?	• The training we received took a short time so we didn't understand • Poor concentration while texting • Forgot/unable to write more than one symptom in a text message • Forget to leave space after every code composed • Poor understanding of the texting procedures and codes • Confusion of the female and male gender in the texts • Because some clinical officers go away and when they are on leave the text messages are sent by an untrained clinical officer	• We need more training on how to text • To be careful when sending the text messages • We have to read well the cue card • The procedures have to be followed as directed • Be careful especially on writing the gender of patient
Why are the patient numbers at the drugstores small?	• Patients are shy to express their symptoms to many people • Patients believe referral delays access to services, because of a long process • Patients believe there are no drugs at the dispensaries • Some drugstore workers are not confident to explain to patients • Most of drugstore don't understand well the process • Referral reduces profits of drugstores • Drugstores' poor collaboration with health facilities • STIs occur seasonally • Some people aren't aware of the text messaging intervention • Drugstores have no money to meet with dispensaries to discuss issues	• Increase patient confidentiality at the dispensary • Give priority to referred patients (fast-track) • Raise awareness on referral importance at the drugstore • Increase friendliness to patients • Cooperate better at the drugstore-dispensary level • Tell patients there won't be a queue at the dispensary • Convince patients only be the clinical officer will know their symptoms • Send a feedback text message to the drugstore • Give financial allowances to participating stores and dispensaries • Improve the community attitude towards drugstores
Why is the uptake at the dispensary low after referral?	• Patients are discouraged by the queues • Sometimes there are no drugs at the dispensary • They think that other people will know what their complaints are • They think there's no treatment if they can't be treated at the place of their first visit • The distance between drugstore and the health centre is far. • Transport costs to dispensary is high • Dispensary workers are harsh • Patients fear HIV diagnosis at the health centre • Patients don't want to tell their symptoms twice • Service is slow at the dispensary • Patients just want 'to kill the pain", not know what STI they have	• More patient health education at the drugstore • New drugstores near the health centre • Stock drugs at the dispensary • Government should make STI treatment free

One major issue that came up in this re-orientation was the idea that the drugstore participants did not feel comfortable sending their patients to the dispensary because they didn't want to lose money. This issue was raised in the first training sessions as well and we usually referred to the benefits described earlier (in Figure 7.9): because drugstores are not licenced to sell antibiotics, they were reminded that referring their patients to the dispensaries could be used as evidence that they do not sell them illegally. This was an important argument to convince TFDA that they were following regulations. They were also reminded that when they refer their clients to dispensaries the patients are sent back after receiving formal prescriptions on required medicines and dosages. The formal prescriptions could be more expensive or required in higher quantities (as recommended doses) than previously sold by the drugstores without the prescriptions. This was much preferable to selling medicines without prescriptions as this can lead to the sale of medicine quantities that are below the recommended dosage [92, 150]. Therefore drugstores would gain from selling through prescriptions, especially since patients are likely to spend money to buy medicines recommended by dispensaries rather than the drugstores.

One of the outcomes from the re-orientation meetings in December 2012 was a request by clinical officers and drugstore attendants to have further training on using the system (Table 7.4.). To provide this support we agreed that every quarter they would receive a re-orientation to make sure that they were up to date and didn't feel that they were expected to implement the intervention on their own.

January to February 2013

After the re-orientation training participants sent text messages with fewer errors and made more referrals. However, as time passed numbers reduced and errors increased again (see a time series analysis of text messaging in the Results Chapter). Another re-orientation was therefore designed and planned for March 2013.

March 2013: re-orientation

From 16th to 22nd March, another re-orientation took place at Magu and Sengerema District Medical Offices. The training content was the same as the first and second trainings but the approach was different. The training followed a training-of-trainees cascade – an approach where individuals are trained in the content and how to facilitate training so that they can deliver the same training in communities. This approach has shown promising results on successful diffusion of knowledge in China, Uganda and Mexico especially in health promotion for HIV/AIDS care [304-306]. In addition to diffusion on content from the DMOs to the health facilities and drugstores, the objectives of using this approach in this re-orientation were to train the district health officials so that they could:

(1) Have better understanding and knowledge of how the system works so they could provide more support toparticipating facilities
(2) Supervise the participating facilities while conducting routine government supervision
(3) Incorporate participating facilities' reports on text-messaging into the district health reports

(4) Prepare themselves for taking over the intervention after the research phase had ended

The assumption was that after this re-orientation, the DMOs would be in position to keep supporting the health facilities as and when needed.

The workshop was carried out over four days, two in Magu and two in Sengerema. In each district, a one-day training session for the DMOs (half-day training, half-day practising) was conducted. Then on the second day the DMOs trained the clinical officers and drugstore attendants. I facilitated the DMO training session whereas the re-orientation of the health facility participants was facilitated by the newly-trained DMOs. Table 7.5 shows the number and cadre of DMO involved and the number of clinical officers and drugstore attendants who attended.

Table 7.5 No. of participants in the second re-orientation

District	District health officials who participated in the ToT training	No. Clinical Officers	No. Drugstore Attendants
Magu	District Medical Officer, Assistant District Medical Officer, District Reproductive and Child Health Coordinator, Medical Officer In-Charge, District Nursing Officer, District Pharmacist	6	19
Sengerema	District Medical Officer, District Nursing Officer, Medical Officer In-Charge, District Pharmacist, District Reproductive and Child Health Coordinator, Assistant District Medical Officer, District Health Secretary, District Immunisation and Vaccination Officer, District Social Welfare Officer	5	17

To emphasise teamwork during practice and training of clinical officers and drugstore attendants, district health officials were asked to share the power point presentation among themselves, each presenting the section they felt more comfortable delivering. DMOs welcomed the ToT approach and participated fully in the sessions. They worked as a team and conducted the training together, reminding each other of issues that had been missed. They emphasized their support for the intervention and made it clear that it was their intention to support the intervention and the wider study. The clinical officers and drugstore attendants appreciated being trained by their supervisors and managers and welcomed requests from the district officials to keep reporting on the intervention. This increased the strength of their relationship with DMOs, not only in this intervention but also related to

other health issues that they discussed both after the sessions and in their own small groups.

April to June 2013

After the March re-training sessions implementation progressed more smoothly again especially with the district officials' continued communication with NIMR about intervention progress. Towards the end of April, however, numbers started decreasing again. In the last week of April we received no patient in the system and got complaints from drugstores that when they sent text messages they received no passwords in return. On investigation we discovered that the toll-free number had been inadvertently shut down by Selcom Tanzania on April 23rd. Ensuring the operation of the toll-free number was the obligation of Minoxsys Ltd in the contract with LSTM. Minoxys acted promptly to gain system re-connection by applying for a new number, which was assessed as the quickest way of reconnecting the system in comparison to re-connecting the old number. During this time the drugstores and dispensaries were each informed of the problem through calls from NIMR. After the system restoration (on 15th May) they were called again and the text message in Box 7.6 was sent to everyone apologising for the glitch and to help rebuild their confidence in the system.

Box 7.6 Text message apology to all facilities for the system shutdown

Ndugu mfanyakazi wa afya, tunaomba radhi kutokana na kutopatikana kwa huduma ya utumaji wa ujumbe mfupi wa IntHEC. Tatizo hilo lilitokana na sababu za kiufundi kwenye mitambo ya mawasiliano. Tatizo hili kwa sasa limetatuliwa na hivyo huduma hiyo itaanza kuendelea kwa kutumia namba mpya utakayotumiwa hivi punde.

English translation:

Dear health worker, we apologise for the temporary interruption in the availability of IntHEC text-messaging referral service. The problem was due to technical reasons in the maintenance of the communications system. That problem has now been solved and the service will continue through a new toll-free number which will be sent to you shortly.

May to July: Masters' student and quarterly re-orientation

Due to the implementation issues described above, a postgraduate student studying on the MSc International Public Health at LSTM was sent on a 3-month placement in Mwanza to explore attitudes towards and uptake of the intervention in the communities. The key objectives of the student's placement were to assess the community's knowledge and understanding, attitudes and acceptance and reasons for non-uptake of services after referral from the drugstores. The results of this study (not included in this thesis) were presented in an MSc thesis for the award of MSc International Public Health at LSTM (by Yukari Onoe). The student was supervised by John Dusabe at LSTM and supported in Tanzania by NIMR colleagues.

In July another re-orientation meeting was organised, in which all the facilities were invited for a one-day meeting (23rd in Magu and 24th in Sengerema) for exchange and discussion on the progress of the intervention. There was no procedural training on text-messaging implementation, but issues were discussed relating their individual progress. Discussions covered the work done by the MSc student, the shutdown of the toll-free number and the sustainability of the intervention (projecting into 2014). Clinical officers further discussed the failure of many patients to take up the referral and all expressed they wanted more incentives. Other issues also included poor communication between the clinical officer from a specific Dispensary and the request by all its partner drugstores to be transferred to a nearby health centre. We promised to deal with all these issues after discussions with NIMR and other research stakeholders.

August to December 2013: Intensive intervention

After the meeting in July, the facilities' concerns were addressed as follows:

Patients' follow up and free airtime after the drugstore

They system was re-designed to incorporate the patients' telephone numbers (for those who had mobile phones) to follow them up and encourage them to proceed to the health facilities. This was done by the drugstore asking them whether they had a telephone number and if so, whether they would be willing to be sent a text message reminding them to go the facility and offering them free airtime (Tsh 500). For those with telephone numbers, a text message (Box 5.6) was sent to them in Kiswahili language for follow up.

Box 7.7 Referral follow up text messages sent to patients with mobile phones

1st Message (Immediately after drugstore visit)

"You have just been referred to the health facility. If you go there for treatment, you will receive free airtime".

2nd Message (48 hours after drugstore visit)

"You have not yet gone to the health facility for treatment after referral. Please reply by selecting a number representing your situation":

1. I will go tomorrow (reply with "1")
2. But I have already gone (reply with "2")
3. The health facility is too far (reply with "3")
4. I bought drugs from somewhere else (reply with "4")
5. I am no longer sick (reply with "5")

Send your reply to: 15543

Health facility and drugstore incentives

Originally the incentive given was for Tsh 600 to each drugstore every week. But this was increased to Tsh 500 for every patient referred. This would be given to drugstores and to dispensaries. The facilities were called in the field and told of this change in the incentives. They confirmed that this satisfied their need for more incentives.

Virtual supervision and monitoring - Two weekly phone calls to all facilities

It was also decided that the intervention coordinator at NIMR would call all the health facilities and drugstores fortnightly. This was done by directly loading Tsh 30,000 airtime to the intervention coordinator's phone from the

system. This amount was still comparable to other incentives offered in the region [303]. The objectives of the phone call were to discuss:

(i) The progress of the intervention – texting, number of patients

(ii) Any technical issues they were having – whether they needed any help

(iii) Whether they could increase the numbers they were sending

(iv) Encouragement for dispensaries to discuss with their partnering drugstores – e.g. they could use some of the free airtime we give them to call each other

(v) Any other issues and updates for discussion

Reports of these phone calls were done to document the "virtual monitoring" outcomes and achievements.

January to February 2014: final impact evaluation and sustainability meetings

Meetings

In January 2014, sustainability meetings were held with the RMO, DMOs, clinical officers and drugstore attendants in Mwanza (21st), Magu (22nd) and Sengerema (23rd).

In the RMO and DMO meetings, presentation on the progress of the intervention, its achievements, costs and preliminary data analyses was discussed. The RMO expressed an interest in continuing the intervention based on the low-cost of the overall expenditure of the intervention annually (see Results). This discussion was taken (by RMO) to the ministry level to

start the process of incorporating the intervention into the Comprehensive Council Health Plans (CCHP). Tanzania's CCHP is an annual strategic plan specifying health interventions to be implemented by various districts. The National Road Map Strategic Plan To Accelerate Reduction of Maternal, Newborn and Child Deaths encourages districts to contribute to priority-making for implementation of priority interventions in their districts through the national decentralisation system [281]. The RMO also encouraged the DMOs to continue with the intervention and the DMOs while opening the meetings with clinical officers and drugstores encouraged them to continue.

Sustainability plans

In the sustainability discussions it was agreed that the intervention would continue with financial support from LSTM and administrative support (data collection, analysis, supervision) from the RMO until 31 May 2014. We also agreed that from January to May, the RMO with DMOs would plan a strategy for the Regional Medical Office to take over the financial support of the intervention after May 2014.

The clinical officers and drugstores welcomed this view and agreed to continue with the intervention under guidance from the district authorities. Data collection formally stopped on 28th February 2014 at LSTM, but web monitoring, patient and text messaging traffic monitoring and support of the districts continued. Financial support was sought from external sources, notably the Alliance for Health Systems and Research to support the

districts in expanding the platform coverage (at the time of writing, the districts were still waiting for the decision on the grant).

Intervention publications and the media

During the implementation, a design paper [307] was published in the Journal of Telemedicine and Telecare. In addition The Guardian Newspaper covered the intervention as an emerging innovation in SRH service delivery: http://www.theguardian.com/society/2012/may/10/new-technology-sexual-health-services. The intervention was also featured on DFID web-resource – *HEART* – blog posts, http://www.heart-resources.org/blog/the-challenge-of-providing-reproductive-health-services-in-rural-areas/ . Finally, it was featured by DrThom – an online prescription, consultation and treatment service: https://www.drthom.com/blog/ask-drthom/travel-health/man-mobile-phones-stop-spread-stis-tanzania/.

8 Sub-study 5: evaluation at the facility level

Introduction

This chapter describes the evaluation of the intervention presented in Chapter 7. The chapter provides a background to the mHealth data handling. It reports how we handled clinical data from our electronic collection system, the approaches taken to analyse it, the results we obtained and a discussion of these results, drawing on research from other settings. The work presented in this chapter forms part of the observation and reflection stages of the action research cycle, whereby we critically analyse the data from the intervention and reflect on its interpretation in the concluding discussion.

8.1 Background

As described in Chapter 7, we used features within the intervention to collect data for evaluation. Other mHealth researchers have also incorporated data collection tools within interventions [22, 168, 308, 309], which promotes better and more efficient use of implementation tools and resources. In addition to this, we used CTC providers' own mobile phones to ensure that our intervention tools could be implemented within minimal expenditures at the field level, an approach also adopted by other researchers [167]. Our implementation described in Chapter 7 generated recognisable uptake at the health facility and drugstore level which we document below.

The primary intervention outcome measure was to estimate the uptake of SRH services at the health facility level by patients after referral from drugstores. Secondary outcomes were to estimate the effect of the following factors on that uptake according to the following indicators:

(1) Age

(2) Sex

(3) Specific RH condition:

   a. HIV

   b. STIs (specific STIs as per symptomatic management guidelines)

   c. Contraceptives (specific contraceptives: condoms [male/female], pills, injections and sterilisation)

   d. ANC

   e. Maternal delivery

In the following sections we describe how we used data obtained from the intervention to measure the above outcomes.

8.2 Methods

Handling of clinical data collected electronically

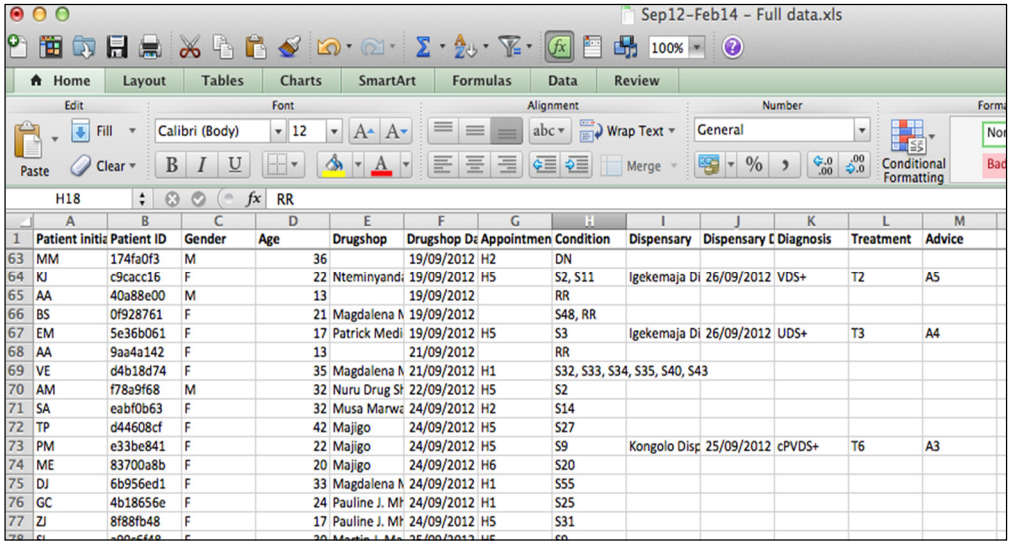
The variables exported from the Snapshot system contained some errors. These included wrong or incomplete text messages and diagnoses or treatment with erroneous spaces or punctuations. The process of how these variables were cleaned, the univariate and multivariate analysis plans as

well as symptom modifications and database preparation is presented below:

Data download and export

The data was downloaded from inthec-smsforhealthcare.apphb.com and exported into Excel 2011 as predesigned. The data exported was already a predesigned database with variables shown in Excel columns A to M in figure 8.1 below. These variables include patient initials, ID, Gender, Age, referrer drug store, date of drug store referral, appointment requested by the patient, symptom(s) presented at the drug store, health facility referred to, date of patient arrival at the health facility, diagnosis, treatment and advice given that corresponding to MoHSW guidelines.

Figure 8.1 Database downloaded with variable columns



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Patient initia	Patient ID	Gender	Age	Drugshop	Drugshop Da	Appointmen	Condition	Dispensary	Dispensary D	Diagnosis	Treatment	Advice
63	MM	174fa0f3	M	36		19/09/2012	H2	DN					
64	KJ	c9cacc16	F	22	Nteminyandi	19/09/2012	H5	S2, S11	Igekemaja Di	26/09/2012	VDS+	T2	A5
65	AA	40a88e00	M	13		19/09/2012		RR					
66	BS	0f928761	F	21	Magdalena M	19/09/2012		S48, RR					
67	EM	5e36b061	F	17	Patrick Medi	19/09/2012	H5	S3	Igekemaja Di	26/09/2012	UDS+	T3	A4
68	AA	9aa4a142	F	13		21/09/2012		RR					
69	VE	d4b18d74	F	35	Magdalena M	21/09/2012	H1	S32, S33, S34, S35, S40, S43					
70	AM	f78a9f68	M	32	Nuru Drug St	22/09/2012	H5	S2					
71	SA	eabf0b63	F	32	Musa Marwa	24/09/2012	H2	S14					
72	TP	d44608cf	F	42	Majigo	24/09/2012	H5	S27					
73	PM	e33be841	F	22	Majigo	24/09/2012	H5	S9	Kongolo Disp	25/09/2012	cPVDS+	T6	A3
74	ME	83700a8b	F	20	Majigo	24/09/2012	H6	S20					
75	DJ	6b956ed1	F	33	Magdalena M	24/09/2012	H1	S55					
76	GC	4b18656e	F	24	Pauline J. Mh	24/09/2012	H1	S25					
77	ZJ	8f88fb48	F	17	Pauline J. Mh	24/09/2012	H5	S31					

String variables

Apart from age (column D in figure 8.1), all data downloaded from the system were string variables. For STATA to understand them in the analysis they were transformed into numerical variables. This was done by assigning numerical codes to sex, drug store and health facility names and diagnosis onto a separate Excel spread sheet and using the codes to replace names onto the main download. Appointment, condition, treatment and advice codes were maintained; only the letters were removed from the string variable. Patient initials, which had been used to identify the patient at the health facility, were removed from the database, as the ID was enough for further analyses. The ID remained as a string variable.

District and ward

The data downloaded (as seen in figure 8.1 above) did not have columns for the patient's district or ward of residence. This was manually added by cross-checking from a table of the drugstores and health facility numbers.

First, M for Magu and S for Sengerema were entered in the column against the number of drug store and health facility in the row by checking where they belonged in the printout of facility tables. M and S were later changed into 1 and 2 respectively to change the data from string to numerical. The ward column was added and ward codes entered by crosschecking the drug store name in the database with the table of all drugstores in the intervention (Table 7.1, Chapter 7).

Text message errors and their column

Incorrect text messages sent from the drugstores and health facilities were screened out of the main database. As described in the methods chapter, the majority of these messages were programmatically incorrect (in terms of technology) but syntactically correct for the purposes of this Sub-study. It was also important to document the changes and nature of error generation as part of the evaluation of intervention logistics and feasibility. These text messages were therefore downloaded separately and entered into the database; their data was added onto the system and a key describing types of texting errors produced and used to populate the text message error column as follows:

(1) Incorrect texts at the drugstores

These were downloaded in a separate excel spread sheet prepared by Snapshot. Snapshot did not have a filter to exclude the correct messages from this download, so all the text messages ever sent from the drugstores were downloaded into the drug store text message spread sheet. This spread sheet contained a column on why

a text message was categorised as incorrect (type of texting error). Using this column, rows of patients whose text messages contained errors were each screened to establish whether the text message could be understood (most errors were incorrect punctuation, spacing, etc). On the main database, rows were inserted and the columns filled manually. All patients whose text messages were incorrect at the drug store were classified as referral uptake failure, because without correct entry into the system, a patient would not be able to visit the health facility based on that particular referral. An error column was inserted in the database and a code for that error was manually entered. This was done for the analysis to show which patients were manually entered into the database.

(2) Incorrect texts at the health facility

These were downloaded from a separate spread sheet as for drugstores above. To qualify for entry into the system, the patient's ID had to be correct. The ID from the incorrect text message spread sheet was typed into the text search box of Excel and once a match was found, data from the incorrect text message was manually entered into the existing row into the database against the ID. In the error column of the database, the type of error made by the clinical officers was specified for later identification and analysis. Patients whose text messages were incorrect at the health facility/HC were classified as correct and 'referral complete' if the ID was found and the message error on content of diagnosis, treatment or advice did not compromise comprehension.

Where we did not know the name of the drugstore that had referred a patient (e.g. if a wrong telephone number was used which happened where some participants had more than one phone), the corresponding message was considered as an error under the – 'invalid phone number' error. However if the same happened with the health facility the message was considered valid. This is because the patient ID in the text message would redirect us to the original referral drug store. Using the drug store-health facility matching table (each health facility was matched to several drugstores – see Chapter 7), we were able to find out which health facility sent the text even with an 'invalid phone number' error.

After sending an incorrect message, drugstores and health facilities could revise and resend the message up to 3 times. The system allowed only 3 incorrect messages and then referred the sender to the intervention coordinator for support. This triggered an email that was sent to NIMR and LSTM indicating the name and number of the facility so that this person could be telephoned to solve the problem they were having. In some cases the patient's details were therefore sent twice or three times. Where this happened, the incorrect text message spread sheets were screened to see whose details had been sent twice or 3 times. For those patients, if the message had been sent correctly on the second or third try, they were not manually entered because that meant the system had picked them up and identified them when the message was correctly sent.

Health facility errors in ID

For patients with errors in the ID, a search was done using a few ID characters in the text message to see if that particular error was on one or two characters in the ID itself. Where this was the case the full ID would be traced and verification done by checking the date the text message was sent (at drug store) and the date the text message was received (at the health facility). If the details matched, these data were also manually entered as complete referrals. Where the ID could not be traced the data was discarded as entering it in the database would have constituted double patient count. Data of four patients with this error were discarded.

Merging and expansion of symptoms, conditions and treatment columns

Some patients had more than one or two symptoms. The columns for symptoms were therefore expanded to give every symptom its own column to allow entry of all data for such patients. However, many symptoms were similar (e.g. "*discharge from penis*" and "*discharge from vagina*") and were therefore merged to reduce the number of columns.

Exclusion of training data entries

Data corresponding to August 2013 was excluded from the analysis, as this was the time when the intervention participants were undergoing formal training and getting used to the system. Data received on the other training dates including 11th and 12th December, 16th to 22nd March and 23rd and 24th July 2013 were also removed from the database.

Patient age calculation (automatic and manual)

The system automatically calculated the patient age from the first date of entry and the date of birth written in the text message. While adding the incorrect text data into the system this procedure was followed by subtracting the date of birth in the text message from the date the text message was sent.

Errors on diagnosis, treatment and advice

All errors made on these variables were understandable as errors were on spacing (double or lack of), stop/comma and addition of unprogrammed character in the text message. These were manually entered and the type of error made coded.

Invalid and incomprehensible entries

For 5 patients (2 sent on 18/12/2012; 1 on 02/01/2013 and 2 on 26/03/2013) the text messages were completely wrong and incomprehensible. These were discarded.

Original data

All original databases containing wrong text messages from drug stores and health facilities and the original downloads from the system were filed in their original formats for reanalysis if needed.

System error

On one occasion only, the system accepted a wrong text message as correct and populated it into the database (ID – 48c933d3 sent by HC17 on 11/11/2013).

Sampling and power

Although the study approach was an intervention that was implemented for 18 months, the analytical approach for the main results follows a cross-sectional study design. This is because patients and their data, collected over a period of the 18 months, were only seen either once (at the drug store) or twice (both at the drug store and at the health facility) at one point in time. With this in mind, the main summary measure we could estimate with the cross-sectional design was prevalence of the conditions covered in the study [310]. Uptake of services for these conditions and factors influencing it at the health facility were considered the endpoint to be estimated from the data using both the univariate and multivariate analyses.

Studies on health-seeking behaviours in Tanzania have reported that more than 75% of the population visit health facilities for various reasons [311, 312]. In health facilities where this study was conducted, 21% of the people with STIs sought SRH services at the health facility [55]. The objective of our text messaging referral intervention was to estimate the SRH service uptake at the health facility after referral from the drugstore. With a design effect of 2, we estimated that a sample of 550 people would be appropriate to measure a 25% uptake at the health facility after referral from drugstores, with a 95% confidence interval from 20% to 30%.

Analysis

Data were analysed using STATA 13.1 software. The statistical tests used were aimed to answer the main objective i.e. to estimate the uptake of SRH services at the health facility level as a result of the drugstore referrals from the community. First, data were summarized by proportions to demonstrate the drugstores and health facilities' activity by month, numbers of patients referred, mobile phone usage, text messaging errors made, demographics of patients including ward of residence, sex and age. To demonstrate SRH seeking behavior at the drugstore level, frequency illustrations of patients per drugstore were calculated. Using proportions, these were summarised per SRH/STI symptom. To estimate the uptake at the health facility after referral, proportions were computed based on patients received at the drugstore in 2 by 2 tables. Similarly, the 2 by 2 tables were calculated to show the proportion of those who visited the health facilities and were diagnosed with various SRH conditions. Proportions of medicines prescribed were also shown to demonstrate whether the treatment needed for those who went to health facility were normally stocked at the drugstores. Proportions of patients who refused referral were also calculated demonstrating their age, sex and ward of residence. Age and sex of those who proceeded to access SRH services at the health facility were computed in 2 by 2 tables. Tests for trend to estimate the relationship of age and health facility visit were conducted. Finally, logistic regressions were conducted to estimate whether age and sex were confounders for SRH service uptake at the health facility.

8.3 Results

Introduction

As reported above, data were collected from text message content received within the Snapshot Referral System. Each text message represented a single patient in the data and no patients were recorded more than once. Therefore the number of correct text messages from the drugstores represents the number of patients at the drugstores, and the number of correct text messages from the health facilities represents the number of patients from the health facilities. The text message content was converted into data on patient demographics, disease symptoms and uptake of given services at the health facilities.

Number of text messages

A total of 2,910 text messages were received through the system from 1st September 2012 to 28th February 2014. Of these, 1004 were sent from drugstores (see Figure 8.2 and Table 8.2). During texting DSAs and COs made texting errors and had to re-send records of the same patient more than once (see above how duplicates were excluded). Due to this process and as described before, a number of records were cleaned and included in the total number of patients studied, while others were excluded due to incompleteness or incomprehensible data. Figure 8.2 illustrates the flow of records and the final records that were included in the study. The figure also shows that 84% (843/1004) of all text messages resulted in usable records. The total number of usable records at the health facility (successful referrals) was 253.

Figure 8.2 Electronic data included in the analysis

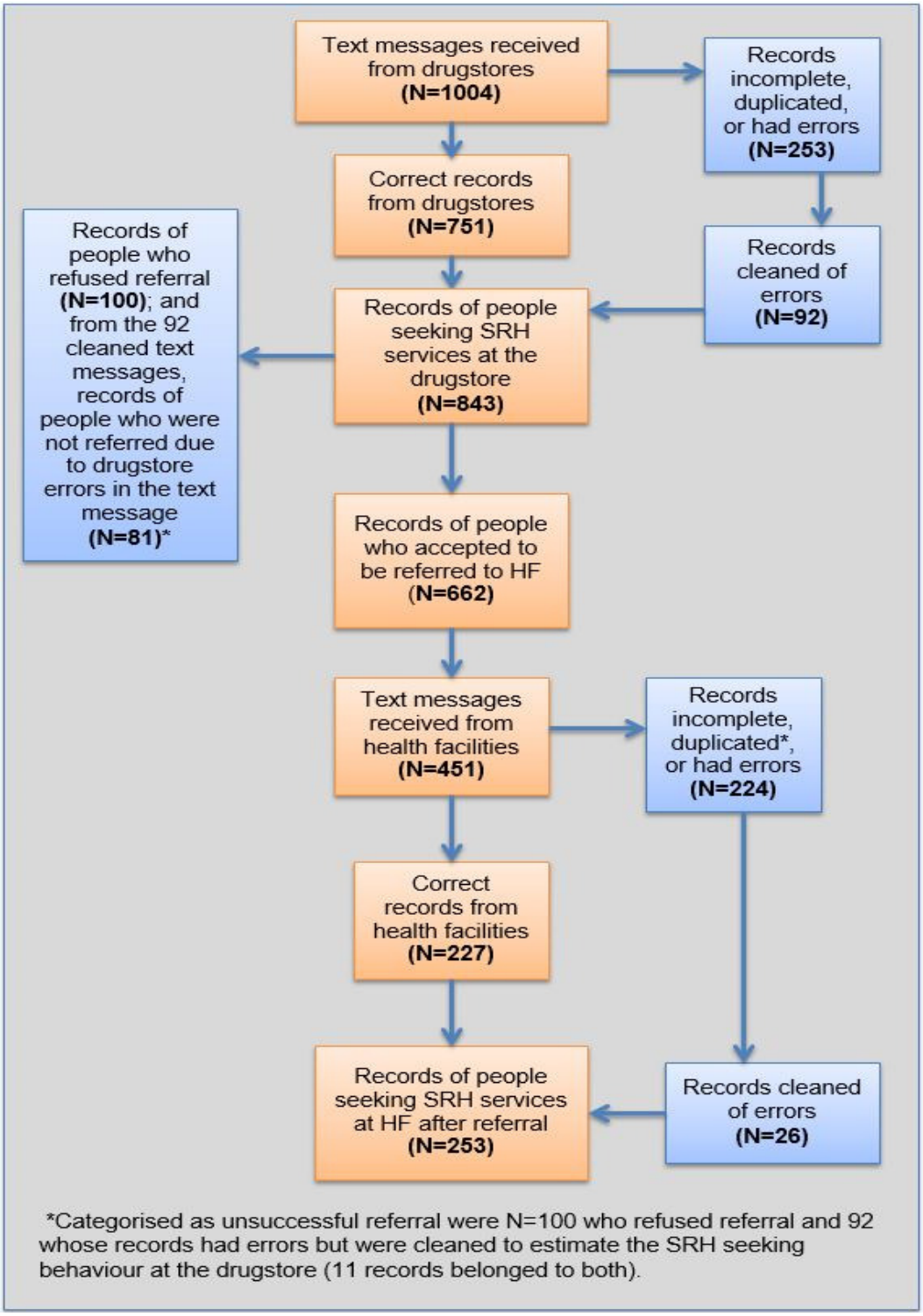


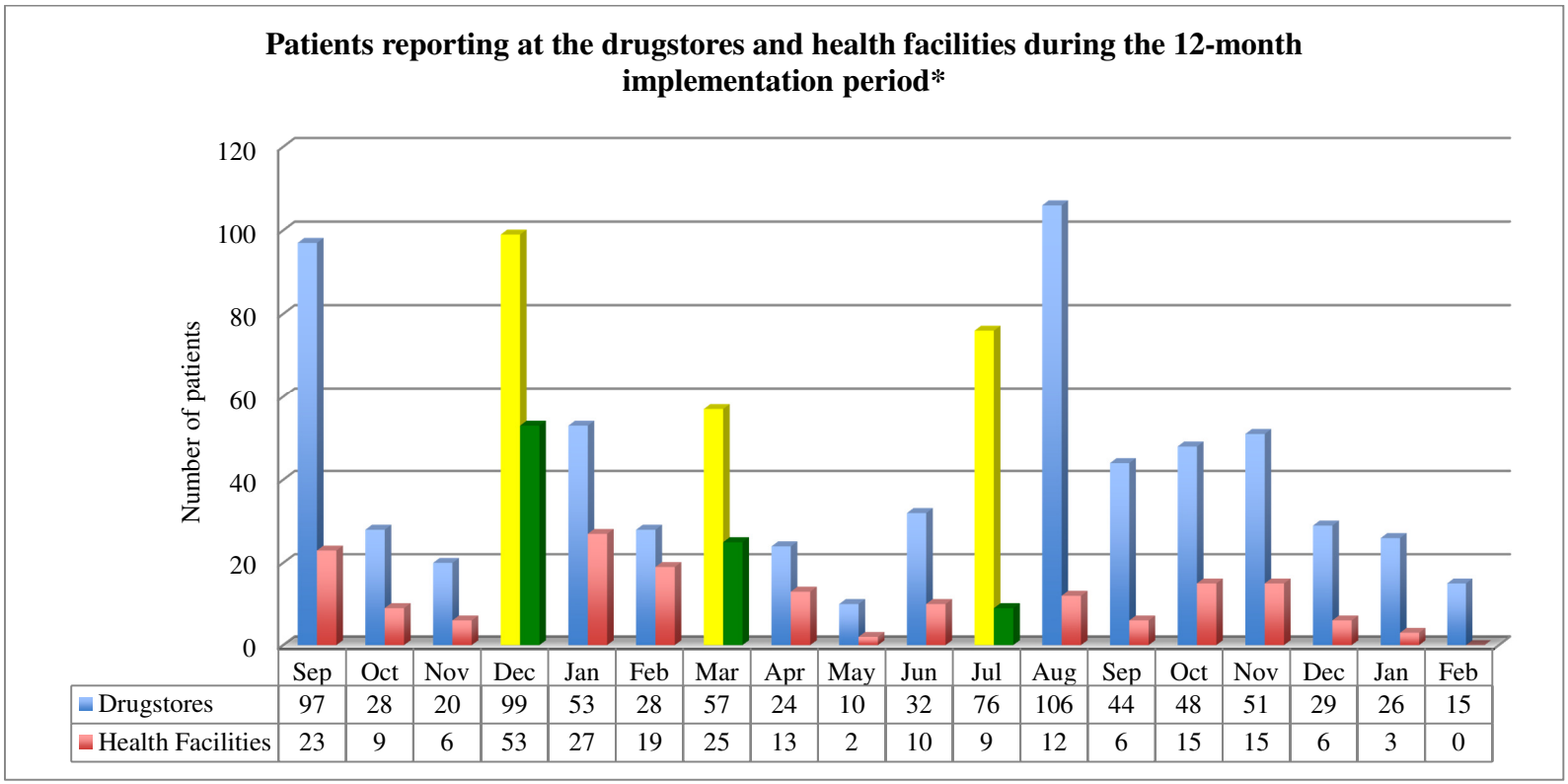
Table 8.1 Monthly patient numbers at the drugstore and health facility

Year	Month	Drugstore N=843	Health facility N= 253
	Jul	Pre-test	Pre-test
	Aug	Training	Training
	Sep	97 (11.51)	23 (9.09)
	Oct	28 (3.32)	9 (3.56)
	Nov	20 (2.37)	6 (2.37)
2012	Dec	99 (11.74)	53 (20.95)
	Jan	53 (6.29)	27 (10.67)
	Feb	28 (3.32)	19 (7.51)
	Mar	57 (6.76)	25 (9.88)
	Apr	24 (2.85)	13 (5.14)
	May	10 (1.19)	2 (0.79)
	Jun	32 (3.80)	10 (3.95)
	Jul	76 (9.02)	9 (3.59)
	Aug	106 (12.57)	12 (4.74)
	Sep	44 (5.22)	6 (2.37)
	Oct	48 (5.69)	15 (5.93)
	Nov	51 (6.05)	15 (5.93)
2013	Dec	29 (3.44)	6 (2.37)
	Jan	26 (3.08)	3 (1.19)
2014	Feb	15 (1.78)	0 (0.00)
	Total	843 (100.00)	253 (100.00)

The intervention was implemented for 18 months, with training and re-orientation of COs and DSAs taking place at month 0 (August 2012), month 4 (December 2012), month 7 (March 2013) and month 11 (July 2013). Each training/re-orientation lasted a maximum of two days. Therefore in Table 8.1, the data shows that during or shortly after training the drugstore and health facility referral activity increased, then reduced gradually. This pattern is seen in September 2012 after the August training, where the number of patients referred from drugstores and treated at the health facilities after referral were 11.5% (97/843) and 9.1% (23/253) respectively. The numbers of patients in both cadres start declining again until the next month of training: December 2012, when the numbers change from 20 (2.4%) at drugstores and 6 (2.4%) at health facilities in November to 99

(11.4%) and 53 (20.9%) respectively. The pattern continues in March and July/August 2013. The aim of training was to increase the number of patient referrals from the drugstores. April/May numbers at the drugstores and health facilities are particularly low as the toll-free number was inadvertently switched off between 23rd April and 15th May. Figure 8.3 is a graph demonstrating the monthly numbers excluding the training months of July and August in 2012.

Figure 8.3 No. of monthly patients



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Drugstores	97	28	20	99	53	28	57	24	10	32	76	106	44	48	51	29	26	15
Health Facilities	23	9	6	53	27	19	25	13	2	10	9	12	6	15	15	6	3	0

*Yellow and Green bars show the number of patients from drugstores and health facilities respectively during the training months.

Table 8.2 No. of text messages exchanged through the system

	Messages received in the system	Messages sent by the system	Total
Drug store text messages	1004	1004	2008
Health facility text messages	451	451	902
Total	1,455	1,455	2,910

Error-making during text messaging

As demonstrated in Figure 8.1 and Table 8.3, 124 text messages had errors which were cleaned for their records to be included in the analysis. Below we describe what type of errors these were.

Table 8.3 Proportion of records with errors

Texts with errors	Freq.	%	95% CI
No errors	719	85.29	0.84 – 0.86
Have errors	124	14.71	0.13 – 0.17
Total	843	100.00	

As shown in table 8.3 above, only 15% of records that we have used in this analysis had errors that were cleaned.

Table 8.4 Percentage of errors by cadre

Cadre making errors	Freq.	Per cent
Drugstores	98	79.03
Health facilities	26	20.97
Total	124*	100.00

*This is the total number of records with cleaned errors as shown in Figure 8.2.

Among the usable records with errors, 79% were from drugstores and 21% from health facilities (Table 8.4).

Table 8.5 Percentage of errors made

Type of errors	Freq.	Per cent
DS error initials	5	4.03
DS error DOB	36	29.03
DS error sex	8	6.45
DS error symptoms	9	7.26
DS error appointment	6	4.84
DS error spacing	22	17.74
DS error phone number	12	9.68
HF error ID	8	6.45
HF error diagnosis	11	8.87
HF error spacing	7	5.65
Total	124	100.00

DOB = date of birth

Table 8.5 shows that the most frequent errors were made at the drug stores, in the coding of patients' dates of birth, comprising 29.0% of total errors made. The next most common type of error was in spacing (18%). Spacing was necessary for the data to be interpreted by the system and errors made related to either lack of space or double spacing. Errors made in adding the initials of the patient were the least comprising only (4%). Seven per cent of errors were omissions of gender of the patient, which was lack of either M (for male) or F (for female). Errors in recording symptoms accounted for 7% were in the form of: (i) lack of symptom and (ii) mistyping of the symptom code in the text message. Lack of the appointment code in the text message accounted for 5% of errors, while 10% of drugstore phone numbers used were not enrolled on the system, constituting an 'invalid number' error.

We had expected that the majority of errors at the health facilities would relate to the patient ID which was 8 random characters. But errors on this feature comprised only 7% of all errors. The majority of errors at the health

facility were made in the entry of the diagnosis code (9%). Text spacing at the health facility accounted for 6% of total errors made. Excluded text messages also had errors of these descriptions but were not quantified (See Figure 8.2).

District of residence

Table 8.6 Patient's district of origin

Patients' District	Freq.	Per cent	95% CI
Magu	513	61.66	0.58 – 0.64
Sengerema	319	38.34	0.35 – 0.41
Total	832*	100.00	

*Although the original denominator was 843, for 11 patients we could not determine the drugstore that had referred them. This could have happened either because some drugstore(s) out of our intervention area had heard about the intervention and tried to send their patients or because some drugstore(s) within the intervention referred these patients using phone numbers that were not registered in the Snapshot system without activating them as described in Chapter 7. To determine the patients' districts of origin we looked at the district where the referrer drugstore was located. Although their data were comprehensible from the text messages therefore, without knowing the referrer drugstore we could not tell which districts the 11 patients had come from.

In Table 8.6, 62% of patients came from Magu whereas 38% came from Sengerema district. This is because Magu had more drugstores than Sengerema (See Chapter 7).

Ward of residence

Table 8.7 Ward of residence

Patient's ward of residence	Freq.	Percent
Seng_Busisi	81	9.74
Seng_Buyagu	14	1.68
Seng_Igalula	184	22.12
Seng_Nyamatongo	7	0.84
Magu_Kongolo	100	12.02
Magu_Shishani	108	12.98
Magu_Nyanguge	143	17.19
Magu_Kisesa	193	23.20
Magu_Mwamabanza	2	0.24
Total	832	100.00

After excluding patients whose ward of residence was unknown (N=11), Table 8.7 shows that the largest number of patients came from Kisesa ward (23%) of Magu district and Igalula ward (22%) of Sengerema District. The lowest number of patients came from Mwamabanza ward (2 patients only) of Magu district.

Patients' sex distribution

Table 8.8 Sex of the patients

Gender of patients	Freq.	Per cent	95% CI
Male	417	49.82	0.46 – 0.53
Female	420	50.18	0.46 – 0.53
Total	837*	100.00	

*Sex was missing for 6 patients

After excluding 6 patients whose sex had not been recorded, data showed that female attendance at the drugstore was the same as that of males; 50.2% and 49.8% respectively (Table 8.8).

Age and sex distribution

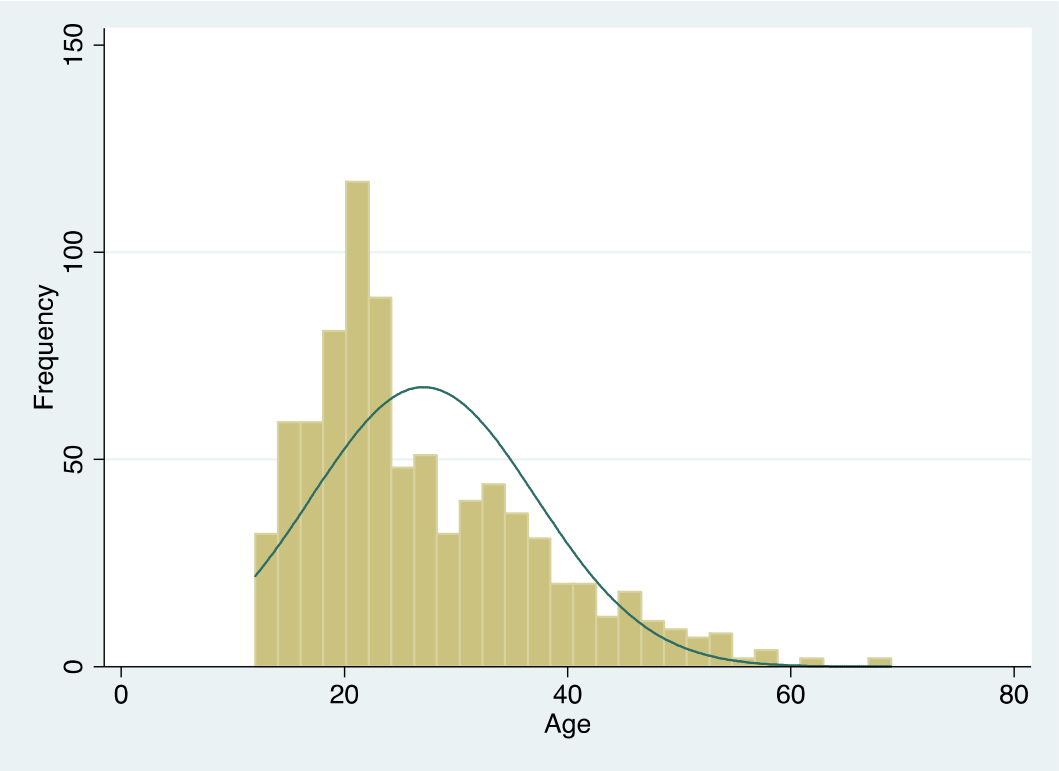
Table 8.9 Age and sex distribution of patients at the drugstore

Age groups	Gender of patients		
	Male N (%)	Female N (%)	Total N (%)
10-14	16 (3.86)	15 (3.61)	31 (3.73)
15-19	71 (17.11)	80 (19.23)	151 (18.17)
20-24	120 (28.92)	132 (31.73)	252 (30.32)
25-29	53 (12.77)	61 (14.66)	114 (13.72)
30-34	49 (11.81)	52 (12.50)	101 (12.15)
35-39	45 (10.84)	34 (8.17)	79 (9.51)
40-44	25 (6.02)	15 (3.61)	40 (4.81)
45-49	21 (5.06)	12 (2.88)	33 (3.97)
50-54	10 (2.41)	10 (2.40)	20 (2.41)
55-59	3 (0.72)	3 (0.72)	6 (0.72)
60-64	1 (0.24)	1 (0.24)	2 (0.24)
65-69	1 (0.24)	1 (0.24)	2 (0.24)
Total	415 (100.00)	416 (100.00)	831* (100.00)

*This total excludes 6 patients whose sex was missing and 6 patients whose age was missing

The age category attending the drugstores most frequently was 20-24 years (30.2%) (Table 8.9).

Figure 8.4 Normal distribution of patients' age at the drugstores



After excluding 6 patients whose age was missing, the mean age was 27 years, the youngest patient was 12 years and oldest 69 years (Figure 8.4). The median age was 24 years (not shown in Figure 8.4).

Drugstore attendance

Table 8.10 Drugstore referral activity

Drugstore visited	Freq.	Per cent
DS name missing	11	1.30
DS1	7	0.83
DS4	33	3.91
DS5	6	0.71
DS9	6	0.71
DS10	13	1.54
DS12	20	2.37
DS13	12	1.42
DS16	7	0.83
DS17	2	0.24
DS18	48	5.69
DS19	1	0.12
DS21	96	11.39
DS22	93	11.03
DS23	2	0.24
DS24	4	0.47
DS25	23	2.73
DS26	1	0.12
DS27	1	0.12
DS28	7	0.83
DS29	7	0.83
DS30	3	0.36
DS31	14	1.66
DS32	58	6.88
DS33	1	0.12
DS34	10	1.19
DS35	5	0.59
DS37	7	0.83
DS38	23	2.73
DS39	20	2.37
DS40	5	0.59
DS42	56	6.64
DS43	8	0.95
DS46	10	1.19
DS47	26	3.08
DS49	6	0.71
DS50	154	18.27
DS51	6	0.71
DS52	31	3.68
Total	843	100.00

All patients included in the analysis visited a drugstore once. Only 38 out of 52 drugstores enrolled on the system referred patients; 14 drugstores did not make any referrals; however, the drugstore name was missing for 11 patients as reported before in Table 8.10. The highest number of patients referred by any single drug store was 154 patients (18.3%). Three drugstores referred one patient each. Further analyses with drugstores excluded the 14 drugstores which did not refer any patients.

Symptoms presented at the drugstore

Table 8.11 Symptoms presented by patients at the drugstore

SRH condition (N=837 for each row)*	Patients with SRH condition*		Patients without SRH condition*	
	Male	Female	Male	Female
Discharge	148	91	252	346
Curd-like discharge (fem)	N/A**	33	N/A	404
Abdominal pain	7	84	393	352
Scrotal swelling	14	NA	386	437
Genital sore	22	22	378	415
Inguinal swelling	4	7	396	430
Itching	39	40	361	397
Pain in testicles	3	N/A	397	437
Pain urinating	32	30	368	407
Vaginal bleeding	N/A	11	400	426
Bleeding during sex	N/A	1	400	436
Pain during sex	2	398	9	428
Growth around genital	6	4	394	433
Blister on genital	2	10	398	427
Blister on mouth	2	2	398	435
Ulcer on genital (painless)	0	2	400	435
Skin rash	11	3	398	434
Blotchy rash, muscle pain, glands	6	4	394	433
Patient demands VCT	31	22	396	415
Patient demands STI test/treatment	32	25	368	412
Patient needs ARVs	1	0	399	437
Male condom for contraception	7	0	393	437
Male condom for STI prevention	9	0	391	437
Female condom for contraception	0	1	400	436
Female condom for STI prevention	0	1	400	436
Patient needs FP: pill	1	15	399	422
Patient needs FP: injection	N/A	11	400	426
Patient needs FP: IUD	N/A	4	400	433
Patient needs FP: patch	N/A	2	400	435
Patient needs FP: diaphragm	N/A	2	400	435
Patient needs FP: tubal ligation	N/A	4	400	433
Patient needs FP: vasectomy	0	N/A	400	437
Patient needs FP: natural	0	2	400	435
Patient needs pregnancy test	N/A	16	400	421
Patient needs ANC	N/A	2	400	435
Patient needs maternal delivery	N/A	4	400	433
Symptom undisclosed	9	10	391	426

*N=837 excludes 6 patients whose sex was missing. The total of 837 is for each row; see explanation below. **N/A – not applicable.

Table 8.11 shows all the symptoms reported at the drugstore and every row shows the number of patients who reported with the symptom out of the total patients reporting at the drugstore (N=837). The numbers have been segregated by sex to show the number of males and females separately. Where a symptom is not applicable for a given sex, N/A has been entered in the table cell. The sum of each row in Table 8.11 is 837 (except where N/A has been recorded) to demonstrate how frequent a given symptom was reported in the whole sample.

The most commonly reported symptom was pain during sex (N=400 patients, see Table 8.11). This symptom was however disproportionately reported between sexes; i.e. there were 398 females and only 2 males reporting pain during sex at the drugstore. Since pain during sex on its own does not necessarily mean a patient has STI, the most STI-related symptom reported was genital discharge, presented by 239 patients out of 837 patients. Other symptoms had patients ranging from 0 to 90 as shown in Table 8.11. Nineteen patients chose to withhold information on the type of symptom they had. The system was programmed to allow such patients to still be referred.

Table 8.12 Demographics of patients who refused referral

Demographic	Male N (%)	Female N (%)	Total N (%)
Age groups			
Age missing	N/A	N/A	2 (2.00)
10-14	8 (12.31)	2 (5.88)	10 (10.00)
15-19	1 (1.54)	1 (2.94)	2 (2.00)
20-24	11 (16.92)	11 (32.35)	23 (23.00)
25-29	4 (6.15)	5 (14.71)	9 (9.00)
30-34	13 (20.00)	11 (32.35)	24 (24.00)
35-39	12 (18.46)	3 (8.82)	15 (15.00)
40-44	4 (6.15)	0 (0.00)	4 (4.00)
45-49	7 (10.77)	1 (2.94)	8 (8.00)
50-54	2 (3.08)	0 (0.00)	2 (2.00)
55-59	0 (0.00)	0 (0.00)	0 (0.00)
60-64	0 (0.00)	0 (0.00)	0 (0.00)
65-69	1 (1.54)	0 (0.00)	1 (1.00)
Total	65 (100.00)	34 (100.00)	100 (100.00)
Ward of patient			
Ward missing	1 (1.54)	0 (0.00)	1 (1.00)
Busisi	0 (0.00)	1 (2.94)	1 (1.00)
Buyagu	0 (0.00)	0 (0.00)	0 (0.00)
Igalula	3 (4.62)	2 (5.88)	5 (5.00)
Nyamatongo	0 (0.00)	0 (0.00)	0 (0.00)
Kongolo	1 (1.54)	6 (17.65)	7 (7.00)
Shishani	0 (0.00)	0 (0.00)	0 (0.00)
Nyanguge	50 (76.92)	22 (64.71)	72 (72.00)
Kisesa	10 (15.38)	8 (8.82)	13 (13.00)
Mwamabanza	0 (0.00)	0 (0.00)	1 (1.00)*
Total	65 (100.00)	34 (100.00)	100 (100.00)

*Sex missing

One hundred patients chose not to be referred as part of the intervention. They rejected referral after they had requested SRH related services at the drugstore and the drugstore attendant attempted to refer them. As these patients did not consent to participate in the study, consultation within the research team reached an agreement to only analyse their demographic data (i.e. sex, age and ward of residence). This decision was reached based on the fact that the information sheet provided to the participants specifically gave them an option to refuse participation, in which case their data wouldn't be

used in the analyses. The team which made this decision included researchers from NIMR and LSTM. Therefore no analysis was conducted to establish what specific SRH conditions or needs these patients had. From the demographic data (Table 8.12), the majority of patients refusing referral were aged between 30-34 (24%), 65% were males (65/99) and 72% were from Nyanguge ward which is in Magu District. Nyanguge is an urban ward and as such is likely to have much higher numbers attending the drugstore, which could have explained why the numbers of refused referrals are higher here. From Table 7.1 (Chapter 7) it can be seen that Nyanguge has one of the highest number of drugstores (N=9), therefore it could also be that this high number of drugstores in fact contributes to the finding in this category. It could also reflect the drugstore attendant's individual approach to referral communication and explanation of consent. Examining the drugstores which had patients refusing the referral demonstrated that 62% of patients who refused referral came from one drugstore DS21 (data not shown).

Table 8.13 Drugstore visit for the 5 SRH conditions

Condition at drugstore	Male N (%)	Female N (%)	Total N* (%)
HIV§	31 (8.99)	19 (5.01)	50 (6.91)
STIs¶	303 (87.83)	304 (80.21)	607 (83.84)
Family planning♯	10 (2.90)	36 (9.50)	46 (6.35)
ANC★	N/A	17 (4.51)	17 (2.35)
Delivery⋀	N/A	4 (1.06)	4 (0.55)
Total	344 (100.00)	380 (100.00)	724 (100.00)

N*=724, excluding 19 patients who chose not to disclose their symptoms (see Table 8.13) and 100 patients who did not consent to the referral (see Table 8.15).

§ HIV conditions include: VCT, patient suspects they have HIV and ARVs or HIV treatment requests.

¶ STI conditions include genital discharge, scrotal swelling, genital sores, inguinal pain, genital itching, pain in the testicles, pain during urinating, vaginal bleeding, bleeding during sex, pain during sex, growth on the genitals, blister on the genitals, blisters in the mouth, genital ulcers, genital rashes, STI test requests, STI treatment requests, male condom for STI prevention and female condom for STI prevention

♯ Family planning conditions include male and female condoms for family planning, contraceptive pill and injection, IUD, patch, diaphragm, ligation, vasectomy and natural family planning requests

★ANC includes all ANC attendance and pregnancy test requests

⋀Delivery includes obstetric delivery

Table 8.13 shows conditions which patients who sought treatment at the drugstore had. The majority of them had STIs (84%), but 7% sought HIV services, while 6% and 2% sought family planning and ANC services respectively. Four patients requested services for maternal delivery at the drugstore.

Appointment

Table 8.14 Preferred time of appointment to visit the health facility

Patients' appointment	Male N (%)	Female N (%)	Total N* (%)
No appointment made	77 (18.47)	77 (18.33)	154 (18.40)
Patient arriving within 1 hr	65 (15.59)	69 (16.43)	134 (16.01)
Patient arriving within 2 hrs	49 (11.75)	55 (13.10)	104 (12.43)
Patient arriving within 3 hrs	40 (9.59)	51 (12.14)	91 (10.87)
Patient arriving within 4 hrs	52 (12.47)	35 (8.33)	87 (10.39)
Patient arriving tomorrow	104 (24.94)	106 (25.24)	210 (25.09)
Patient arriving after tomorrow	30 (7.19)	27 (6.43)	57 (6.81)
Total	417 (100.00)	420 (100.00)	837 (100.00)

*N=837 excluding 6 patients whose sex is missing

Table 8.14 shows that the most popular preferred appointment was going to the health facility the day after the drugstore visit (preferred by 25% of patients) whereas the least popular option was going after two days (7%). Table 8.16 also shows that there is no significant difference of choosing appointment time between men and women, suggesting that both sexes had the same ability to make a decision on when to go to the health facility.

Health facility visit

Table 8.15 Proportion of patients who went to the health facility

Key: *Frequency* *Column percentage*			
Patient went to HF	Gender of patients		
	Male	Female	Total
Yes	117 38.11	136 38.31	253 38.22
No	190 61.89	219 61.69	409 61.78
Total	307 100.00	355 100.00	662 100.00

Among the patients who were successfully referred (N=662; after excluding N=100 referral refusals and N=81 records remaining with errors at the drugstore), 38% proceeded to access services at the health facility, whereas 62% did not (Table 8.15).

Table 8.16 Uptake of SRH referral by age group

	Total	Male		Female		
Age group	Yes* N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)	P-Value
10-14	2 (0.79)	0 (0.00)	6 (100.00)	2 (15.38)	11 (84.62)	0.31
15-19	26 (10.28)	11 (18.3)	49 (81.67)	15 (20.83)	57 (79.17)	0.72
20-24	67 (26.48)	26 (27.96)	67 (72.04)	41 (36.94)	70 (63.06)	0.17
25-29	45 (17.79)	21 (45.65)	25 (54.35)	24 (46.15)	28 (53.85)	0.96
30-34	42 (16.60)	18 (54.55)	15 (45.45)	24 (60.00)	16 (40.00)	0.64
35-39	28 (11.07)	14 (53.85)	12 (46.150	14 (50.00)	14 (50.00)	0.77
40-44	16 (6.32)	13 (65.00)	7 (35.00)	3 (23.08)	10 (76.92)	0.02
45-49	9 (3.56)	7 (53.85)	6 (46.15)	2 (18.18)	9 (81.82)	0.07
50-54	13 (5.14)	5 (71.43)	2 (28.57)	8 (80.00)	2 (20.00)	0.68
55-59	3 (1.19)	1 (50.00)	1 (50.00)	2 (66.67)	1 (33.33)	0.70
60-64	1 (0.40)	1 (100.00)	0 (0.00)	0 (0.00)	1 (100.00)	0.15
65-69	1 (0.40)	0 (0.00)	0 (0.00)	1 (100.00)	0 (0.00)	-
Total	253 (100.00)					

*Total of patients who took up referral by age group

In Table 8.16, the second column shows the total number and proportion of patients from each age group who went to the health facility after referral. The table indicates that the 20-24 age group accounted for the highest referral uptake (26%) compared to any other age group. This was also true after stratifying by sex. From 10-14 age group, the proportion of female patients taking referral was higher than that of males until 30-34 age group. Although the number of patients going to the health facility after referral reduces with increasing age, Table 8.16 also shows that from 35-39 to 45-49 age groups the proportion of male patients who take up referral is higher than that of females. Beyond 45-49 age group the numbers are small to comment on the sex difference. The test for trend however showed a reduction in the odds of going to the health facility as the age increases with a significant p-value (Table 8.17).

Table 8.17 Test for linear trend for age group

Odds ratio	95% CI	Chi2	P-Value
0.77	0.72-0.84	40.80	0.00

Table 8.18 Maximum likelihood of ORs comparing age groups and sex*

Age	**OR**	**Chi^2**	**P-value**	**95% CI**
10-14	0.00	0.98	0.32	-
15-19	0.85	0.13	0.72	0.36-2.04
20-24	0.66	1.84	0.17	0.36-1.21
25-29	0.98	0.00	0.96	0.44-2.18
30-34	0.80	0.22	0.64	0.31-2.05
35-39	1.17	0.08	0.78	0.39-3.44
40-44	6.19	5.38	0.02	1.06-36.11
45-49	5.25	3.10	0.07	0.67-41.41
50-54	0.63	0.16	0.69	0.06-6.47
55-59	0.50	0.11	0.74	0.00-31.96

60-64	-	1.00	0.31	-
65-69	-	-	-	-
Mantel-Haenszel estimate controlling for age group:				
OR	Chi^2	P-value	95%CI	
0.96	0.04	0.84	0.69 1.34	
Test of homogeneity of ORs (approx): Chi^2 (10) = 13.00 P = 0.22				

* on going to the health facility after referral

To determine whether age was confounding the uptake of services after referral we ran a model to control for age group and established that it was not. The first part of Table 8.18 above shows the odds of going to the health facility for each age group. None of them was statistically significant except for 40-44 year olds which however had a wide CI due to the small sample of participants from that age group (CI=1.06-36.10). We tested for interaction (effect modification) between age group and sex and there was none (Chi2=13; P=0.22; df=10), suggesting that males had 0.4% chance of not going to the health facility (OR=0.96) but this was not statistically significant (P=0.84; CI=0.69-1.34).

Table 8.19 Score test for trend of odds of visiting the health facility*

Sex	**OR**	**Chi²**	**P-value**	**95% CI**
Male	0.71	31.86	0.00	0.63-0.80
Female	0.82	12.19	0.00	0.74-0.92
Mantel-Haenszel estimate controlling for sex:				
OR	**Chi²**	**P-value**	**95% CI**	
0.77	40.82	0.00	0.71-0.83	
Test of homogeneity of ORs (approx.): Chi^2 (1) = 3.23; P = 0.07				

* with age group by sex

Table 8.19 above showed that sex was significant for going to the health facility. For a unit increase in age group, the odds of going to the health facility increased by OR=0.77 (P=0.72-0.84). There was borderline evidence of interaction between sexes however (Chi2=3.2; P=0.07; df=1) rendering the overall OR=0.77 invalid. The individual sex ORs where therefore considered, suggesting that there was a 29% chance of not going to the health facility after referral among males (OR=0.71; P=0.00; CI=0.63-0.80) and an 18% chance of not going to the health facility among females (OR=0.82; P=0.00; CI=0.74-0.92).

Health facility activity

Table 8.20 Health facilities visited by the patients after referral

Health facility visited	Freq.	Per cent
Disp1	2	0.79
Disp2	1	0.40
Disp3	0	0.00
Disp4	121	47.83
Disp5	22	8.70
Disp6	0	0.00
Disp7	0	0.00
Disp8	0	0.00
Disp9	17	6.72
Disp10	44	17.39
Disp11	0	0.00
Disp12	2	0.79
Disp13	0	0.00
Disp14	1	0.40
Disp15	0	0.00
HC16	1	0.40
HC17	36	14.23
HC18	6	2.37
Total	253	100.00

Table 8.20 shows which health facilities the patients went to after referral. The most visited health facility was Disp4 accounting for 47.8% of all patients who took up referral. Patients visited only 11 out of 18 facilities enrolled on the referral system. The 7 facilities that did not receive any patients are shown in Table 8.21.

Table 8.21 Health facilities that did not treat patients*

Health facility	Collaborating Drugstore(s) with number of patients referred (in brackets)
Disp3	*1.* DS3 (0) *2.* DS8 (0) 3. DS17 (0) *4.* DS19 (1) *5.* DS33 (0)
Disp6	No drugstore
Disp7	*1.* DS5 (6) *2.* DS24 (2)
Disp8	*1.* DS15 (0) *2.* DS16 (7)
Disp11	*1.* DS23 (0)
Disp13	*1.* DS2 (0)
Disp15	*1.* DS6 (0) *2.* DS11 (0)

* and the number of patients referred from their participating drugstores

In Table 8.21, investigations were done to establish why these 7 health facilities received no patients. Table 8.23 shows that the reason for non-treatment of referred patients was because few or no patients were referred from the drugstores partnering with these 7 facilities.

Diagnosis

Table 8.22 Diagnosis performed at the health facility

Diagnosis	Gender of patients		
	Male; N (%)	Female; N (%)	Total; N (%)
Diagnosis missing	0 (0.00)	3 (2.21)	3 (1.19)
ANC	N/A	1 (0.74)	1 (0.40)
Mixed infections_cPVD	1 (0.85)	1 (0.74)	2 (0.79)
Genital Ulcer Disease	6 (5.13)	4 (2.94)	10 (3.95)
HIV	11 (9.40)	10 (7.35)	21 (8.30)
Inguinal Bubo_IB	3 (2.56)	1 (0.74)	4 (1.58)
Non-STI_Treatm_needed	13 (11.11)	15 (11.03)	28 (11.07)
Non-STI_Treatm_Not_need	2 (1.71)	7 (5.15)	9 (3.56)
Pelvic Inflam Disease	0 (0.00)	20 (14.71)	20 (7.91)
Painful Scrotal Swell	5 (4.16)	N/A	5 (1.98)
Prolonged UDS	11 (9.40)	N/A	11 (4.35)
Prolonged VDS	N/A	5 (3.68)	5 (1.98)
Syphilis	10 (8.55)	5 (3.68)	15 (5.93)
Urethral Discharge	53 (45.30)	N/A	53 (20.95)
Vaginal discharge	N/A	56 (41.18)	56 (22.13)
Genital Warts	2 (1.71)	3 (2.21)	5 (1.98)
Family Planning_injection	0 (0.00)	4 (2.94)	4 (1.58)
Family Planning_Vasectomy	1 (0.85)	0 (0.00)	1 (0.40)
Total	118 (100.00)	136 (100.00)	253 (100.00)

We considered diagnosis at the health facility medically correct to inform about the patients symptoms than those recorded by the drugstores. Consistent with the symptoms presented at the drugstores however, discharge (urethral/vaginal) was the most frequently diagnosed condition performed at the health facility (45% in males; 41% in females). Discharge contributed to 49% of the total diagnoses including prolonged vaginal discharge syndrome and prolonged urethral discharge syndrome (Table 8.22).

Ability of the health facilities to provide STI and HIV diagnosis

Health facilities in Tanzania use syndromic management of STIs, where the facilities use the guidelines by the WHO and MoH to determine the

infection the patient might have based on the symptoms presented. This is because the facilities lack basic diagnostic tools. For HIV however, it is necessary to conduct a laboratory examination for the confirmatory tests of the suspected diagnosis. The results in Table 8.22 suggest that 8.3% of patients at the health facilities were diagnosed with HIV. Table 8.23 shows that the HIV patients were from three health facilities, i.e. Disp4, Disp10 and HC18. The HIV positive tests were conducted using "*Bioline*" or "*Determine*" rapid diagnostic tests which are provided to the health facilities by MoHSW. It is not clear why Disp4 had more HIV patients than any other 2 facilities which diagnosed it, but it is the only health facility situated in a rural ward in Sengerema district. It is therefore likely that HIV patients did not have anywhere else to go.

Table 8.23 Health facilities which diagnosed HIV

Health Facilities visited	No. of patients with HIV	Per cent	Cum.
Disp4	15	71.43	71.43
Disp10	3	14.29	85.71
HC18	3	14.29	100.00
Total	21	100.00	

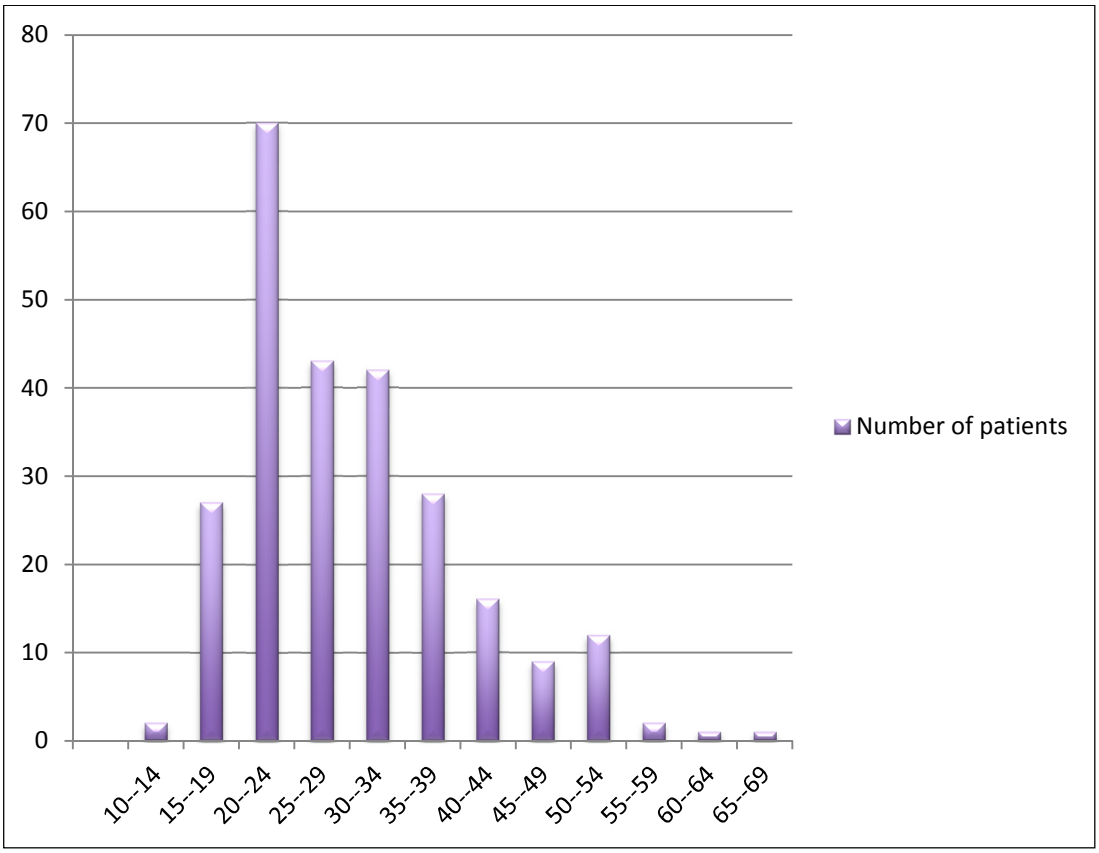
Table 8.24 Detailed statistics of all diagnoses, stratified per gender and age group

Age group	ANC		cPVD		GUD		HIV		IB		NSTIn		NSTIRx		PID		PSS		pUDS		pVDS		Syph		UDS		VDS		GenW		FPinj		FPvas		Total
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
10-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
15-19	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	4	0	0	1	0	0	0	1	0	9	0	0	9	0	0	0	1	0	0	27
20-24	0	0	0	1	1	1	1	3	1	0	0	3	0	3	0	6	0	0	4	0	0	1	2	0	18	0	0	21	0	2	0	1	1	0	70
25-29	0	0	0	0	0	0	1	2	0	1	3	3	1	1	0	2	0	0	0	0	0	3	1	1	14	0	0	9	1	0	0	1	0	0	43
30-34	0	1	0	0	1	3	0	0	0	0	6	2	0	0	0	5	1	1	2	0	0	0	3	3	5	0	0	8	0	1	0	0	0	0	42
35-39	0	0	0	0	2	0	2	2	0	0	1	5	1	0	0	2	2	0	1	0	0	1	1	0	4	0	0	3	0	0	0	1	0	0	28
40-44	0	0	1	0	1	0	4	1	1	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	16
45-49	0	0	0	0	1	0	1	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	9
50-54	0	0	0	0	0	0	1	1	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	12
55-59	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
60-64	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
65-69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	1	1	6	4	11	10	3	1	13	15	2	7	0	20	4	1	11	0	0	5	10	5	55	0	0	57	2	3	0	4	1	0	253

ANC=Antenatal care; cPVDS=mixed infections; GUD=Syphilis, Chancroid, LGV and HSV-2; HIV=HIV; IB=Inguinal Bubo; NSTIn= Non-STI symptom, no treatment is needed; NSTIRx=Non-STI symptom, treatment is needed; PID=Pelvic inflammatory disease; PSS=Painful scrotal swelling – gonorrhoea or Chlamydia infections; pUDS=Prolonged Chlamydia, trichomoniasis, 2nd line gonorrhea; pVDS=Candidiasis, bacterial vaginosis, prolonged Chlamydia 2nd line gonorrhea; Syph=Syphilis; UDS=Urethral Discharge Syndrome; VDS=Vaginal Discharge Syndrome; GenW=Genital Warts; FPinj=injection contraceptive needed; FPvas=Vasectomy contraceptive needed.

Table 8.24 shows the numbers of all conditions diagnosed per age group and sex. It shows that the overall diagnosis of the major SRH conditions was done among age group 20-24 and this is further demonstrated in Figure 8.5, which only plots the totals shown in Table 8.24.

Figure 8.5 No. of patients with SRH conditions per age group



Drugs prescribed to patients with various SRH conditions

Table 8.25 Drugs prescribed and clinical management*

Drugs prescribed/clinical management*	Freq	Per cent
Cipro500mg Doxy100mg	103	40.55
Clotri_pess100mg	7	2.76
Doxy100mg Metron2g Ceftri250mgInj	8	3.15
Clotri100mg Ceftri250mg Doxy100mg Metro	1	0.39
Clotri100mg Cipro500mg Doxy100mg Metron	4	1.57
Refer_lab	2	0.79
RH Promotion_PITC_Refer	7	2.76
Cipro500mg Doxy100mg Metron400mg Analge	8	3.15
Refer	14	5.51
Refer Surg_Gyn IV Resusc	2	0.79
Refer Surg_Gyn	7	2.76
Doxy100mg Metron400mg Ceftri250mg	4	1.57
Refer Surgeon	4	1.57
BenzPen2.4MU Eryth500mg Acycl400mg	11	4.33
Eryth500mg RH Prom	3	1.18
Refer to Surg_cont Treat	1	0.39
Podophyllotoxin Sol or Gel	4	1.57
BenzPen2.4MU Erythr500mg Acycl400mg	13	5.12
MoH Guide HIV_Treat	16	6.30
Contrace pills	2	0.79
Contrace inj	3	1.18
Intra Uter Device	1	0.39
Contrace Patch	1	0.39
Diaphragm	1	0.39
Vasectomy	1	0.39
ANC Care	1	0.39
No treatment needed	11	4.33
No treatment offered	14	5.51
Total	253	100.00

*See Appendix 7.2 for the details of drugs and treatment in the cue card

Table 8.25 has been prepared using the recommendations from MoHSW and WHO for treatment of STIs/RTIs and cue cards used by health facilities while texting the information on referral completion. The table demonstrates that 40% of patients received ciprofloxacin tablets and shows that it was the most commonly prescribed medicine. Only 0.8% of patients were referred for lab tests. 6% of patients did not receive any form of treatment. At the

time of analysis none of the medicines prescribed in Table 8.25 was licensed for distribution at the drugstore level in Tanzania.

Table 8.26 Advice given

Advice given	Freq.	Per cent
Advice missing	8	3.16
RH promotion	77	30.43
RH promotion and treatment	111	43.87
Back_referred to collab DS	34	13.44
Referred to any DS	6	2.37
Referred to higher HF	17	6.72
Total	253	100.00

Advice given

Data related to advice provided to patients is shown in table 8.26. Advice was given accompanying treatment and drugs. It was an additional measure to establish whether the patient got all the treatment they needed or whether they had been re-referred somewhere else. We included an indicator we coined as '*back-referral'* where health facilities re-referred their patients back to the collaborating drugstores for drugs; 13.4% of patients were referred this way. '*Down-referral'* occurred where patients were referred to another drugstore (this was done when the health facility knew that the needed drug was not available at the collaborating drugstores); only 2.37% of patients were referred this way. Full-treatment was given to 43.87% of patients and 30.43% were given only health promotion. Only 6.7% of patients were given '*upward-referral'* – where patients were referred to higher health facilities for further diagnosis and treatment.

8.4 Discussion

Acceptance of the intervention among the drugstores and health facilities

As seen in the data, drugstores and health facilities participated well and sent text messages through the system as required. Before implementation we were not certain how drugstores would receive the intervention, since it instructed them to refer their patients to the health facilities, potentially losing custom. For this reason we started with a conservative target for the number of referrals from drugstores (we had estimated a sample of 550 but had 843 patients referred). Similarly, we had estimated that our intervention would facilitate 25% uptake of SRH services after referral, but in fact we achieved 38% uptake. Our intervention suggests that drugstores are sufficiently motivated to refer their SRH patients to the health facilities and are willing to integrate with them. Evidence from neighbouring Kenya has also demonstrated that drugstores are willing and ready to refer their patients if they know that they have a possibility of integration [313].

The health facilities also proved willing and able to confirm that they had treated patients referred to them, in spite of competing demands on them that have been reported before [314]. Other researchers have also demonstrated that health facility workers are motivated to implement mHealth interventions [303, 315, 316]. Within the health facilities and drugstores therefore, our intervention was accepted and implemented satisfactorily.

Effectiveness of training and re-orientations

Our monthly data demonstrated that training and re-orientation of health facility clinical officers and drugstore attendants were key motivators for implementation. During the months following the training, referral of patients increased and this increase was associated with increased service uptake at the health facility (Figure 8.3). This suggests that for an intervention of this nature, training and re-orientation as feedback mechanisms are vital for implementation. Other mHealth intervention implementers have also found that these feedback mechanisms contribute significantly to the success of intervention uptake [317].

Gender equity of the intervention at the drugstore and health facility levels

The uptake of the intervention at the drugstore level was equal numbers among both sexes. This demonstrates that the intervention was acceptable to both women and men, which is a significant gender-equity finding. After referral however, women had a slightly higher chance of going to the health facility than men, after removing the effect of age. This sex differential in SRH service uptake has been reported before: women have been reported to take up ART services more than men [318] and the Tanzania DHS of 2010 reported that among those who reported having STI symptoms in the preceding 12 months, a higher proportion of women sought treatment than men [55]. Further research is needed to explore gender equity dimensions of the type of the intervention we implemented.

SRH service seeking at the drugstores

Our study showed that the age range of people who sought SRH services at the drugstores was between 12 to 69 years of age. This demonstrates that almost all ages are able to access drugstores. The fact that people as young as 12 years seek SRH services at the drugstore ties in with the data on sexual debut in Tanzania: it was recently reported (by the DHS 2010) that 12% of women aged 15-25 (N=4,081) and 6.9% of men of the same age (N=1,058) had had sex before they were 15 years of age. In Mwanza this figure was 17.1% (N=791) and 6.6% (N=248) respectively [55]. Our findings reinforced those from the DHS to show that younger people seek SRH services in a similar way to older members of the community.

Our findings demonstrated that all major SRH services were sought at the drugstore, including HIV and maternal delivery services. The findings show however, that STIs constitute 85% of SRH services sought at the drugstores. Other research has shown before that STI treatment is the biggest SRH service sought at drugstores in Tanzania [92, 150]. Drugstores therefore represent a major stakeholder for STI management in Tanzania.

Referral refusal

Twelve per cent of those who came to the drugstore (100/843) refused the referral. Refusal happened after the drugstore attendant described the intervention and asked for consent. Due to lack of consent no more questions could be asked about the reasons for refusal. We therefore cannot determine reasons for refusal. An MSc student seconded to the intervention in Mwanza for 3 months found that those who accepted referral but did not go to the health facility, encountered barriers such as the distance to the

health facilities, fear of unfriendly attitude of clinical officers and perception that they are no medicines at the facilities [319]. After the intervention we went into villages and conducted a randomised household survey to establish whether we could meet any of those patients and establish what views and opinions they or the community had regarding the intervention referral. The findings of this survey are presented in Chapter 9. Challenges on acceptance and non-acceptance of mHealth interventions have been reported before [320].

Health facility service uptake

Uptake of services at the health facility after referral was 38%, which was above our target of 25%. Although there are no exactly similar interventions to compare, our achievement seems to be significantly better than that obtained in Uganda: in a relatively similar intervention involving community malaria drug distributors implemented in Uganda in 2006, only 10% of those referred from the drug distributors accessed services at the health facility level [159].

We did not collect data to determine whether the diagnosis made by the health facility clinical officers and the treatment given were accurate as that was beyond the scope of the study. However, for those who went to the health facility after referral (38%), we found that their diagnosis was consistent with symptoms reported at the drugstore. The symptoms reported at the drugstore were recorded in our text messages after the attendants cross-checked on the cue card we had developed in accordance to the WHO and MoHSW guidelines for treatment of STIs and RTIs. The consistency

between drugstores and health facilities in the recognition of symptoms suggests that providing more information to drugstores could help avoid the prescribing of controlled medicines without sufficient clinical knowledge of STIs. Other evidence has shown that lower cadres of health workers can treat SRH conditions [321], especially through task-shifting [122]. Specifically for drugstores, researchers have demonstrated that drugstores can prescribe antimalarials better following training in Kenya [322].

Regarding STI prevalence, we found in this intervention that the prevalence of abnormal discharge was 45% among men and 41% among women and that genital ulcer disease (GUD) was 5% among men and 3% among women. The DHS 2010 found in a Mwanza population, that abnormal discharge had a prevalence of 8% among men and 6% among women. GUD was reported by the DHS to have a prevalence of 6% both in men and women [55]. Except on abnormal discharge, our findings are comparable to those of the DHS. The high percentage of diagnosed discharge could be due to the fact that our sample was not random and was from those already seeking treatment at the health facility, compared to that of the DHS which was randomly selected at the household level. In addition, the DHS results are self-reported by the participants as opposed to the diagnosis by the health facility clinical officers in our study. The DHS did not present HIV status of the patients, but the 8% HIV prevalence in our sample, is almost double that reported by TACAIDS in 2013 (4.2% in Mwanza [54]), which could also be related to the non-random and self-selecting status of our sample.

Sub-study limitation

Although the results and discussion above suggest this sub-study met the objective of estimating the level of SRH service uptake after referral, there were various limitations associated with it.

The results showed that of all text messages sent 15% had errors. This could have hindered the success of the intervention by demotivating the drugstore and health facility implementers.

Thirty eight per cent of those referred actually took the SRH services at the health facility. Our system did not have a mechanism to track those who did not take up the referral, which meant we could not tell whether or not they accessed services elsewhere.

We did not have the ability to interact with patients directly at the point of care; therefore we cannot tell what experiences they had. The intervention might have achieved the service user preferences such as confidentiality reported in the situational analysis Sub-study 2; however, we were unable to tell how adolescents we spoke to in Sub-study 2 would have viewed the intervention as we were unable to interact with them at the drugstore or health facility. Nevertheless, we obtained their views through a randomised household survey reported in the next Chapter.

Twelve per cent of the drugstore clients (100/843) who were referred rejected the referral and refused to be sent to the health facility. This could be associated with many factors such as the patients' mistrust and subsequent denial of consent to use their data or the perception of lack of medicines at the health facility. But in terms of coverage this percentage

represents people for whom our intervention did not work although they were in our target.

Data were only collected through the text messaging system and therefore limited by it. Although this ensured high validity of patient numbers accessing the services, other data collection mechanisms could have given us more patient details as mobile phone data collection through our referral codes limited the amount of text that could be collected through a standard text message due to character limitations of mobile phone text-messaging features.

We are unable to tell if someone heard of the intervention from a friend or other member of the public and went directly to the health facility to avoid going to the drugstore only to be referred. In this case we cannot confirm the impact of our intervention at the community level.

There were 52 drugstores registered in our system at the beginning of the intervention, but the results presented above suggest that 14 of them did not refer any patients during the 18-month implementation period. Although further consultations with them confirmed they did not receive any SRH patients in need of referral, our intervention did not have a system to verify this as we did not supervise the drugstores directly.

We did not have the ability to verify the diagnosis conducted by the health facilities. Therefore the recorded STI/HIV diagnoses are subject to clinical officers' competence in diagnosing these diseases using the existing MoHSW systems.

We cannot tell if there were cases where referred patients went to the health facility but due to competing clinical demands the clinical officers did not send the final text messages to confirm referral completion. Cases where this happened could constitute under-estimation of the SRH referral service uptake.

This Sub-study lacks qualitative account of drugstores and health facilities' views on the intervention. Although this is covered in Chapter 10, lack of qualitative data in the system could have lost examples of these providers' fresh observations at the time of interaction with patients.

Finally, although sustainability is discussed further in Chapters 10 and 11, we did not conduct any socio-economic analyses of the intervention to estimate its sustainability. We are therefore unable to tell its health economics outcomes for scale up.

Summary

This chapter has analysed the data we obtained from the intervention and confirmed that it was successful in achieving its main objective (as described in Chapters 1 and 7), which was to refer SRH patients from drugstores to health facilities and estimate the uptake of SRH services at the health facility after referral. In the next chapter we discuss a randomised household survey we conducted with the communities to establish their awareness, uptake and attitudes towards the intervention.

9 Sub-study 6 – household survey

Introduction

This sub-study was the second of the three evaluation sub-studies conducted to establish the coverage of the text messaging intervention at the community level. The main objective was to consult the community to establish its knowledge of the text-messaging intervention, its uptake among those who had access to it, as well as attitudes (current and future) of those who had and had not received any services through it. The evaluation we conducted at the health facility/drugstore level (Chapter 8) gave results that are devoid of patients' views on the intervention. Therefore, this sub-study aimed to determine awareness and uptake of and attitude to the text-messaging intervention at the community level. It is also part of the action research cycle stage of "observation".

9.1 Background

Evaluations of health facility-based interventions at the household level have been conducted in the same communities before, both quantitatively [242] and qualitatively [323]. mHealth-related interventions had not been evaluated at the community level in Mwanza but have been reported elsewhere [324].

Previously, the public's views on interventions have been reported to be important for intervention evaluations and scale-up [325, 326], as well as for research uptake by actors and practitioners [327]. Views and attitudes of the public have also been reported to play a major role in future uptake of

interventions at the community level [328, 329]. We conducted this sub-study to add to this body of literature.

9.2 Methods

Setting

This sub-study was nested within the IntHEC trial household survey, which was conducted to evaluate the trial's interventions. The sub-study was conducted in Mwanza region, in the Magu and Sengerema districts in intervention-only wards (i.e. nine intervention wards described in Chapters 3 and 7; Figure 3.6 and 3.7). Participants included in this sub-study were recruited from randomly-selected households in the nine intervention wards to give a sample size that comprised an equal number of male and female participants aged 15-35 years (see below).

Questionnaire design and validation

The main feature of the IntHEC household survey was that it was conducted to compare two age groups i.e. 15-19 year and 20-35 year olds. The rationale behind this design is ingrained within IntHEC's theoretical framework (not described here) [206] that these two age groups differ greatly in access and use of SRH services. This sub-study evaluated the community-level impact of the text-messaging intervention in these two age groups. A survey questionnaire was developed (Appendix 9.1) and incorporated into the main IntHEC questionnaire. This was then validated in print (hard-copy version) in formative communities (see Formative Wards, Chapter 3). After validation the questionnaire was revised, converted to an electronic version and installed on Windows netbooks using the US Census

and Survey Processing System – CSPro (U.S. Census Bureau, 4600 Silver Hill Road, Washington DC). The electronic version was re-validated in formative communities to pre-test its functionality and detect errors after the version formatting. Errors resulting from this second validation were cleaned and the final questionnaire implemented in the nine intervention wards. Implementation of electronic questionnaires has been reported to be more logistical and error-free compared to administration of their hard-copy counterparts [330, 331].

Sample size and statistical power

As stated in the above sections, this sub-study was part of an IntHEC household survey. IntHEC was conducting its own household survey and this sub-study was nested within it. The sub-study therefore used IntHEC household sample in Mwanza. IntHEC sample size comprised of eighteen wards in Magu and Sengerema, nine for intervention and nine for comparison wards in these two districts. For this sub-study, only the sample of participants from the intervention areas (i.e. nine wards) was included. For each ward, IntHEC had a sample of 200 participants with a 50% representation of sex and age group. The sample for this sub-study was therefore 1800 males and females aged 15-35 years, each of which were considered separately. The main outcome was having visited a drug store for an SRH and heard about our text messaging intervention, and the comparison was between those aged 15-24 years and those aged 25-34 years. With a design effect of 2, a sample of 1800 of each sex, equally divided into the 2 age groups, would have 80% power to detect a 10%

difference in the outcome between the 2 age groups, as significant at the 5% significant level.

Ethics statement

This household survey was covered under the ethics approval reported in Chapter 3. On the evening before the day of the survey, the research team and village tracer went into the randomly selected households and read (in privacy) the information sheet to the recruited participant. A village tracer was someone with the village's geographical and topographical knowledge selected by the team and village executive officer to help in the conduct of house-to-house access. The information sheet and associated consent form were left with the participant in the household for further reading and signing respectively. On the day of the interview, a review of the information sheet and consent form was conducted before the start of the interview. Consent forms from all participants were collated and filed at NIMR Mwanza.

Household selection

The village tracer, enumerators, survey supervisors and a senior researcher (the research team – all NIMR employees) selected the first household using a central location in the village or town, such as a market, a mosque or church. This central location was aimed to be near the approximate geographical centre of the village. Where no church, market or school existed, the village executive officer's house was used as the central location. From this point, the direction of the research team selecting households was selected randomly by spinning a bottle on an even ground

and wherever the bottle pointed was the direction the team took. Selection of the second and following households was based on a sampling interval of five (i.e. every 5th household from the first/previous household).

Selection of participants

Only one participant was selected from each household. Selection of the participating individual at household level was based on the following criteria:

- First selection criterion, sex: if the last participant in the previous household was a male, a girl was selected and vice versa.
- Second selection criterion, age group: if the last participant was 15-19 years old, then the next participant was in the 20-35 age-group, and vice versa.

If there was more than one eligible participant in a given household (i.e. if there were more than two people aged 15-35 years old) and the two criteria above could not resolve the selection, eligible individuals were given numbers and one person selected by randomly selecting their number. When an eligible household didn't have an eligible participant, such a household was skipped and the next 5th nearest household selected.

Interviewer-interviewee pairing

To encourage participants to speak freely, same-sex interviewers were matched with participants (i.e. female participants were only interviewed by female interviewers, and male participants by male participants).

Data management and analysis

Data was received from the Windows Netbooks at NIMR Mwanza. The NIMR data manager cleaned the data and merged them onto the main survey database. After survey completion, the cleaned database was sent to LSTM. Analysis was done using STATA 13.1 (StataCorp, 4905 Lakeway Drive, College Station, Texas 77845 USA). With the significant level and statistical power described above, the specific analyses conducted include:

- The socio-demographic summaries to demonstrate the age, sex and ward of residence of the participants
- The likelihood of using drugstores, having heard about the text-messaging intervention, current use of the intervention and the likelihood of using the intervention in future by using frequencies, proportions and odds ratios with p-values and chi-square tests.
- Logistic regression to establish whether age and sex could have been confounders in SRH seeking behaviour and perception on use of the text messaging intervention.

9.3 Results

Socio-demographic characteristics of the participants

Table 9.1 Socio demographic characteristics of the participants

Socio-demographic data	Male: n (%)	Female n (%)	Total n (%)
Total	971 (53.03)	860 (46.9	1,831 (100.00)
District of residence			
Magu	531 (54.69)	510 (59.30)	1,041 (56.85)
Sengerema	440 (45.31)	350 (40.70)	790 (43.15)
Age-group			
15 – 19	432 (44.49)	422 (49.07)	854 (46.64)
20 – 24	280 (28.84)	200 (23.26)	480 (26.22)
25 – 29	119 (12.26)	121 (14.07)	240 (13.11)
30 – 34	126 (12.98)	104 (12.09)	230 (12.56)
35+	14 (1.44)	13 (1.51)	27 (1.47)
20 – 35	539 (55.51)	438 (50.93)	977 (53.36)

There were a total of 1,831 participants, which was above the estimated value of 1,800. Of these, 53% were male and 47% were female. Fifty-seven percent were from Magu district and 43% were from Sengerema district.

The survey results in terms of age group are shown in Table 9.1. An analysis of a 5-year age stratum in Table 9.1 results in the 15-19 year age group having 47% of the participants, decreasing at every 5-year age group to 13% for 30-34 year olds. However, comparing the two age groups of 15-19 and 20-35 age groups shows that the participants' distribution is comparable at 47% and 53% for the 15-19 and 20-35 year old age groups respectively. This observation was by design as opposed to chance. Therefore, follow-on comparisons focused on these two age groups. Ward comparisons were not conducted on this data as health facilities and drugstores participating in the intervention being evaluated (see Chapter 7)

were not systematically distributed per ward or community within the design.

Use of drugstores

Table 9.2 Participants' use of drugstores

Drugstore visit in the last month N=1831								
		Male			Female			
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	15-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	975 (53.25)	251 (58.10)	280 (51.95)	P=0.05	222 (52.61)	222 (50.68)	P=0.57	P=0.07
Yes	856 (46.75)	181 (41.90)	259 (48.05)	1.28 (0.99-1.65)	200 (47.39)	216 (49.32)	1.08 (0.82-1.41)	1.18 (0.98-1.42)
Total	1,831 (100.00)	432 (100.00)	539 (100.00)		422 (100.00)	438 (100.00)		
Drugstore visit within the last month associated with purchase of drugs N=856								
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	10-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No didn't get drugs	836 (97.66)	179 (98.90)	248 (95.75)	P=0.05	197 (98.50)	212 (98.15)	P=0.78	P=0.08
Yes got drugs	20 (2.34)	2 (1.10)	11 (4.25)	3.96 (0.86-18.27)	3 (1.50)	4 (1.85)	1.23 (0.27-5.61)	2.39 (0.84-6.79)
Total	856 (100.00)	181 (100.00)	259 (100.00)		200 (100.00)	216 (100.00)		
Drugstore visit within last month was for a SRH condition N=856								
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	10-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	818 (95.56)	173 (95.58)	248 (95.75)	P=0.93	194 (97.00)	203 (93.98)	P=0.14	P=0.32
Yes	38 (4.44)	8 (4.42)	11 (4.25)	0.95 (0.37-2.43)	6 (3.00)	13 (6.02)	2.07 (0.76-5.57)	1.39 (0.71-2.72)
Total	856 (100.00)	181 (100.00)	259 (100.00)		200 (100.00)	216 (100.00)		

*OR comparing age-group 20-35 vs. 15-19 adjusted for sex

Recent use of drugstores and access to drugs

Within the previous month of the interview, at least 46% of the 1,831 participants had visited a drugstore for unspecified health issues. For both males and females, the 20-35 year olds were more likely to have visited a drugstore within the previous month. In males, 48% of participants aged 20-35 years old had visited a drugstore and were 28% more likely (OR=1.28; P=0.05) to have visited a drugstore in the preceding month than 42% of participants aged 15-19 years old. Though with a slightly lower difference, this finding was the same in females, where 49% of participants aged 20-35 had visited a drugstore with an 8% chance (OR=1.08; P=0.57) to have visited a drugstore in the preceding month compared to 47% of participants aged 15-19 years. After adjusting for sex, there was an 18% chance of participants aged 20-35 years old visiting a drugstore compared to 15-19 year olds within the preceding month (OR=1.18). However, this overall odds ratio has a P-value of 0.07 and its confidence interval included a null value (CI=0.98-1.42), suggesting a lack of statistical difference between the two age groups on this outcome after adjusting for sex.

Only 2% of participants who reported visiting a drugstore in the preceding month were actually sold drugs. For both males and females, participants aged 20-35 were more likely to have been sold drugs compared to those aged 15-19 (Table 9.2, Part 2). After adjusting for sex, 20-35 year old participants were more likely to have been sold drugs (OR=2.39). However, the confidence interval was 0.84-6.79, suggesting there was no statistical significance between the age groups on being sold drugs.

We asked the participants whether the drugstore visits they made in the preceding month were for SRH conditions. Only 4% (N=856) reported this. For males aged 15-19 years, that recent drugstore visit was more likely to be for an SRH (25%) compared to males aged 20-35 years (4%). Females aged 20-35 years old were more likely (6%) than those aged 15-19 years old (3%) to have visited drugstores for SRH conditions within the preceding month. There was no statistical difference between the 20-35 years and 15-19 years age groups after adjusting for sex (OR=1.39; CI=0.71-2.72; P=0.32).

History of visiting drugstores for SRH conditions

Table 9.3 History of visiting drugstores

Ever visited a drugstore visit for an SRH problem N= 1687								
		Male			Female			
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	15-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	1,149 (68.11)	288 (75.00)	340 (67.46)	P=0.01	252 (67.18)	259 (63.33)	P=0.25	P=0.01
Yes	538 (31.89)	96 (25.00)	164 (32.54)	1.44 (1.07-1.94)	128 (32.82)	150 (36.67)	1.18 (0.88-1.58)	1.30 (1.06-1.61)
Total	1,687 (100.00)	384 (100.00)	504 (100.00)		390 (100.00)	409 (100.00)		
Were you sold drugs when you visited a drugstore for SRH condition N=607								
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	10-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	421 (69.36)	83 (69.17)	129 (69.73)	P=0.91	104 (74.29)	105 (64.81)	P=0.07	P=0.23
Yes	186 (30.64)	37 (30.83)	56 (30.27)	0.97 (0.59-1.60)	36 (25.71)	57 (35.19)	1.56 (0.59-2.58)	1.23 (0.87-1.75)
Total	607 (100.00)	120 (100.00)	185 (100.00)		140 (100.00)	162 (100.00)		
Did the drugstore refer you to the health facility? N=561								
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	10-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	232 (41.35)	48 (43.24)	69 (41.82)	P=0.81	48 (35.56)	67 (44.67)	P=0.11	P=0.33
Yes	329 (58.65)	63 (56.76)	96 (58.18)	1.06 (0.65-1.72)	87 (64.44)	83 (55.33)	0.68 (0.42-1.10)	0.84 (0.60-1.19)
Total	561 (100.00)	111 (100.00)	165 (100.00)		135 (100.00)	150 (100.00)		

*OR comparing 20-35 years age-group vs. 15-19 years age-group, adjusted for sex

We asked all participants whether they had ever visited a drugstore specifically for SRH conditions. Over a third (32%) had visited a drugstore at least once for an SRH condition. When we compared the age groups, both males and females aged 20-35 years old had higher odds of visiting drugstores for SRH conditions than 15-19 year olds (Table 9.3). This difference was statistically significant in males (OR=1.44; CI=1.07-1.94; P=0.01). After controlling for sex, the analysis showed that participants aged 20-35 years old had a 30% higher chance of visiting a drugstore compared to participants aged 15-19 years old (OR=1.30; CI=1.06-1.61; P=0.01), suggesting that age had a statistically significant effect on visiting drugstores for an SRH condition.

Participants were asked whether they were sold drugs when they went to drugstores for SRH conditions, and 30% reported that they had been sold drugs. Comparing men aged 15-19 years and 20-35 years showed no difference between these age groups (i.e. 31% and 30% respectively). However, women aged 20-35 years old were more likely to be sold drugs (35%) compared to those aged 15-19 years old (26%). Adjusting for sex did not pick up this difference between the age groups (OR=1.23; CI=0.87-1.75; P=0.23).

When asked whether they were referred, a higher proportion of participants (59%) said they were referred compared to those who were not (41%). There was no difference in men aged 15-19 years old compared to those aged 20-35 years, but slightly more women aged 15-19 years (64%) reported being referred compared to those aged 20-35 years (55%). Adjusting for age showed no statistical significance (OR=0.84; CI=0.60-

1.19; P=0.33), suggesting these age and sex-specific odds ratios are significant.

Community awareness, use of and attitude to the text-messaging intervention

Table 9.4 Awareness and use of the text messaging intervention

Ever heard of the text-messaging referral intervention for SRH N= 1721								
		Male			Female			
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	15-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	1,572 (91.34)	362 (91.41)	484 (92.19)	P=0.66	361 (92.09)	365 (89.46)	P=0.19	P=0.54
Yes	149 (8.66)	34 (8.59)	41 (7.81)	0.90 (0.56-0.45)	31 (7.91)	43 (10.54)	1.37 (0.84-2.22)	1.10 (0.79-1.55)
	1,721 (100.00)	396 (100.00)	525 (100.00)		392 (100.00)	408 (100.00)		
Have you ever been referred through this intervention N=149								
	Total N (%)	15-19 n/%	20-35 n/%	OR (95% CI)	15-19 n/%	20-35 n/%	OR (95%CI)	Overall OR* (95%CI)
No	82 (55.03)	22 (64.71)	19 (46.34)	P=0.11	19 (61.29)	22 (51.16)	P=0.39	P=0.08
Yes	67 (44.97)	12 (35.29)	22 (53.66)	2.12 (0.81-5.52)	12 (38.71)	21 (48.84)	1.15 (0.58-3.90)	1.79 (0.91-3.50)
	149 (100.00)	34 (100.00)	41 (100.00)		31 (100.00)	43 (100.00)		
After referral did you go to the health facility N= 67								
	Total N (%)	15-19 N (%)	20-35 N (%)	OR (95% CI)	15-19 N (%)	20-35 N (%)	OR (95%CI)	Overall OR* (95%CI)
No	16 (23.88)	4 (33.33)	4 (18.18)	P=0.32	2 (16.67)	6 (28.57)	P=0.44	P=0.87
Yes	51 (76.12)	8 (66.67)	18 (81.82)	2.25 (0.42-11.9)	10 (83.33)	15 (71.43)	0.50 (0.07-3.12)	1.09 (0.34-3.47)
	67 (100.00)	12 (100.00)	22 (100.00)		12 (100.00)	21 (100.00)		

*OR comparing age-group 20-35 vs. 15-19 adjusted for sex

As shown in Table 9.4, only 9% of the participants (N=1,721) had ever heard about the text-messaging intervention. For both males and female there did not seem to be any significant differences when comparing participants aged 15-19 with those aged 20-35. However, after adjusting for sex the findings suggested that 20-35 had a 10% chance of having heard about our intervention, which was not statistically significant (CI=0.79-1.55; P=0.54).

Among the participants who said they had heard about the intervention, 45% reported they had been referred to the health facility through it (N=149). Among men, 20-35 year olds were more likely to have been referred (54%) than 15-19 year olds (35%). This finding was similar among women as well, where 49% of those aged 20-35 years were more likely to have been referred compared to 39% of those aged 15-19 years. After adjusting for sex, participants aged 20-35 years had a 79% non-statistically significant chance of having been referred compared to those aged 15-19 years (CI=0.91-3.50). The wide confidence interval may be due to the small sample size (N=149).

The reported uptake of SRH services after referral by drugstores was found to be 76% (N=67). Men aged 20-35 years were more likely to take up the referral (81%, N=22) compared to men aged 15-19 years (67%, N=12). For women, however, those aged 15-19 years were more likely to take up services (83%; N=12) compared to those aged 20-35 years (71%; N=21). Adjusting for sex didn't have any statistically significant effect on uptake of services (OR=1.09; CI=0.34-3.47; P=0.87).

Attitudes on acceptance of the text-messaging intervention

Table 9.5 Reasons for (non-) acceptance of referral

Reason for accepting referral N= 51							
		Male			Female		
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
Because the drugstore said so	14 (27.45)	2 (25.00)	6 (33.33)		3 (30.00)	3 (20.00)	
Condition could have been severe	17 (33.33)	4 (50.00)	6 (33.33)		3 (30.00)	4 (26.67)	
Prefer health facility (HF)	19 (37.25)	2 (25.00)	6 (33.33)		4 (40.00)	7 (46.67)	
HF is cheaper	1 (1.96)	0 (0.00)	0 (0.00)		0 (0.00)	1 (6.67)	
Total	51 (100.00)	8 (100.00)	18 (100.00)	*Chi^2=0.65 *P=0.72	10 (100.00)	15 (100.00)	Chi^2=1.00 P=0.80
Reason for not accepting the referral N=16							
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
No time	1 (6.25)	1 (25.00)	0 (0.00)		0 (0.00)	0 (0.00)	
No money	12 (75.00)	3 (75.00)	3 (75.00)		0 (0.00)	6 (100.00)	
HF too far	2 (12.50)	0 (0.00)	0 (0.00)		1 (100.00)	0 (0.00)	
I got better	1 (6.25)	0 (0.00)	1 (25.00)		0 (0.00)	0 (0.00)	
Total	16 (100.00)	4 (100.00)	4 (100.00)	Chi^2=2.00 P=0.36	2 (100.00)	6 (100.00)	Chi^2=8.00 P=0.00

*Chi2 and P-values comparing 20-35 and 15-19 age groups in males and females

Reasons for accepting referral

Among the participants who said they were referred and accepted the referral, 37% (N=51) said they went because they preferred to receive services at the health facility. Thirty-three percent said being referred could have been an indicator that their condition was severe. Twenty-seven percent wanted to take up the drugstores' recommendations, while only 2% (one participant) thought the health facilities were cheaper. The sample was too small to establish whether there were significant differences between males and females (Table 9.5).

Reason for refusal of referral

Among those who did not take up the referral, 12 participants (N=16) reported lack of money as the main reason why they could not manage to get to the health facility. Two participants, said the health facility was too far and another two said that their health improved and therefore they did not go to seek the services.

Knowledge of others in the community who have had access to the intervention

Table 9.6 Knowledge of others who had access to the intervention

Knowledge of anyone who was referred through the intervention N=256							
		Male			Female		
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
No	120 (45.28)	30 (42.25)	28 (46.67)		25 (40.98)	37 (50.68)	
Yes	145 (54.72)	41 (57.75)	32 (53.33)		36 (59.02)	36 (49.32)	
Total	256 (100.00)	71 (100.00)	60 (100.00)	*Chi^2=0.25 *P=0.61	61 (100.00)	73 (100.00)	Chi^2=1.25 P=0.26
Knowledge of whether the referred person went to the health facility N= 145							
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
Yes they went	85 (58.62)	24 (58.54)	20 (62.50)		22 (61.11)	19 (52.78)	
No they did not	52 (35.86)	15 (36.59)	11 (34.38)		12 (33.33)	14 (38.89)	
Don't know	8 (5.52)	2 (4.88)	1 (3.12)		2 (5.56)	3 (8.33)	
Total	145 (100.00)	41 (100.00)	32 (100.00)	Chi^2=0.20 P=0.90	36 (100.00)	36 (100.00)	Chi^2=0.57 P=0.75

*Chi2 and P-values comparing 20-35 and 15-19 age groups in males and females

Among those who were asked whether they knew someone in the village who had been referred through the text-messaging intervention (N=256), 55% said they did. There was no significant difference between sex and age group on this outcome, which could be related to the small sample size (Table 9.6).

Of those who knew someone who had been referred, 57% said they believed that person went to the health facility (N=145). Only 8% said they didn't know whether that person went or not.

9.4.5 Future use of text-messaging referral service (general)

Table 9.7 Acceptance of referral in the future

Would you accept this type of referral in future? N =1,717							
		Male			Female		
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
No	465 (27.08)	114 (28.79)	152 (29.12)		122 (31.12)	77 (18.92)	
Yes	1,252 (72.92)	282 (71.21)	370 (70.88)		270 (68.88)	330 (81.08)	
Total		396 (100.00)	522 (100.00)	*Chi^2=0.01 *P=0.91	392 (100.00)	407 (100.00)	Chi^2=15.89 P=0.00

*Chi2 and P-values comparing 20-35 and 15-19 age groups in males and females

Table 9.8 Odds ratios of referral acceptance in future controlling for sex and age group*

Future acceptance of referral	OR	z-statistic	P-value	95% CI
Sex-adjusted OR	1.25	2.04	0.04	1.00-1.55
Age group-adjusted OR	1.32	2.58	0.01	1.06-1.64

*A test of interaction between sex and age group was not statistically significant

Overall, 73% of participants (N=1,717) reported they would use this type of intervention in future. This was significantly more likely among older females compared to adolescents. (Chi^2=15.89, P=0.00) (Table 9.7).

Table 9.8 shows odds ratios of future referral acceptance controlling for sex and age group. Females had a higher chance of accepting the intervention in future compared to males (OR=1.25; P=0.04; CI=1.00-1.55), while participants aged 20-35 years had a higher chance of accepting referral in future compared to those aged 15-19 years old (OR=1.32; P=0.01; CI=1.06-1.64).

Future acceptance of referral (among those who have and those who have not heard of the intervention)

Table 9.9 Future referral acceptance

Ever heard of text messaging referral intervention	If referred through this intervention in future would you accept?		Total N (%)
	No N (%)	Yes N (%)	
No	447 (28.51)	1,121 (71.49)	1,568 (100.00)
Yes	18 (12.08)	131 (87.92)	149 (100.00)
Total	465 (27.08)	1252 (72.92)	1,717 (100.00)

Table 9.10 Maximum likelihood estimate of the odds ratio of accepting referral in future*

Age group	Sex	OR	Chi^2	P-value	95% CI
15-19	Male	3.27	5.24	0.02	1.11-9.59
15-19	Female	1.97	2.17	0.14	0.78-4.95
20-35	Male	5.68	10.23	0.00	1.70-18.95
20-35	Female	1.87	1.66	0.19	0.70-4.94
Mantel-Haenszel estimate controlling for age group and sex:					
OR	Chi^2	P-value	95% CI		
2.82	17.63	0.00	1.70-4.68		
Test of homogeneity of ORs (approx.): Chi^2 (3) = 2.71; P = 0.43					

* among those who have heard about the intervention

Tables 9.9 and 9.10 show the acceptance levels of the intervention by participants after they had heard about it. Amongst those who had heard of the intervention, 88% (N=149) reported they would accept the intervention in future. Of those who have never heard of it, 71% (N=1,568) said they would also accept referral.

In Table 9.10 we show the odds ratios of accepting the referral among those who had heard about the intervention. Individual odds ratios for females were not statistically significant. However, among males, future referral acceptance was statistically significant for 15-19 year olds (OR=3.27; P=0.02) and for 20-35 year olds (OR=5.68; P=0.00). However, the precision of this outcome was uncertain due to the small sample size (CI=1.12-9.59 and CI=1.70-18.95) respectively. After controlling for age group and sex, future intervention acceptance among those who had heard of the intervention was more precise (OR=2.82; P=0.00; CI=1.70-4.68). The homogeneity test showed no interaction between sex and age group (Chi^2=2.71; df=3; P=0.44).

Future acceptance of the intervention (among those who have been referred and among those who have not been referred before)

Table 9.11 Future acceptance of the intervention:

Have you ever been referred through this intervention?	If referred through this intervention in future would you accept?		Total N (%)
	No N (%)	Yes N (%)	
No	13 (15.85)	69 (84.15)	82 (100.00)
Yes	5 (7.46)	62 (92.54)	67 (100.00)
Total	18 (12.08)	131 (87.92)	149 (100.00)

Table 9.12 Maximum likelihood estimate of the odds ratio of accepting referral in future among those who have been referred before

Age group	Sex	OR	Chi^2	P-value	95% CI
15-19	Male	-	2.40	0.12	-
15-19	Female	0.23	2.37	0.12	0.03-1.74
20-35	Male	2.47	0.52	0.46	0.19-31.06
20-35	Female	-	5.28	0.02	-
Mantel-Haenszel estimate controlling for age group and sex:					
OR	Chi^2	P-value	95% CI		
2.06	2.01	0.15	0.74-5.77		
Test of homogeneity of ORs (approx.): Chi^2 (3) = 10.32; P = 0.01					

Among those who had gone through the process before, 92% said they would accept referral again (N=67). This is a much higher proportion than that of those who accepted referral in the past (76%; N=67, Table 9.4). Age group and sex were not factors affecting acceptance of the intervention in future for those who had been referred before (see individual ORs, Table 9.12), and the adjusted odds ratio after controlling for these two factors was not statistically significant (OR=2.07; P=0.16; CI=0.74-5.77). A test of ORs' homogeneity suggests there is an interaction between age group and sex on this outcome (Chi^2=10.32; df=3; P=0.01).

Reasons for future (non-) acceptance of the intervention

Table 9.13 Reasons for acceptance of referral in future

Why would you accept this type of referral in future? N =1,251							
		Male			Female		
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
To comply with drugstore	378 (30.22)	66 (23.49)	100 (27.03)		109 (40.37)	103 (31.21)	
Condition could be severe	434 (34.69)	100 (35.59)	151 (40.81)		83 (30.74)	100 (30.30)	
I prefer HF	286 (22.86)	68 (24.20)	85 (22.97)		51 (18.89)	82 (24.85)	
Because HF is cheaper	37 (2.96)	14 (4.98)	4 (1.08)		7 (2.59)	12 (3.64)	
Other	99 (7.91)	27 (9.61)	28 (7.57)		18 (6.67)	26 (7.88)	
I don't know	17 (1.36)	6 (2.14)	2 (0.54)		2 (0.74)	7 (2.12)	
	1,251 (100.00)	281 (100.00)	370 (100.00)	*Chi^2=14.90 *P=0.01	270 (100.00)	330 (100.00)	Chi^2=8.60 P=0.12

*Chi2 and P-values comparing 20-35 and 15-19 age groups in males and females

In Table 9.13, according to the participants the main reason for future acceptance of referral was the fear that if the drugstore decided to refer them, then their SRH condition was probably severe (35%; N=1,251). The second reason was to comply with the drugstore's advice (30%). Preference of health facility as a reason to accept referral was the third reason with 23%. Only 3% of the participants would prefer to accept the referral because they believed the health facility was cheaper than the drugstore. Eight percent of participants cited other reasons including their desire to be diagnosed, better service anticipated at the health facility, the proximity of the health facility to the participant (e.g. if the participant's household was near the health facility), just because they wanted to be sure and other reasons such as "because my wife goes to the health facility". One percent said they didn't know.

Reasons for future non-acceptance of the intervention

Table 9.14 Reasons for future non-acceptance

Why would you not accept this type of referral in the future? N=465							
		Male			Female		
	Total N (%)	15-19 N (%)	20-35 N (%)		15-19 N (%)	20-35 N (%)	
No time	69 (14.84)	21 (18.42)	30 (19.74)		10 (8.20)	8 (10.39)	
No money	74 (15.91)	16 (14.04)	23 (15.13)		22 (18.03)	13 (16.88)	
HF too far	94 (20.22)	26 (22.81)	28 (18.42)		26 (21.31)	14 (18.18)	
HF no drugs	32 (6.88)	9 (7.89)	14 (9.21)		7 (5.74)	2 (2.60)	
HF staff unfriendly	4 (0.86)	1 (0.88)	2 (1.32)		1 (0.88)	0 (0.00)	
Prefer just to buy drugs	43 (9.25)	11 (9.65)	10 (6.58)		14 (11.48)	8 (10.39)	
Can get drugs at another drugstore	24 (5.16)	7 (6.14)	6 (3.95)		5 (4.10)	6 (7.79)	
Other**	125 (26.88)	23 (20.18)	39 (25.66)		37 (30.33)	26 (33.77)	
Total	465 (100.00)	114 (100.00)	152 (100.00)	Chi^2=3.22 P=0.86	122 (100.00)	77 (100.00)	Chi^2=3.56 P=0.82

*Chi2 and P-values comparing 20-35 and 15-19 age groups in males and females

The participants' main reason for not accepting referral in the future was that health facilities were too far away (20%, N=456). Lack of money was the second biggest reason (16%), followed by lack of time (15%). A large percentage of participants (9%) preferred just to buy drugs from the drugstore. Lack of drugs at the health facility contributed only 7%. Five per cent said that they wouldn't accept referral in the future because they knew that if one drugstore refused to sell them drugs they knew they can access them from somewhere else. Staff unfriendliness at the health facility was not a major reason for not accepting referral, as only 1% of participants reported this. However, a high percentage of participants' (27%) gave answers that fell in the 'other' category. These reasons were different and because it was free-written text most of them were in Kiswahili language. We could not analyse them within STATA for this reason. However, some of them are summarized in Figure 9.1. We conducted a detailed double pretesting of the questionnaire (see Section 9.3.2), but this high percentage of different answers on this outcome points to a possible error during pre-testing. Due to the nature of the question it is possible that qualitative approaches might be more preferable to get exhaustive evaluation on this outcome.

Figure 9.1 Some of the reasons for future non-acceptance of referral

Estimate of the intervention's coverage to a target group for health promotion (i.e among those who visit drugstores for SRH services)

Table 9.15 Community coverage of the intervention

Ever visited drugstore for SRH condition	Ever heard of drugstore text messaging referral intervention		Total N (%)
	No N (%)	Yes N (%)	
No	1067 (94.01)	68 (5.99)	1135 (100.00)
Yes	430 (84.65)	78 (15.35)	508 (100.00)
Total	1497 (91.11)	146 (8.89)	1643 (100.00)

Table 9.16 Probability of hearing about the intervention

Maximum likelihood estimate of the odds ratio of hearing the intervention among the participants who have ever visited drugstores for SRH conditions					
Age group	Sex	OR	Chi^2	P-value	95% CI
15-19	Male	3.35	11.54	0.00	1.59-7.05
15-19	Female	5.91	22.19	0.00	2.55-13.71
20-35	Male	1.46	1.28	0.25	0.75-2.84
20-35	Female	2.89	11.12	0.00	1.50-5.58
Mantel-Haenszel estimate controlling for age group and sex:					
OR	Chi^2	P-value	95% CI		
2.82	37.53	0.00	1.99-4.00		
Test of homogeneity of ORs (approx.): Chi^2 (3) = 7.22; P = 0.06					

The impact of our intervention is estimated in Table 9.15 above. In the table, 15% of the participants who ever visited a drugstore for SRH services had heard of the intervention (N=508). We interpreted this as the coverage of intervention among the risky population (defining risk as the proclivity to buying drugs for SRH conditions from drugstores). In addition, our intervention reached 6% (N=1,135) of those who said they had not before sought SRH services at the drugstore. These are individuals we assumed would go to health facilities next time they have an SRH condition (because

they have not visited a drugstore for SRH we can assume whenever they get SRH needs they go to the health facility) or if they go to drugstores they will ask for referral (because they have heard of the service). However, this 6% figure can also be interpreted as those people who would not usually have gone to drugstores but will go because they have heard of a referral intervention based there. Future scale-up interventions would target the 85% (N=508) who have visited drugstores for SRH services but have never heard of the intervention. We also assume that the 94% (N=1,135) of those who have never visited drugstores and never heard of the intervention seek SRH services from health facilities.

Table 9.16 shows odds ratios of having sought SRH at the drugstores and having heard of the referral intervention, stratified by sex and age group. The table shows that the stratum-specific odds ratios for sex and age group are statistical significant (except for males aged 20-35; P=0.25), suggesting a positive outcome. There is borderline evidence suggesting possible interaction between sex and age group (Chi2=7.22; df=3; P=0.06). Therefore, the statistically significant adjusted odds ratio of hearing the intervention among those who have ever sought SRH services at drugstores (OR=2.82; P=0.00; CI=1.99-4.00) has been ignored.

Estimate of future intervention acceptance among the populations at risk

Table 9.17 Future acceptance of referral for the population at risk

Future acceptance of referral among those who have ever sought SRH services at drugstores and have heard of the referral intervention	OR	z-statistic	P-value	95% CI
OR adjusted for having ever visited drugstores for SRH	0.99	-0.00	0.99	0.78-1.27
OR adjusted for having heard of the intervention	2.99	4.13	0.00	1.77-5.04

Defining risk as the proclivity to visiting drugstores for SRH services, Table 9.17 shows that those who had ever heard of the intervention had a statistically significant chance to go in the future (OR=2.99; P=0.00; CI=1.77-5.05). The results suggest those who have ever visited drugstores for SRH services would not go in future but the odds ratio is not statistically significant (OR=0.99; P=0.99; CI=0.78-1.27).

The number of participants was too small to estimate the probability of future referral acceptance among those who have been referred before.

9.4 Discussion

Introduction

This sub-study outlines results related to use of drugstores, access to SRH services in the drugstores, access to the drugstore text-messaging referral intervention reported on in Chapters 7 and 8, acceptance to that intervention in the past and attitude towards its future acceptance. This section discusses those results.

Use of drugstores

Generally, use of drugstores in Mwanza communities is high: nearly half of the participants in our sub-study (47%, N=1831) visited drugstores within the preceding month. This is a very high proportion and supports our argument that drugstores play an important role in the provision of healthcare services at the grassroots level. To our knowledge, this is the first household survey in these communities measuring use of drugstores. However, other researchers have demonstrated that drugstore use is very high in other Tanzanian regions and have argued that drugstores are a force for good [146, 332]. Our data support the view that greater involvement of this cadre in government initiatives could ameliorate the community's access to healthcare. However, Tanzania has not ignored the importance of drugstores. As discussed in previous chapters in this thesis, through the Accredited Drug Dispensing Outlets (ADDOs) the MoHSW has trained drugstore workers and provided them with funding to upgrade their stores into recognized pharmaceutical entities [151]. It is not yet clear to what

extent this will help achieve effective clinical service delivery as the ADDOs still lack diagnostic and prescription knowledge.

In the month preceding our sub-study, use of drugstores for SRH was low at 4% (N=1,831). But this proportion increased to 32% (N=1,687) on participants' ever use of drugstores for SRH services. The DHS 2010 reported this to be 21% [55]. We believe our percentage is higher than that of the DHS because the DHS's only looked at STIs, whereas ours included all SRH services in the sample. Thirty-one percent of the people in our sub-study who visited drugstores were sold drugs. Therefore a high percentage of people in these communities accessed antibiotics without prescriptions. Such high sales and purchases of antibiotics have been reported previously [92]. With the currently increasing rates of antibiotic resistance and call for surveillance reforms [333], now is the time to target interventions within drugstores at the community level. The good news from our sub-study is that more than a half (59%, N=561) of those who had ever visited drugstores for SRH conditions (possibly including those who were sold drugs) were referred to a health facility. This does not suggest that a 59% drugstore referral to health facilities is high enough. However, it suggests that drugstores are ready to refer their patients to health facilities, which was also confirmed by our sub-study discussed in Chapter 8.

Visiting drugstores for SRH services was more likely to happen among those aged 20-35 than those aged 15-19 (OR=1.30; P=0.01). There are no previous studies in the region looking at age and use of drugstores, but other researchers have suggested that age could be associated with health-seeking behaviour in general, where older members of the community are more

likely to seek services than adolescents [334]. These findings could suggest that interventions targeting this age group are necessary.

Awareness of, access to, use and acceptance of the text-messaging intervention

There was low awareness of the text-messaging intervention at the community level. Only 9% of the participants had heard about it. However, our intervention did not target the community level; it targeted those among the community members who are likely to visit drugstores. Therefore, a more accurate reflection of the intervention coverage might be 15% (N=508). This is the proportion of the participants who had heard about our intervention among those who had ever gone to drugstores for treatment of SRH conditions (Table 9.15).

This coverage is not large enough, but there are likely factors that could be contributing to this: for example, we don't know what proportion of people who usually use drugstores for SRH treatment visited drugstores during the period of our intervention (September 2012 to February 2014). Also, we only enrolled registered drugstores existing in the sub-study area to the intervention; there could have been unregistered ones operating. These could not have known about our intervention and therefore could not have informed their patients about it. Another reason for the percentage coverage could be related to the way our study was designed: there was a low chance of finding people who had visited drugstores for SRH conditions and had heard of our intervention in randomly-selected households at the village

level. A purposive selection and stratification of households around the immediate geographical areas of drugstores' physical locations could probably have given a higher proportion. We have no literature to compare this outcome to with previous studies, but difficulties in intervention coverage continue to be a topic of discussion in implementation research circles [335-337].

Our sub-study also established that 55% of the participants knew someone who had been referred (N=256), 59% of whom said they believed that person had proceeded to the health facility (N=145). It is difficult to interpret this finding but we believe it supports our argument that the coverage could be underreported.

From those who had ever been referred through our text-messaging intervention (N=67), we had a high uptake reported (i.e. 51% of these said they proceeded to access SRH at the health facility after the referral). This is higher than the actual uptake obtained from the intervention electronic data (38%, see Chapter 8). This discrepancy between the reported and the actual uptake is difficult to interpret, but other researchers have observed it in Tanzanian communities [57]. In our case it could be that participants from the household survey were willing to over-report positive answers. For this reason, this reported uptake is not discussed in detail, as the 38% uptake found in Chapter 8 is likely to be more valid, because the data collection methods of the actual uptake used in the Snapshot Platform minimized reporting errors on access of SRH services at health facility level. However, in spite of the reporting bias of the household survey sub-study, 51% uptake

is reasonable enough to accept the positive understanding of the intervention by the participants.

We found that the main reason for accepting the referral was because the participants preferred health facilities to drugstores. This finding corroborates with that of DHS 2010 that among the people who reported having STIs in preceding 12 months, the majority (57%) preferred accessing treatment at the health facilities [55]. However, fear of the condition's severity was another important reason for accepting referral in our sub-study. This corroborates Kowalewski et al 2000's qualitative findings from southern Tanzania which reported that perception of risk severity was associated with acceptance of referral for maternal health services [338]. Some participants in our sub-study thought it was important to accept the drugstore recommendation of going to health facilities, but this was a third reason (after health facility preference and severity of condition), which could indicate that trusting drugstore instructions is an issue in these communities. This aligns with the finding from one of our situational analysis sub-studies (Chapter 4), which indicated that communities' trust for drugstores is limited.

Lack of money was reported to be the main reason for not seeking the health facility service after referral (12 participants; N=16). Distance to health facilities was the second. Lack of money and long distance to health facilities has been reported to be important reasons for non-uptake of referral services [338] and important reasons for not seeking healthcare services generally [234, 339].

Future acceptance of referral

In general, future acceptance of this type of referral was high (as reported in the Results section). We found that females are more likely to accept referral compared to men and 20-35 year olds compared to 15-19 year olds. A similar finding in the case of women vs. men was reported by a focus groups' study by Pembe et al 2008, although it pointed to yet another challenge of referral uptake, i.e. that of men's decisions negatively influencing women's uptake of referral [340]. Doyle et al 2010 also reported that women were more likely to seek SRH services (36%) compared to men (29%) after the intervention [242], although there was no referral outcome in their findings. It is well-known that adolescents in Tanzania have generally less likelihood to access SRH services than older age-groups [334, 341], but whether this can be said for referral is a finding that hasn't been claimed before (to our knowledge). Our sub-study suggests this.

Among those who have heard of the intervention, males would in future accept referral more readily than women would. The reason(s) for this is unknown, except that those women who had heard of the intervention and were referred may not have had positive experiences either at the drugstores or health facilities. The number of participants was too small to estimate the probability of future referral acceptance among those who stated various reasons for non-attendance and among those who were referred through the intervention previously.

The reasons for non-acceptance of referral in future were consistent with non-acceptance in the past as discussed above. The additional reasons, such

as belief that there are no drugs at the health facilities and preference to just buy drugs were also listed. These issues have been reported before [56, 240, 342].

Weaknesses and strengths

Weaknesses

This sub-study used a sample of participants that were selected for another study (IntHEC household survey) and therefore could not look at some factors, such as economic and residence characteristics, which could have confounded some of the findings.

Strengths

The sub-study employed exhaustive tool validation in communities and obtained data from a large representative sample, using systematic logistic and technical approaches in the field. Data resulting from the sub-study was handled by a team of experienced data managers and analysed using advanced statistical techniques.

Summary

This sub-study's objective was to establish the awareness and uptake of and attitude to the text-messaging intervention at the community level. Its results suggested that some members of the general population (at 9%) had heard of the intervention. Some had been referred through it, some were willing to accept referral through it in the future and others were not. Reasons were given in each case. In the next Chapter we describe the last sub-study of this thesis, which was conducted with the health facility

clinical officers and drugstore attendants to establish their views on the intervention's process and future scale up.

10 Chapter 10

Sub-study 7: evaluation with CTC providers

Introduction

This is the last of the three sub-studies conducted to evaluate the text messaging intervention in Mwanza. It was conducted with drugstore attendants and health facility clinical officers. Its objective was to clarify the lessons learned; document their intervention experiences, and capture their views on its future sustainability. Therefore, it falls under the "observe" and "reflect" stages of the action research cycle. The chapter describes the background to the sub-study study, methods used, results obtained and discusses the implications of these.

10.1 Background

As discussed in earlier chapters, consultations with stakeholders were conducted throughout the intervention process. This has been recommended as critical for success in intervention research [297]. Views of the implementers post-intervention are key to establishing whether that intervention will be sustainable among those that would implement it in the future [244]. In Mwanza, previous interventions implemented in the region have followed a framework where implementers have always been involved in the evaluation. For Mema Kwa Vijana (MkV) [240] for example, evaluations established that schools and health facilities that participated in

the interventions spoke highly of the project and were very supportive for the sustainability and scale up [334]. This evaluation helped inform MkV researchers design scale-up interventions that involved embedding MkV technical assistants into the local governments, which built the capacity of district education and health departments [335]. Intervention implementers at the grassroots are especially likely to have important recommendations because they are most informed about the interventions than any other local stakeholders [343] , and they are likely to have ideas that can be transported to higher authorities to consider future implementations [272]. After the text messaging interventions therefore, we wanted to establish the impacts the village level implementers in the drugstores and health facilities would communicate to the district, regional and national level authorities about the intervention they had been implementing.

10.2 Methods

Design and sampling

As in the previous qualitative sub-studies in this thesis we used FGDs and IDIs to elicit the views from participants. FGDs and IDIs have been recommended as effective methods for getting this depth of data [220] and the justification for using these methodologies in this thesis has been given in Chapter 5. The sample selection of the participants was 100%; i.e. all the participating health facility clinical officers and drugstore attendants from 18 health facilities and 53 drugstores respectively were invited. The FGDs and IDIs were conducted at the district level. The invitations were sent through the DMO by the NIMR intervention coordinator.

FGD and IDI guides and their implementation

These were prepared and pretested in Magu District with clinical officers and drugstore attendants who worked on the intervention to verify their clarity and validity.

The study was conducted in the same areas as the intervention had been implemented during the preceding 18 months, from 19 January to 4th February 2014. Drugstore attendants and health facility clinical officers were invited to the district headquarters for the sub-study. We separated these two cadres to ensure that they felt able to speak freely and to be able to capture the potential diversity of their views effectively.

The FGDs and IDIs were moderated in Kiswahili Language with NIMR and LSTM researchers at the districts. The duration of each FGD was less than one hour.

Selection of the sample for IDIs was done by asking the participants from the FGD to volunteer for an IDI, and the number of IDIs conducted was equivalent to the number of interviewers available at the time. The IDIs were conducted to explore ideas that participants did not get a chance to talk about in the FGDs either because they found them controversial or for any other reason.

Ethical considerations

As in the previous sub-studies presented in this thesis, the participants were read and given the sub-study information sheet and signed consent forms

before starting the discussions. The signed forms were collected and filed at NIMR.

Transcription, translation and analysis

Discussions and interviews were transcribed at NIMR headquarters in Mwanza, then translated, verified and re-transcribed into English. English and Kiswahili transcripts were emailed in separate folders to LSTM after transcription. At LSTM, the English transcripts were thematically analysed using NVivo 10.1 software to manage the data (QSR International, Doncaster Victoria, Australia). Analysis was by a thematic framework using apriori themes that were pre-determined from the FGD and IDI guides. The data was coded onto the following six themes that were represented in the guides:

1. Perceptions on the intervention
2. Benefits of the intervention
3. Drawbacks of the intervention
4. Changes to the intervention for its sustainability
5. Experience of working with drugstores/health facilities
6. Perception on patient satisfaction

All data were coded onto the themes above and the summary of each them is presented in the Results below. Original quotes were extracted and are included in the results as verbatim evidence of the perceptions of the participants.

10.3 Results

Table 10.1 shows the total number, cadre and district of the participants. In total there were 34 participants, with whom we conducted a total of 5 FGDs and 10 IDIs.

Table 10.1 Details of participants in the FGDs and IDIs

Cadre	District			
	Magu		Sangerema	
	FGDs*	IDIs*	FGD*	IDI*
Health facility clinical officers	1 (9)	3 (3)	1 (9)	2 (2)
Drugstore attendants	2 (9)	2 (2)	1 (9)	3 (3)
Total	3 (17)	5 (5)	2 (17)	5 (5)

*Number of participants in brackets. For IDIs, there was one participant per IDI

Views from drugstores are presented alongside the views from health facilities to explore commonalities and differences between the two cadres' perceptions of the intervention.

Theme 1: Perceptions on the intervention

Both drugstores and health facilities understood the purpose of the intervention as the provision of SRH referral services from drugstores to health facilities.

> "*The aim of the intervention was to provide referral for people with genital diseases.*" FGD #1 DSAs, Magu Dsitrict.

Drugstores also identified the purpose of the intervention to be health promotion among the drugstores as well as creating linkages with health facilities.

The health facilities believed the main purpose of the intervention was to increase the uptake of services at the health facility level:

> "The *objective was to help people especially adolescents get proper STI treatment at the health facility*." FGD #1, COs, Magu District.

The drugstores and health facilities also thought the intervention was to train them on how to conduct SRH referral. Some drugstores said the intervention was aimed at raising community's awareness on SRH, while others thought the intervention's objective was to reduce the STIs. It was clear with all these varied ideas that the clinical officers and drugstore attendants were able to understand the purpose of our intervention. The fact that they thought it was for raising awareness or training them to refer SRH patient could suggest a positive health promotion outcome in general.

Theme 2: Benefits of the intervention

To the drugstores, the intervention helped them build confidence, connect more with their patients through deeper interactions with patients:

> *"We learned the difference between patients who come with headache and those who come with a genital condition; we now spend time and talk privately with the latter about referral options"*. FGD #1, DSAs, Magu District.

They also reported that using password was a strength that helped drugstores to believe that the patients they were sending were really going to be seen.

The intervention benefits reported by the health facilities included the satisfaction of receiving a text message and knowing that out there a patient has been referred to their facilities that they would be coming. They also concurred on confidence, saying that patients believed that if drugstores were referring their patients there, that patients would understand their facilities to be doing good. But most importantly, health facilities believed that the intervention helped increase the number of people who seek SRH services:

> *"Many patients who would not have been able to come to the health facility came so we received more patients with STIs"*. FGD #1, COs, Magu District.

Through the focus groups we observed the participants' positive attitudes towards these benefits. There was no disagreement within the focus groups and the participants demonstrated that not only were they able to help their community, but could also ameliorate their practice and learning for example on how to distinguish STIs from other medical conditions as reported by the drugstores.

Theme 3: Drawbacks of the intervention

Drugstores reported being negatively viewed by patients who sometimes questioned their skills:

> *"Some patients said that if we were referring them somewhere else it means we were not trusting ourselves to know what we were doing which was embarrassing".* FGD #1, DSAs, Sengerema District.

This resulted from patients' mistrust who could not believe it was true that drugstores were collaborating with the health facilities.

Although there was no evidence, drugstores believed that the unlicensed drugstores which were not participating in the intervention received SRH patients who did not want to be referred and treated them. This they believed made them lose custom. They also believed they would not make

money on the patients they had referred, and they called this "sacrificing their business":

> *"We sacrificed business when we just sold Panadol [a brand of an over- the-counter painkiller] to the patient, knowing that they might not come back after they have been to the health facility"*. FGD #2, DSAs, Magu District.

The health facilities found drawbacks to include lack of proper cooperation between the drugstores and between drugstores and health facilities, especially on the matter of medicine prices. This became a problem if they found a patient who needed drugs urgently but couldn't give them treatment at the health facility because of the perception on price differences:

> *"When we told the patients the cost of the service they would say that it would have been cheaper at the drugstores and therefore refused to pay"*. FGD #1, COs, Magu District.

Another drawback at the health facility level was the non-uptake of the referral by patients after they had been to the drugstores. Health facilities were demotivated by this and wondered what would have been the cause:

> *"We received many referrals but many patients did not come and we don't know why… could have failed because the health facility is too far from them".* FGD #1, COs, Sengerema.

Both the drugstores and health facilities reported challenges pertaining to the texting system, including the rules of accepted texts and definition of errors:

> *"Text messaging was difficult sometimes, even when one corrected the errors we still got the process wrong.* IDI #5, DSAs, Magu District.

> *"There were many texting errors because the codes were very specific and could not accommodate more spaces or punctuations".* FGD #1, COs, Sengerema District.

Such challenges could have limited the overall achievement of the intervention. It could also be understood that the drugstore attendants and health facility clinical officers faced complexities that influenced their implementation of the intervention, suggesting negative effects to their motivation. However, the fact that the health facilities were concerned about patients who did not turn up for the services suggests that they were committed to the intervention.

Theme 4: Changes to the intervention

The participants were asked what modifications they would make to the intervention if they were to continue implementing it. Drugstores suggested various modifications including giving them an inventory of medicines available at the health facilities so that they can know cases where the patients might be coming back; including unlicensed drugstores in the intervention to eliminate their competition; as well as providing skills and tools to test STIs at the drugstores. They also suggested that it could help if all STI medicines were given to them, so that they give them out to patients who only have prescriptions:

> *"We should be given drugs for STIs so that when the people get prescriptions from the health facility come back and we dispense them"* FGD #2, DSAs, Magu District.

Further to this, drugstores believed that if all medicines are accessed from them facilitated by community initiatives e.g. insurance it could help counter illegal sales:

> *"…provide insurance channelled through drugstores, so that the community can get diagnosis at the health facility and access drugs at our stores".* IDI #7, DSA, Sengerema.

Health facilities wanted the texting system changed to accept minor errors such as punctuation and spacing. They said the incentive was too small and asked for increase. They also requested for a solution that can ease the patients' access to drugs without being sent back and forth from one the drugstore to the health facility. Further, they believed the district's participation was minimal and called for the districts to be in charge of the intervention, in order for them to continue implementing it:

> *"Ask the districts to be involved so that they can support us if NIMR or LSTM were not implementing the intervention anymore".* IDI #1, COs, Sengerema.

The participants responded well to this theme on revision of the intervention. During the discussions they seemed happy to identify themselves with the intervention and provided suggestions freely for its scale up.

Theme 5: Experience of working with drugstores/health facilities

Drugstores reported that the intervention developed and improved their working relationships with the health facilities, which has facilitated the general partnerships on other services that are unrelated to SRH:

> *"Now we have good relationships with the clinical officers, we can even call them for other patients outside of this intervention".* IDI #9, DSA, Sengerema.

A similar observation was made by the health facilities, who reported that the intervention improved their relationship, stating that receiving referral text messages confirmed that the drugstores were not selling antibiotics, which was a good thing:

> *"Drugstores were cooperative… sometimes they called us to ask whether the patient they have sent has arrived…. they had high expectation of us and that made us believe they were not selling the drugs without prescriptions".* FGD #1, COs, Sengeream District.

Theme 6: Perceptions about patient satisfaction

There were mixed reactions on patient satisfaction, especially at the drugstore level. In Magu they said that patients were satisfied with the intervention:

"Patients got cured and were very happy." FGD #3, DSAs, Magu District.

However, further discussion of the issue revealed that drugstores believed patients might have misunderstood the purpose of the intervention:

> *"Some patients have not understood the point of referral, they thought it was a waste of time".* FGD#10, DSAs, Sengerema.

They also reported that feedback from patients was that there were no drugs at the health facility and that when they went there was no clinical officer to diagnose them, so they would come asking for help. Drugstores also reported a state of helpless in situations where they couldn't help such a patient who had come back:

> *"Sometimes we didn't understand the point of appointment when the patient came back and told us there was no clinical officer at the health facility.*
> *Once we mentioned about SRH referral, some patients wanted deep explanations about these that we couldn't give".* FGD #5,DSAs, Magu District.

Patient feedback at the health facility level was on questions regarding the reason for back-referral to the drugstore:

> *"It was difficult when some patients asked us to give them drugs instead of sending them back to the drugstores but we did not have them".* IDI#4, COs, Sengrema District.

Health facilities also reported that in cases of emergencies some patients complained they were being made to wait while they had referral passwords with a promise that they would be given a fast-track service:

> *"Some patients were not understanding when we told them to wait a bit until we had dealt with more emergency cases".* FGD #1, COs, Sengerema.

10.4 Discussion

Both drugstore attendants and clinical officers understood that the objective of the intervention was to provide better care for SRH at the community level. They appeared to understand what the intervention required them to achieve and aimed to provide SRH services accordingly.

They cited a number of benefits that they believed had helped them achieve the intervention: drugstores believed the intervention had helped them gain confidence and trust within the communities, especially because they identified themselves with the health facilities. Health facilities also found it beneficial that receiving referred patients reassured them the drugstores were not selling the medicines without prescriptions. Similarly positive experiences in relationship development between drugstores and health facilities during and after the interventions have also been reported in Kenya [313].

However, they encountered challenges during the intervention, some technical that were associated with the technology of texting mechanism, others that were related to community attitudes about the intervention. Specifically, although they reported having built confidence with community members through the intervention, drugstores also feared that sending their patients to the health facilities made them appear unknowledgeable about provision of treatment. This, in addition to sending their patients without certainty that they would come back to buy drugs from them created a major challenge that could negatively have impacted on the intervention. Challenges of community mistrust about drugstores have

been reported in Tanzania and other SSA countries [17]. Nevertheless, evidence from the results reported in Chapter 8 suggests that in spite of this, drugstores continued to refer patients to health facilities.

Staff in drugstores and in health facilities were willing to continue implementing the intervention and made positive suggestions on possible modifications. Drugstores for example suggested providing laboratory tests within the villages so that patients could find out earlier whether they had a condition or not, before making long journeys to the health facilities. Evidence suggests that this could be possible in the future for example through HIV self-testing [344].

The drugstores and health facilities demonstrated their willingness to give contributions to revising aspects of the intervention that affected their implementation. Issues of the integration as identified by drugstores asking to be included in the main health sector and have direct links with the health facilities are important to discuss here, because they highlight the drugstores' willingness to work within a system that is regulated by medical standards. This has been reported before, that Tanzanian drugstores are ready and have potential to be part of the mainstream health system especially when considering proper management of STIs [92].

Requests to increase incentives have been reported in previous mHealth interventions in Tanzania [303] and other sub-Saharan African countries [345]. In our intervention the drugstores and health facilities thought the incentives they received were not enough. In Chapter 7 we described the rationale for the amount of financial incentives given. But in this sub-study

we found that our participants would appreciate increasing them. For future sustainability, reasonable modification of such incentives would be important to demonstrate that the implementers' views have been taken on board.

Another important outcome of this sub-study was the positive feedback on the perceptions of drugstores partnering with the health facilities and vice versa: their recognition for the improvement of the relationship and positive reporting on the interactions between the two cadres are important outcomes to discuss. Although this is the first intervention linking drugstores and health facilities through mHealth in Tanzania, positive partnership outcomes between drugstores and health facilities have been reported in Kenya [313, 322]. This issue is discussed further in the next chapter in relation to the sustainability of our intervention.

The mixed views on the drugstores and health facilities' perception on patient satisfaction also make point of further discussion, especially the negative side of views. Although we report on the patients' views in the last Chapter (Chapter 9), this sub-study did not have a patient angle on their interactions with the drugstores and health facilities and any contributions to the intervention revision. This is a limitation in this sub-study and we will discuss further its implications in Chapter 11. However, drugstores and health facilities believed that patients found the intervention helpful. As identified in Chapter 5, drugstores and health facilities presented misunderstandings on availability of medicines, attitudes of health workers and the distance to health facilities as likely negative patients' perceptions associated with the intervention. As discussed earlier, these issues have been

reported by other researchers [233, 234]. The fact that our drugstores and health facilities also considered these to be problems patients will have incurred in our intervention suggests that they continue to hinder SRH service provision and accessibility in Tanzania and should be addressed through a systems integration and periphery service delivery approach. The health facilities reported that patients found it difficult to wait once they arrived at the health facilities – friction between the intervention premise and perception on patients' uptake of services is a key issue that should be addressed through future scale up and interventions designs [237].

Both the health facilities and drugstores suggested raising the awareness of the community about the intervention so that uptake could be increased. However this idea raised a health promotion problem because the intervention targeted specifically people who visit drugstores for SRH services. Raising awareness about the intervention at the community level could have been perceived as encouraging the general public to go to drugstores so that they can be referred to health facilities. This is against standard SRH promotion which encourages people to go directly to the health facility when they are sick. At the time of the research drugstores were not part of the mainstream primary healthcare facilities recommended by the government of Tanzania [255], so it would have been difficult to take on this recommendation.

Sub-study limitations

This sub-study was conducted within a group of clinical officers and drugstore attendants who knew each other and had been participating in the

intervention together. We were therefore able to achieve effective homogeneity during the FGDs, however the lack of variability could have impacted on the ability of the participants to discuss or disagree with each other strongly, especially in cases of differential power relations between the participants because they knew each other. We minimised this by separating the health facility clinical officers from drugstore attendants.

Another limitation is that the participants in the sub-study were people who have been participating in the intervention fully. The implication of this could be that these were people who were most keen or positive about the intervention, and therefore further negative views could have been missed.

In this sub-study we used an *apriori* analysis framework only and coded the data around pre-determined themes. We chose this analysis framework because we worked with the participants through the discussion guide following these themes. This type of analysis has been said to be popular but has also been suggested to be superficial especially if the researchers don't know the participants well [346]. We hoped this would not be an issue as we had worked with the participants for the previous 18 months.

Summary

This sub-study aimed to explore health facility and drugstore staff views on the text messaging intervention, as discussed above and was the last of all the sub-studies conducted in the communities where the intervention was implemented. The results described above suggest it has achieved its aim, however, we described above limitations such as lack of the patients' perspectives on the intervention. These are revisited further in the

Discussion Chapter and discussed in more details. The Discussion Chapter also triangulates all the sub-studies' findings into an encompassing argument that examines how those sub-studies met the objectives listed in Chapter 1.

11 Overall Discussion

Introduction

Previous chapters of this thesis have reported seven sub-studies conducted during this doctoral research and have discussed their rationales, methodologies, results and implications. This overall discussion is therefore a synthesis of the issues discussed in those chapters. It frames the work within the action research cycle to discuss the original contribution of the research to the broader literature, relating it to studies in similar contexts as well as discussing the limitations, conclusions and recommendations emanating from the sub-studies in this thesis. The chapter forms part of the last action research cycle stages (reflection); and in the sense that this cycle has been described to be continuous [191], it also links back to the "planning" stages of the research during the conclusion and recommendation sections.

11.1 Original contribution of this work

Partnerships and linkages

This thesis adopted the action research framework that promotes working with participants though the design, implementation and evaluation of interventions [191]. The framework facilitated identification of the key research problem; that CTC providers such as drugstores attendants had negative attitudes towards SRH service provision, lacked linkages to formal health services and needed an intervention to facilitate SRH referral. This is

a key research area because CTC providers are vital in SRH service provision and access in sub-Saharan Africa [114, 123]. Due to lack of resources in SSA and in Tanzania in particular, as discussed in Chapters 2 and 5, working with the drugstores and empowering them to provide efficacious services should be a priority in a setting where the majority of the population only have access to these providers [20].

Linkages to the mainstream system are also important and as our situational analysis Sub-study 1 identified these are missing in this context. Indeed, without such linkages it is challenging for the drugstores to provide SRH services. Using the action research framework therefore, we implemented an intervention that links drugstores to the mainstream health service. The process of intervention development aimed to help facilitate their own reflexive action by encouraging critical acknowledgement and awareness of their practices and systems. This process produced consensus on the need to develop an intervention that initiated action to refer their patients to health facilities for diagnosis and treatment [347]. This is key for providing essential services at the community level.

Action research and community attitudes to health services

Communities' attitudes to drugstores are poor; they often do not trust them and think they are expensive, do not have the necessary skills for SRH and are driven by trade and profits [265]. Yet, due to broader constraints, community members visit these drugstores anyway and end up consulting them for SRH services or buying medicines from them, although they would

prefer to go to the health facility (Sub-study 2). There was an opportunity to intervene here using the action research techniques. Our consultations with the communities through the adolescents revealed that they would need an intervention that provides them with access to SRH services without judgement, that are confidential and that can be trusted. Like many other sub-Saharan African countries [266], Tanzania has had challenges of confidentiality and trust within the SRH service provision [240].

Evidence suggests that adolescents find it more difficult to access SRH services [245]. Our Sub-study 2 was designed to work with adolescents to establish the problems they faced so as to take these into consideration within the intervention design. Evaluation of the intervention suggests there were no age-related disparity in the likelihood of participants accessing the SRH services after referral (Sub-study 5). We argue that this could be because adolescents felt comfortable to use our intervention, perhaps because no names were asked, only passwords were used and were sent directly to the health facility with a promise of fast track services. Indeed, interventions in Mwanza that targeted adolescents directly have suggested that these do lead to increased uptake up SRH services [348]. It is therefore possible that tailoring an intervention to adolescents' needs facilitates their health service uptake. We argue that confidentiality was a key component of our success here and our intervention has contributed a viable approach for this through mHealth referral at the drugstore level.

Action research and CTC provider involvement

The action research approach provided a conceptual framework, through which an intervention could be developed that reflected the views of CTC providers triangulated with those of the communities and health facilities. However the facilities still experienced challenges of lack of resources (Sub-study 3). Improving these resources was out of the scope of the intervention, as unfortunately we were not equipped to address lack of manpower, equipment or medicines in the health facilities. There is likelihood this may have affected the provision and uptake of SRH services within our intervention, nevertheless we tried to minimise their effect by embedding the intervention services within the existing systems; for example, by setting the appointment feature within the mHealth referral system to be within the working hours of the health facility clinical officers. These challenges have been going on for decades and other researchers [237, 335] as well as the Ministry of Health [281] continue to implement SRH interventions within similar resource limited settings.

Despite lack of trust in the community, drugstores and other private providers of medicines have been suggested to contribute to improvements in SRH services provision [141]. Evidence from our intervention also suggests that, not only are the drugstores motivated to implement referral but they could also potentially contribute to uptake of SRH services by people who would otherwise not have accessed those services. It has been suggested that drugstores are mainly interested in profits from sale of

medicines [146], however findings from Sub-study 7 suggest that they are willing to bypass these gains and "sacrifice" the business where they feel they will be able to provide better services by doing so. Abuya et al (2009) argue that through better partnerships and increased recognition these attitudes can be fostered and enhanced [349]. It is clear that drugstores can play important roles for delivery of community-level services; greater efforts should be made to gain and sustain their involvement in such interventions. We also made positive observations from working with the clinical officers and drugstores over the 18 months' period. For example, the drugstore attendants and clinical officers reported that their working relationships improved (Sub-study 7), which suggests that power differentials between them were not a barrier in the context of our intervention. Such an outcome may be attributable to our action research approach that provided a platform for them to interact as fully as possible from early on [191]. In relatively similar settings in Kenya, drug retailers developed relationship with health facilities which improved drug selling practices and prompt treatment of malaria [350]. It has also been reported that relationships developed through such partnerships could be an avenue for provision of other health services outside the specific interventions for which the partnerships were formed [351], and we believe there is a chance of this from our mHealth intervention, especially since drugstores sell other medicines besides antibiotics.

As discussed in several places of the thesis, it has been reported that patients often find no health workers at the facilities even during working hours

[233, 269]. The type of referral provided through our intervention involved an appointment preference made at specific health facilities and health workers were made aware of this as the referral was confirmed only if they had received that appointment. This could have motivated them not to leave health facilities as they waited for the patients to arrive. Indeed, clinical officers expressed regret that oftentimes they waited for patients in vain. Improving health worker attendance might not prove sustainable in the absence of such an intervention, but there is a likelihood that the health workers who implemented our intervention might in future reflect on such practice and attempt to stay in health facilities during working hours.

Action research and mHealth for SRH referral

Text messaging is innovative and has advantages of coverage and outreach, especially in Tanzania where the ratio of population to phone was 2:1 at the time of the intervention [36] and was estimated to become 1:1 at the end of 2014 [21]. In fact the access within the health workers and service providers was 100% [based on verbal communication with the providers]. Evidence from the neighbouring Kenya suggests the same [352].

The intervention followed stages of the action research framework [191]. To our knowledge, mHealth referral for SRH services with drugstore attendants and clinical officers was the first of its kind in Tanzania. Training of these providers proved instrumental to the intervention. Indeed, training of providers and participants within mHealth research is necessary because it is still an emerging field that uses new digital technologies for provision of

services [353]. Lack of resources within the project however meant that training could not be conducted as often and as extensively as possible. As others have described, challenges of follow up and management of interventions can be problematic with the action research methodology [191, 192]. Indeed, it could be argued that the observed proportion of texting errors at 15% is attributable to lack of extensive follow up and infrequency of training; other researchers have also reported texting errors to be an issue in mHealth interventions [324]. We addressed this problem by providing three training events and connecting the drugstores and health facilities with the district and regional medical officials so that they could provide support. Through the training of trainers the district medical officials gained skills on how the texting mechanisms worked, which could have provided moral support to the implementing drugstores and health facilities. Within the action research approaches, working with the upper cadres and supervisory decision makers can foster achievement of the outcomes [119, 354]. Such problem solving approaches we adopted in our text messaging intervention could therefore contribute to future mHealth referral activities in the region.

An important advantage of the action research methodology for this intervention was that while text messaging referrals were ongoing, we were able to quickly discover these challenges as they happened, get direct feedback and address them right away. For example, we were able to remove the passwords that participants disliked, to increase the incentive when this was identified and to conduct training-of-trainers activities at the

district level to foster contextual and motivational support from district health authorities. This occurred within action research cycle stages of 'action' and 'observation' [191].

Also, as per the observation stage of the action research framework, we carefully analysed data obtained throughout the duration of the text messaging implementation to verify the uptake [192]. The results suggested that we achieved better service uptake after referral compared to the intervention implemented with the CTC providers in neighbouring Uganda [355] and better SRH outcomes than self-reported by participants in the Tanzania DHS [55]. This suggests that our mHealth tools could potentially improve the uptake of SRH services in these settings.

Action research and multi-sectoral approaches

Both the clinical officers and drugstores attendants believed that patients could have misunderstood the intervention especially when they expressed frustration about getting to the drugstores only to be referred somewhere else (Sub-study 7). As we found in Sub-study 2, communities believed that the drugstores were not favourable and reported to prefer the health facilities.

Nevertheless, we observed that some patients did not want to go to the health facilities even after they had been referred (Sub-study 5). We did not explore why the community perceptions and actions were contradictory in these two sub-studies, but it could be that those who went to the drugstores

had already decided not to visit the health facilities and any further intervention could probably not have changed their minds anyway. It could also be because of the perceptions that the health facilities are 'unfriendly' [356] and that they lack drugs [342]. But it could also be due to the belief that when they go to the health facility there would not be anyone to attend to them. Indeed, drugstore attendants reported that some patients came back to say they went to the health facility and found no providers available (Sub-study 7).

It is widely reported in these settings that health workers do not always work full time and some leave the government facilities to work in their own private clinics [269]. However, Sub-study 3 suggested that there is an acute lack of providers in most facilities, which could also explain this. It is therefore a multi-faceted problem that may benefit through investment in multiple solutions including referral pathways and better health promotion, as well as addressing the lack of human resources within health facilities. Indeed our research demonstrates the benefits for mHealth referral and thus contributes to the wider literature suggesting that multi-sectoral approaches are paramount for improving health services [357, 358].

Fight against antibiotic resistance

Globally, there is a growing concern about antibiotic resistance [333]. Our intervention facilitated patient referral from drugstores, a CTC provider cadre that is known to sell antibiotics without prescriptions as reported by a

randomised household survey in our Sub-study 6 and by other researchers [92, 150].

The WHO has argued that this cadre of CTC providers is important for future interventions to combat antibiotics resistance [16]. Our attempt to link them to health facilities and dissuade them from directly selling these medicines to patients therefore has made a contribution to this public health priority.

Health facility clinical officers had expressed a concern in the situational analysis Sub-study 1 that the drugstores interfered with STI treatment by selling antibiotics. They wanted to improve their linkages with them so that the gap of medicine proliferation at the drugstores and lack of medicines at the health facilities could be filled [127]. Through the realised referrals in our intervention it was possible to create such linkages and facilitate the health facility clinical officers to be the first port of call for STIs which provided an important contribution to the overall service provision and medicine prescription.

Public private partnerships

Furthermore, our intervention has made contributions towards public-private partnerships for health in Tanzania by linking private drugstores to government health facilities. Fostering public-private partnerships (PPP) for transformation of health systems in SSA has been recommended by WHO [359, 360]. We provide the initial evidence to suggest that drugstores

can contribute to PPP through mHealth for SRH referral to health facilities in Tanzania and therefore argue that they should not be left behind during collaborative PPP initiatives.

During the period of our intervention, Mwanza region was yet to upgrade drugstores into the accredited drug distribution outlets. This exercise involved vetting of several conditions, one of which being that drugstores did not sell controlled medicines without prescriptions or license [151]. Working on this intervention could have supported drugstores' applications for upgrade through referring patients with STIs to health facilities via text messaging, an intervention that the TFDA and MoHSW in charge of the upgrading exercise were aware of. We believe this could have made an important contribution to this government initiative in the districts of our intervention.

General SRH service uptake

From our intervention, the uptake of STI services was higher than any other SRH services. This could be because sometimes STIs present with acute symptoms that need immediate medical attention compared to the other SRH needs e.g. family planning services. It could also be attributed to the fact that reported STI prevalence in these settings is high [55]. It could also be that when patients have other SRH needs e.g. if they require family planning services, they may simply go directly to the health facilities and therefore do not feature within our system. Indeed, Sub-study 2 suggested

that the communities would prefer health facilities for this. This is an important finding that could be further investigated in future research.

The contribution of our intervention to the overall reduction in prevalence of SRH conditions such as HIV and STIs is a point of contentious discussion. Due to the nature of the study no biomedical outcomes were available to measure such prevalence. It has been reported that within the action research tools we adopted it is hard to argue improvement of secondary outcomes and biomedical endpoints if they were not the primary objective of the study [361, 362]. But we had patients through our system who tested HIV positive and those who had STIs. Such patients accessed treatment services due to our intervention. Though not directly verifiable through the measurements we used, facilitating patients' access to health services has contributed to better management of these conditions.

In light of the arguments above therefore, our work contributes to growing body of evidence for mHealth, use of CTC providers for SRH services and partnerships between private and public providers in Tanzania. The research demonstrated positive outcomes in a number of areas, particularly in terms of benefits reaped from close engagement with CTC providers, health care workers and community members themselves to increase uptake of SRH services. We also believe that our findings could provide local and international actors with examples that can be considered when involving such providers in primary healthcare service provision.

11.2 Limitations of this thesis

As previously reported each Sub-study has its own methodological limitations and these have been discussed at the end of each chapter and are therefore not repeated here. However we must recognise the overall contexts related to main aim of the intervention in relation to its achievement. The aim of the PhD "*to implement and evaluate an mHealth intervention on uptake of SRH services at formal health facilities, CTC providers and household levels in Mwanza*" has been attained through several sub-studies following an action research approach. The element of community implementation raises questions that relate to how mHealth, drugstores, health facilities and the wider contexts in which they operated in our intervention could have influenced referral or the uptake of services. These are discussed below.

mHealth limitations

Mobile phone technology comes with logistical challenges which could have hindered the intervention success: for example, at month eight of implementation our toll-free number was switched off. This caused disruption in service provision and access and lowered motivation of drugstores and health facilities. In addition, the lack of electricity in major villages in Tanzania which in turn affects charging of phone batteries could have led to clinical officers and drugstore attendants lacking battery power and therefore being unable to send text messages in a timely manner. Phone

battery life in other mHealth interventions has been reported to be a challenge [363]. However, our research participants did not report this as a significant barrier.

Most text messaging interventions have reported use of incentives that were associated with provision of phone airtime credit [364]. As reported in Sub-study 4, our intervention adopted this type of incentive as well. However it is not clear to what extent this may have affected the success of the intervention , especially when compared to other forms of incentives such as salary increments [365, 366]. The clinical officers and drugstore attendants asked for the increase of the incentive and reported that the airtime credits given were not enough. Although we eventually addressed this through an increase in the incentive amount, this could also have contributed to low motivation, frustration and/or refusal to send text messages. No evidence from the implementation suggests this, but we cannot discount it as it was not verified. There is likelihood that the drugstore attendants and clinical officers may not all have reported their frustration for fear of retribution, as has been reported in previous research [205].

Our mHealth system design was found to be challenging to use especially for the drugstores attendants, who sometimes did not speak English well. Indeed, we had to translate some of the training material into Kiswahili language (Sub-study 4) for ease of understanding. Whenever they sent incorrect text messages they received error reports which could have frustrated them and may have led to lower engagement with the intervention

in some cases (Sub-study 7). Depending on the required data, purpose and functionality of the mHealth system the complexity of their designs can produce challenges for users [367]. We provided a platform for correction of errors by allowing the drugstore attendants and clinical officers to re-send the text message three times, but clearly this would have presented a challenge if a health worker had a patient in front of them and were trying to convince them to take up services. We were unable to quantify the missed opportunities for intervention success due to this, but it is something that should be considered and better investigated for future implementations and follow up.

Robustness of intervention evaluation

Indirect impacts of the intervention arising from research participant reflexivity leading to changes in perceptions and practices were reported qualitatively in Sub-study 7 but could not be quantitatively estimated in the research as the indicators for this were beyond the scope of the PhD. However, such impacts cannot be discounted. Changes in medicine sales and referral practice of SRH patients attributable to our intervention could lead to future sustainability of referral practice among the drugstores. Such indirect impacts have been reported in other interventions as well as the challenges in measuring them documented [73].

There was no risk of overestimating the referral uptake as the numbers were doubly confirmed at the drugstore and health facility through a single ID that was randomly generated. However there could have been some under

estimation: for example the clinical officers might have lacked the time to send text messages after treating a referred patient, or patients at the health facility might have decided not to present themselves as having been referred from the drugstore for some reason. We did not assess either case but they cannot be discounted, which may mean that there were patients who received the intervention but were not included in our analysis.

In addition, there may have been broader impacts at the community level in relation to the health promotion aspect of the intervention. For example, there could have been cases where patients were referred through the intervention and the next time they had an STI proceeded directly to the health facility knowing if they went to the drugstore they would be referred. As suggested by the clinical officers (Sub-study 7), there is also a possibility that the people who accessed SRH services through the intervention could not have accessed them had it not been for the drugstore attendants' referral. These could be important community outcomes of our intervention but they were not measured so we cannot empirically discuss them. Future research should take these potential outcomes into consideration at the impact evaluation stage.

Costs of medicines could have affected the uptake of our intervention, because the clinical officers reported that patients were dissatisfied due to the differences of medicine costs at the drugstores and health facilities (Sub-study 7). Inconsistent medicine prices have been attributed to disincentive for health service uptake in Tanzania [234]. Cost was an aspect that was

beyond the scope of this PhD, but we recognise its importance for such type of intervention and suggest that were it to be scaled up, this would have to be addressed through socio-economic measurements that include factors from all stakeholders including patients. Although we had some data on project expenditures, we were not able to consistently collect all financial data pertaining to implementation activities in the field. We are therefore unable to assess cost effectiveness of this intervention.

In the situational analysis Sub-study 2 we identified that the communities had little trust in CTC providers. In the evaluation Sub-study 10 we found exactly the same sentiment from the drugstore attendants. Community awareness-raising through meetings between these intervention stakeholders could have potentially addressed this lack of trust. However our intervention did not include this approach as this could have been interpreted as promoting SRH service attendance at the drugstores which would have contradicted the MoHSW policy [255]. We also had no way of measuring how this lack of trust could have influenced the uptake of SRH services at the community level especially after the referral from drugstore attendants. As reported for other mHealth interventions in SRH, trust of the providers [drugstores] by the communities should be achieved for scale up and sustainability to be realised [368]. In Mwanza settings, research has demonstrated that through community health promotion and health worker sensitisation greater trust is achievable between other cadres such as community health workers, nurses and PMTCT health workers [369]. For improved uptake and sustainability, these approaches could be adopted for

mHealth referral of community members from the drugstores and other private providers.

Furthermore, Sub-studies 1 and 2 demonstrated the existence of multiple CTC providers, for example identifying private clinics to be popular among communities. However, we could not work with these actors due to feasibility and lack of resources. Working with these and other CTC providers identified in Sub-Study 2 could have maximised access to SRH by their clients and could constitute an important area for future research and interventions.

Study design limitations

Our intervention was nested within another study (IntHEC) and formed a component of IntHEC outputs which created a need for its independence as described in Chapter 3; the intervention itself (text messaging) doubled as a data collection tool for evaluation which meant it could not be evaluated within IntHEC comparison communities without contaminating them. There was also a limitation of resources that impacted on our ability to perform independent design of sub-studies; for example, due to lack of resources we could not perform health facility or drugstore level stratifications and randomisations for intervention implementation independent of those conducted within IntHEC trial.

Finally, our analysis was not able to deal with all possible confounding factors as either data pertaining to them was not collected or the way it was

collected had to conform to IntHEC randomisation units which were different to the intervention design. Nesting smaller studies in bigger ones has been reported to have analysis difficulties [370] and the sampling issues that we had in our sub-studies have been reported by other researchers [310]. In addition, the results of the main intervention evaluation (Sub-study 5) do not reflect the most rigorous evaluation methods; for example the intervention was not implemented in a trial setting with a control or randomisation. This would be required were the intervention to be further scaled up in the future.

11.3 Conclusions

Our research shows that mHealth referral in Tanzania can contribute to uptake of SRH services at the health facility level. As reported through the research described our sub-studies, this can be achieved through involvement of communities, drugstores, health facilities and local authorities. Such actors are viewed as important resources where that can be mobilised through mHealth interventions to meet the grand challenges in the health sector [371], a view which our research confirms..

Local authorities are willing and ready to support mHealth interventions from the village to regional levels. In our intervention the regional and district medical officials expressed interest in the intervention and wanted to take charge of it. However, they need the support from the Ministry of Health to sustain it. Indeed, there remains a long process before the intervention can be adopted into the Comprehensive Council Health Plan.

For this to happen the intervention must be tested within the MoHSW systems and then the regional medical offices have to allocate funds from their own budget to implement it [255]. Funds for implementation were however not available at this level. In addition, they said that the bureaucracy involved could be prohibitive in the circumstances of small interventions. A clear strategy is therefore needed for such small-scale interventions to be scaled up and sustained.

Partnership at the drugstores and health facilities was necessary for mHealth intervention to prosper. Within our action research framework the health facility clinical officers decided on which drugstores to partner with. This increased their collaborations and improved their relationship. They both reported that their trust in one another increased especially in relation to drugstores agreeing not to sell antibiotics without licences (sub-study 7). Such an outcome suggests these partnerships could yield positive results and that research interventions can contribute to promoting these relationships. In neighbouring Kenya it was reported that partnerships between these two cadres not only improved the working relationship but also improved the service uptake at the community level [372].

Ultimately, our research concludes that a text messaging referral intervention connecting community drugstores to health facilities could be potentially significant for SRH service uptake after referral. This benefits from the growing popularity of mobile phones in Tanzania. SRH providers, communities and health authorities demonstrate varying levels of

engagement that can be tapped into in order to contribute to Universal Health Coverage targets.

11.4 Sustainability and scale up

To assess the long-term sustainability of our intervention further evidence will need to be generated on the functionality of our mHealth tools in clinical and randomised settings, as well as on the good will of local authorities for implementation and evaluation. Such sustainability will have to balance the local authorities' political will, drugstore attendants and health facilities' practices, skills and attitudes with the community's beliefs, attitudes and needs. Without such a multiplicity of approaches long-term sustainability will not be possible.

This study developed a community of practice in Magu and Sengerema districts and created a canvass for future research and implementation of mHealth projects. Other researchers and implementers of mHealth will be able to use the tools we have developed.

Minoxsys is willing to train local staff and empower them with expertise that can be used at the local level, through local human and other resources. This has already been found possible when we used district health officials to conduct training-the-trainer re-orientations during our intervention.

Implications for future research

We identify three implications for future research: firstly, our findings are not applicable to many other settings as the study looked at drugstores and health facilities in Mwanza Tanzania only. We therefore call for more elaborate studies to verify our findings through alternative rigorous study designs. For example, a step-wedge intervention trial with clusters around each health facility could give evidence on how socio-economic and spatial factors affect access to SRH services in the facilities. Secondly, we found that collaborations, stakeholders and district level partnerships for mHealth are possible. However further evidence is needed to establish whether this can be conducted within SSA or indeed Tanzanian health system structures on a long term basis. Thirdly, our intervention was conducted with minimal financial resources and we did not collect all data on its costs. A more health economics focused study would therefore be required to establish whether such an intervention is cost-effective.

11.5 Recommendations

There are a number of important recommendations arising from the discussion above on the research contributions, limitations and implications. These are described below.

In our intervention we worked with health officials from the ministry to the local level. We innovated the intervention and published its design with MoHSW officials [307]. Working with local health authorities will therefore be necessary for future mHealth interventions to facilitate entry and acceptance at the health facility level.

In our study, translation and back translation of materials from Kiswahili into English was necessary as our drugstore attendants were more versed with Kiswahili than English. Mobile technologies are evolving and there will be a need to train people how to use them especially in Tanzania, where the majority speak Kiswahili which is not on of operating languages on most mobile phones.

The mHealth ecosystem in Tanzania is still limited. There is a limited number of institutions with ability to set up and run mHealth systems. Flexibility to source this out of Tanzania like we did in our intervention is therefore necessary, but there will be a need to support Tanzanian capacity to provide these services.

During implementation, constant feedback with drugstores and health facilities is necessary to increase motivation and supervision. Preferably, airtime incentive is necessary to allow mHealth intervention participants to contact the management if there are difficulties.

Calls for mHealth data protection mean future interventions will need to incorporate passwords before providing algorithms for off-and online data transmission and access.

There is a need to establish how mHealth can increase business potential of the private sector, e.g. through the suggested health insurance that links

drugstores with health centres and provides medicines through a standard premium paid by government or households.

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13 Appendices

13.1 Appendix 2.1 Literature search strategy

1. Action research.mp. or Health Services Research/
2. Community-Based Participatory Research/ or practical action research.mp.
3. Participatory action research.mp.
4. (Participatory learning and action).mp.
5. Community participation.mp.
6. Community of practice.mp. or Primary Health Care/
7. Action.mp.
8. Reflection research.mp.
9. Reflexive research.mp.
10. Evaluation.mp. or Evaluation Studies as Topic/
11. Participation.mp.
12. Research/ or collaborative research.mp.
13. Experiential research.mp.
14. Research in action.mp.
15. Cooperative research.mp.
16. or/1-15
17. (Sexual and reproductive health).mp.
18. SRH.mp.
19. Reproductive health.mp. or Reproductive Medicine/ or Pregnancy/ or Family Planning Services/ or Reproductive Health/ or Sex Education/
20. Receptors, HIV/ or HIV.mp. or HIV-2/ or HIV Wasting Syndrome/ or HIV-1/ or HIV Seropositivity/ or HIV Seroprevalence/ or HIV Infections/ or HIV Long-Term Survivors/ or HIV Antibodies/ or HIV/ or HIV Seronegativity/ or HIV Antigens/ or HIV Reverse Transcriptase/
21. Acquired Immunodeficiency Syndrome/ or HIV-1/ or HIV Infections/ or Sarcoma, Kaposi/
22. Pelvic Inflammatory Disease/ or Sexual Behavior/ or Health Knowledge, Attitudes, Practice/ or Syphilis/ or Adult/ or Condoms/ or HIV Infections/ or Chlamydia Infections/ or Sexually Transmitted Diseases/ or sexually transmitted infections.mp. or Adolescent/
23. Sexual Behavior/ or Gonorrhea/ or Adult/ or Young Adult/ or Adolescent/ or HIV Infections/ or Sexually Transmitted Diseases/ or STI.mp.
24. Family planning.mp. or Family Planning Services/
25. Contraception Behavior/ or Contraception/ or Contraception, Barrier/ or contraception.mp.
26. Pregnancy Complications, Infectious/ or Pregnancy Complications/ or Infant Mortality/ or Adolescent/ or Adult/ or Pregnancy Outcome/ or Pregnancy/ or HIV Infections/ or Prenatal Care/ or antenatal care.mp. or Infant, Newborn/
27. Pregnancy Complications, Infectious/ or Pregnancy/ or Prenatal Care/ or Adult/ or HIV Infections/ or Adolescent/ or ANC.mp.
28. Maternal health.mp.
29. Maternal mortality.mp. or Maternal Mortality/
30. Delivery, Obstetric/ or Pregnancy Complications/ or Pregnancy Outcome/ or Prenatal Care/ or Adult/ or Ischemia/ or Cesarean Section/ or Maternal Mortality/ or Pregnancy/ or maternal morbidity.mp.
31. or/17-30

32. Family Planning Policy/ or Population Dynamics/ or Social Planning/ or Economics/ or Communism/ or Political Systems/ or Population/ or Population Growth/ or Politics/ or communit$.mp. or Public Policy/
33. Community Health Services/ or Health Promotion/ or Public Health/ or "Delivery of Health Care"/ or Community Health Nursing/ or community health work$.mp. or Primary Health Care/ or Community Health Workers/
34. Health Education/ or Community Health Services/ or Community Health Workers/ or Adult/ or Health Promotion/ or CHW$.mp. or Primary Health Care/
35. Health Services Research/ or Qualitative Research/ or Patient Satisfaction/ or Community Health Services/ or Biomedical Research/ or Home Health Aides/ or "Delivery of Health Care"/ or Community Health Workers/ or HIV Infections/ or lay health work$.mp. or Health Knowledge, Attitudes, Practice/
36. Adult/ or Employment/ or Primary Health Care/ or Health Personnel/ or auxilliary work$.mp.
37. Adolescent/ or Aged/ or Poverty/ or Middle Aged/ or Medical Missions, Official/ or Adult/ or HIV Infections/ or Volunteers/ or voluntary work$.mp. or Personal Satisfaction/
38. Regression Analysis/ or Allied Health Personnel/ or Randomized Controlled Trials as Topic/ or volunt$.mp. or Nurses/
39. Education/ or Prenatal Care/ or Maternal Mortality/ or "Organization and Administration"/ or Pregnancy/ or Health/ or Maternal Health Services/ or Health Knowledge, Attitudes, Practice/ or Midwifery/ or traditional birth attend$.mp. or Developing Countries/
40. Adult/ or Aged/ or Skin/ or traditional heal$.mp. or Middle Aged/
41. Neisseria gonorrhoeae/ or Health Planning/ or Economics/ or United Nations/ or Developing Countries/ or Primary Health Care/ or HIV Infections/ or Acquired Immunodeficiency Syndrome/ or Organizations/ or NGO$.mp. or International Agencies/
42. International Cooperation/ or Adult/ or HIV Infections/ or Health Education/ or Voluntary Health Agencies/ or non governmental organisation$.mp. or Health Promotion/ or Relief Work/
43. Non-governmental organisation$.mp.
44. or/32-43
45. Rural Health Services/ or "Patient Acceptance of Health Care"/ or Health Services Accessibility/ or service uptake.mp.
46. Adolescent/ or "Delivery of Health Care"/ or Home Care Services/ or Patient Satisfaction/ or Adult/ or Health Services Accessibility/ or Quality Assurance, Health Care/ or service improvement.mp. or Emergency Service, Hospital/
47. Adolescent/ or "Quality of Health Care"/ or implementation.mp. or "Attitude of Health Personnel"/ or Health Plan Implementation/ or Electronic Health Records/
48. "Review Literature as Topic"/ or Research Design/ or "Delivery of Health Care"/ or Randomized Controlled Trials as Topic/ or Evidence-Based Medicine/ or Middle Aged/ or complex intervention$.mp. or "Quality of Health Care"/ or Primary Health Care/
49. Community Health Services/ or Health Education/ or Adolescent/ or Aged/ or Middle Aged/ or HIV Infections/ or Adult/ or community intervention$.mp. or Health Promotion/
50. Poverty/ or Health Policy/ or Schools/ or Public Policy/ or Community Health Services/ or Health Promotion/ or community initiative$.mp. or Program Evaluation/

51. Mass Screening/ or Middle Aged/ or Adolescent/ or Uterine Cervical Neoplasms/ or Health Promotion/ or Adult/ or Preventive Health Services/ or HIV Infections/ or prevention service$.mp.
52. "Delivery of Health Care"/ or treatment service$.mp.
53. Health service$.mp. or Health Services/
54. Health Status/ or health outcome$.mp.
55. or/45-54
56. Developing countr$.mp.
57. (Low and middle income countr$).mp.
58. Resource limited setting$.mp.
59. Resource-limited setting$.mp.
60. Sub-Saharan Africa.mp.
61. Africa$.mp.
62. East Africa.mp.
63. Tanzania.mp.
64. or/56-63
65. Drugstore$.mp.
66. Drug store$.mp.
67. Drug shop$.mp.
68. Drug sell$.mp.
69. Drug sell$.mp.
70. Medicine sell$.mp.
71. Village pharmac$.mp.
72. Pharmac$.mp.
73. Drug vend$.mp.
74. Medicine vend$.mp.
75. Private provid$.mp.
76. Public private partner$.mp.
77. Partner$.mp.
78. Private initiat$.mp.
79. or/65-78
80. mhealth.mp.
81. m-health.mp.
82. Mobile health.mp.
83. Electronic health.mp.
84. ehealth.mp.
85. e-health.mp.
86. telehealth.mp.
87. tele-health.mp.
88. Telemedicine.mp.
89. Tele-medicine.mp.
90. Telecare.mp.
91. Tele-care.mp.
92. Text messag$.mp.
93. Text remind$.mp.
94. SMS.mp.
95. Short message service$.mp.
96. Mobile phone$.mp.
97. Mobile telephone$.mp.
98. or/80-97
99. 16 and 31 and 44 and 55 and 64
100. 31 and 44 and 55 and 64 and 79
101. 31 and 44 and 55 and 64 and 98
102. 31 and 44 and 55 and 64 and 98

13.2eAppendix 3.1 LSTM
Ethics approval

e

LSTM
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John Dusabe
Liverpool School of Tropical Medicine
Pembroke Place
Liverpool
L3 5QA

Monday, 30 January 2012

Dear John Dusabe

Re: Research Protocol (11.94RS) Establishing a community referral system to improve uptake of adolescent sexual and reproductive health services in Mwanza Region, Tanzania.

Thank you for your letter responding to the points raised by the Research Ethics Committee. The protocol now has formal ethical approval from the Chair of LSTM Research Ethics Committee.

The approval is for a fixed period of three years, renewable annually thereafter. The committee may suspend or withdraw ethical approval at any time if appropriate.

Approval is conditional upon:

- Submission of ethical approval from other ethics committees.
- Notification of all amendments to the protocol for approval before implementation.
- Notification of when the project actually starts.
- Provision of an annual update to the Committee. Failure to do so could result in suspension of the study without further notice.
- Reporting of all severe unexpected Adverse Events to the Committee
- Reporting of new information relevant to patient safety to the Committee
- Provision of Data Monitoring Committee reports (if applicable) to the Committee

Failure to comply with these requirements will result in withdrawal of approval. The Committee would also like to receive copies of the final report once the study is completed.

Yours sincerely

Dr Brian Faragher
Acting-Chair, Research Ethics Committee

13.3 Appendix 3.2 NIMR
Ethics approval

THE UNITED REPUBLIC OF
TANZANIA

National Institute for Medical Research
P.O. Box 9653
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Fax: 255 22 2110986

NIMR/HQ/R.8a/Vol. IX/1336

21st May 2012

Mr John Dusabe
C/O Dr Soori E Nnko
NIMR Mwanza
P O Box 1462
MWANZA

CLEARANCE CERTIFICATE FOR CONDUCTING MEDICAL RESEARCH IN TANZANIA

This is to certify that the research entitled: Development of a community referral system to improve uptake of adolescent sexual and reproductive health services in Magu, Mwanza region in Tanzania (Dusabe J et *al),* whose local investigator is D Soori E Nnko, NIMR Mwanza, has been granted ethics clearance to be conducted in Tanzania.

The Principal Investigator of the study must ensure that the following conditions are fulfilled:

1. Progress report is submitted to the Ministry of Health and the National Institute for Medical Research, Regional and District Medical Officers after every six months.
2. Permission to publish the results is obtained from National Institute for Medical Research.
3. Copies of final publications are made available to the Ministry of Health & Social Welfare and the National Institute for Medical Research.
4. Any researcher, who contravenes or fails to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine. NIMR Act No. 23 of 1979, PART III Section 10(2).
5. Approval is for one year: 21st May 2012 to 20th May 2013.

Name: Dr Mwelecele N Malecela

Signature

CHAIRPERSON
MEDICAL RESEARCH
COORDINATING COMMITTEE

Name: Dr Donan Mmbando

Signature

ACTING CHIEF MEDICAL OFFICER
MINISTRY OF HEALTH, SOCIAL WELFARE

CC: **RMO**
DMO

13.4 Appendix 3.3 Participant information sheet and consent

*Standard Information and Consent for IntHEC project**

Introduction: My name is….. ..... and I am a facilitator/team leader/ for the *Int*HEC Project
What is *Int*HEC? *Int*HEC stands for Health Education and Community Integration. This is a project to increase the effectiveness of reproductive health services, and to ensure all communities in sub-Saharan Africa have equal access to those services. The project that is being conducted in Tanzania and Niger by a group of different scientists. In Tanzania, these scientist are from the National Institute of Medical Research, Mwanza, The Government Ministries of Health and Ministry of Education and Vocational Training . The research is funded by the European Commission.
The *Int*HEC research project will take place in three major steps.
Step 1: We will conduct research to better understand how services related to reproductive health work in your community.
Step 2: We will work with young people, teachers, health service providers and other authorities in the community to see what parts of reproductive health services are working well what parts could be improved. We will then work with these groups to improve the services.
Step 3: We will conduct research to assess whether the changes truly improved the services

Why are we here today? We would like to ask you questions about the work that you do relating to reproductive health. We would like to understand what you think are good things and what things you think should be improved or changed.

Why have you been chosen? Because you do work that is important for the reproductive health of young people.

What will happen? If you agree to help us with the study, we will ask you questions about health and what people do to preserve their health. If you agree, we will record what you say on a small machine.

There are no right or wrong answers. We would just like to understand your actual experiences and what you really think, so that we can improve reproductive health services .

What will happen to the information that you give to us? The information you give us is very helpful and we will treat it with respect. Your name will not be entered into the machine, so no one will be able to know how you personally answered the questions. The information will be stored in central computers and studied by the research team. In three to four years, when the research is finished, we will come back and give the overall results from the thousands of people who participated, but we will not give information about the responses of individual people. The overall results will be used to improve health services in other parts of your country. Reports of these overall results will be shared with scientists all over the world so that they can learn from this research.

Do you have to participate? We would greatly value your help with this work, but you **do not** have to participate if you do not wish to. Also, if you start to answer the questions and then decide that you want to stop, you can do so at any time. You do not have to give any reason.

How do you benefit from participating? There is no immediate benefit to you now, but we hope that your answers will help improve the way that services are provided in your community. We therefore hope that you will benefit in the future. However, that will only happen if the research is successful.

*Adapted for contexts of different sub-studies

Will there be any cost to you if you do not participate? No. You will be able to continue using the services and facilities just as before.

Will you be paid for participating? No. Unfortunately, we cannot pay you to participate.

What if you have some more questions? If you have any questions you can ask me now or later today, or you can contact the *Int*HEC project information team at…..(address to be supplied)

What happens next? Please ask if you have any more questions. You do not have to take part in the study, but if you would like to do so, then please complete the consent form attached.

Consent form

Date of participation	____/____/_____

PLEASE CIRCLE THE CORRECT ANSWER

1. The *IntHEC* Project and the purpose of the research has been explained to me. **YES / NO**

2. I have read a participant information sheet or it was read to me
YES / NO

3. I feel that I understand the purpose of today's research activity. **YES / NO**

4. I agree to participate in the study about my views and experiences of reproductive health services. **YES / NO**

5. I know that I can stop participating in this research at any time without consequences.
YES / NO

If 'NO' to any of the above, the participant is ineligible to take part

Signature of participant

Signature or Thumbprint		Date of signature	

Signature of researcher taking consent

Signature		Date of signature	
Name			

*Adapted for contexts of different sub-studies

13.5 Appendix 6.1 infrastructural situational analysis data collection tool

A. Facility and services

A1. District |_____|
A2. Ward |_____|
A3. Name of health facility |_____|
A4. Level of health facility |_____|

A.5 Facility RH Service Resources

A5. *(Tick the services provided by facility)*	HIV	✓/X	STI	✓/X	FP	✓/X	Maternal health	✓/X
	Counselling		Counselling		Counselling		Antenatal care	
	Microscopy Test		Symptomatic Test		OCP		Delivery	
	Rapid Test		Microscopy test		Injectable		Post-natal care	
	Treatment		Treatment		IUD		Immunisation	
	CD4 count		Male condoms		Norplant		Post-abortion care	
	Prophylaxis		Fem. condoms		Tubectomy			
	Male condoms				Vasectomy			
	Fem. condoms				ECP			
	Other: specify							

A6. Facility Infrastructure Resources

A6. *(Tick the availability of infrastructure and write quantity of each of the resources available in the facility)*	Infrastructures	✓/X	How many
	Buildings		
	Reception rooms		
	Consultation rooms		
	Counselling rooms		
	YFS room (consultation, counselling,etc)		
	OPD		
	IPD		
	IPD male		
	IPD female		
	IPD beds male		
	IPD beds female		
	Delivery room		
	Laboratory room		
	Microscopes		
	Stethoscopes		
	Other: specify		

B.

B. Staff and training:

B1. Number of staff

B1.

(Write the number of staff available in the facility per cadre in the tables across)

Cadre	#
Medical officer	
AMO	
Clinical officer	
Assistant clinical officer	

Cadre	#
Pharmacist	
Pharmacist Technician	
Assistant pharmacist	
Laboratory technician	
Assistant lab technician	

Cadre	#
Nursing officer	
Public health nurse	
Nurse Midwife	
Medical attendant	
Nurse attendant	
Other nurse (specify)	

Cadre	#
Receptionist	
Guard	
Messenger	
Other (specify)	

13.6 Appendix 6.2 Service uptake situational analysis tool
Data Collection Tool at the Dispensary/Health Centre Level May 2012

Name of ward ----------Name of facility ----------Level of facility ----------

Demographics

Population		15-19		20-24		25-29		30-34	
	Male		Female	Male	Female	Male	Female	Male	Female
Ward									
Village (where HF is located)									
Number of health centres in ward			Number of dispensaries in ward						

Age-group	Last 3 months Date: (June 2012)	Gender	HIV					STI					Family planning						Pregnancy	
			VCT/PICT/information		Condoms	ARV	# Return	Diagnosis		Treatment	Counselling	Condoms	Condom	Pill	Injection	IUD	Implants	Other FP	ANC	Delivery
			+ve	-ve				+ve	-ve											
15-19	March	Male																		
		Female																		
	April	Male																		
		Female																		
	May	Male																		
		Female																		
20-24	March	Male																		
		Female																		
	April	Male																		
		Female																		
	May	Male																		
		Female																		
25-29	March	Male																		
		Female																		
	April	Male																		
		Female																		
	May	Male																		
		Female																		
30-34	March	Male																		
		Female																		
	April	Male																		
		Female																		
	May	Male																		
		Female																		

Note: if facility does not have numbers for the last 3 months, collect the data for the available period. Seasonality is important, data to be collected for the same months at impact evaluation.

IntHEC Project
Text-message platform to improve uptake of adolescent reproductive health services in Tanzania
Drug shop/ADDO Cue Card

The following process must be followed when sending a text message to refer a patient to a Dispensary for treatment

1. Enter the word AFYA and hit space
2. Enter Patients initials (eg: JY)
3. Enter date of birth (ddmmyy)
4. Enter gender (M or F) then space.
5. Choose a symptom code from the table below. If there is more than 1 symptom, simply state them all in codes with a space between each code.
6. Example of correct content message: AFYA[SPACE}XY150697F[SPACE]D1[SPACE]H1
7. Send message to the toll-free number 15543

   NOTE: H codes are listed at the bottom of this table. Please use an H code at the end of each text

Signs and symptoms presented at dispensary	Likely Service Needed	Keyword	Code
Symptoms			
Discharge from penis	**Chlamydia/Gonorrhoea test/treatment**	Discharge	S1
Discharge from vagina	**Chlamydia/Gonorrhoea test/treatment**	Discharge	S2
Curdlike discharge from vagina	**Candidiasis**	Curd discharge	S3
Persistent discharge from penis: 2nd visit	**Prolonged Chlamydia, trichomoniasis, 2nd line gonorrhoea**	Discharge-2	S3
Persistent discharge from vagina: 2nd visit	**Candidiasis, bacterial vaginosis, prolonged Chlamydia 2nd line gonorrhoea**	Discharge-2	S4
Persistent curdlike discharge from vagina	**Mixed infections**	Discharge-3	S5
Persistent discharge from penis: 3rd visit	**Refer**	Discharge-4	S6
Persistent discharge from vagina: 3rd visit	**Refer**	Discharge-5	S7
Discharge from vagina not abnormal	**SRH education**	SRH Education	S8
Lower abdominal pain	**Pelvic inflammatory disease (PID)**	PID	S9
Lower abdominal tenderness, vaginal discharge and temp equals or >38°C	**PID**	PID	S10
Abnormal vaginal bleeding, missed period, recent delivery and abortion	**PID**	PID	S11
Lower abdominal pain, vaginal bleeding, etc 2nd visit no improvement	**PID**	PID	S12
Lower abdominal pain, vaginal bleeding, etc 2nd visit patient improved	**PID**	PID	S13
Lower abdominal pain, vaginal bleeding, etc 3rd visit symptoms persist	**PID**	PID	S14
Scrotal pains, swelling, tenderness and fever	**Painful scrotal swelling (PSS) – gonorrhoea or Chlamydia infections**	PSS	S15
Scrotal pains, swelling, tenderness and fever	**PSS**	PSS	S16
Scrotal pains, swelling, tenderness and fever 2nd visit – No improvement	**PSS**	PSS	S17
Genital sore or ulcer	**Syphilis, Chancroid, LGV and HSV-2**	GUD	S18
Genital sore or ulcer	**Only vesicles found, HSV-2**	GUD	S19
Genital sore or ulcer	**GUD no improvement**	GUD	S20
Painful inguinal swelling	**Inguinal Bubo (IB)**	**Inguinal Bubo**	S21
Painful inguinal swelling	**Inguinal Bubo (IB), swollen and/or tender inguinal lymph nodes and genital ulcer**	**GUD**	S22
Painful inguinal swelling 2nd visit no improvement	**IB no improvement**	**IB no improvement**	S23
Itching: penis	**Chlamydia/Gonorrhoea test/treatment**	Itching	S24
Itching: vagina	**Chlamydia/Gonorrhoea test/treatment**		S25
Pain in testicles	**Chlamydia/Gonorrhoea test/treatment**	Pain testis	S26
Pain passing urine	**Chlamydia/Gonorrhoea test/treatment**	Pain urinating	S27
Bleeding (between menses)	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	S28
Heavier periods than usual	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	S29
Bleeding after sex	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	S30

Pain during sex	**Chlamydia/Gonorrhoea test/treatment**	Pain sex	S31
Growth around genital (or anal) area	**Genital Warts test/Rx - STI**	Growth genital	S32
Bump(s) around genital (or anal) area		Bump genital	S33
Blisters on the genitals	**Herpes Test/Rx - STI**	Blister genital	S34
Blisters on the mouth (cold sores)		Blister mouth	S35
Sore/ulcer on the genitals (or mouth) - painless	**Syphilis - STI**	Sore genital	S36
Skin rash and sore throat		Skin rash	S37
Muscle pain, blotchy rash, swollen glands	**HIV test - HIV**	Suspect HIV	S38
HIV testing	**HIV and STI**	Test HIV	S39
STI testing		Test STI	S40
HIV counselling		Counselling HIV	S41
HIV treatment		Treat HIV	S42
STI treatment		Treat STI	S43
Male condom to prevent pregnancy	**Family planning**	Mcondom preg.	S44
Male condom to prevent STI/HIV		Mcondom STI	S45
Female condom to prevent pregnancy		Fcondom preg	S46
Female condom to prevent STI/HIV		Fcondom STI	S47
Pill		FP pill	S48
Injection		FP injection	S49
IUD		FP IUD	S50
Patch		FP patch	S51
Diaphragm		FP diaphragm	S52
Tubal ligation		FP ligation	S53
Vasectomy		FP vasectomy	S54
Natural FP method		FP natural	S55
Pregnancy test	**Pregnancy and delivery**	Pregnancy	S56
Antenatal all trimesters		Antenatal	S57, S58, S59, S60
Delivery at the facility		Delivery	S61
Symptom denied	**Will not disclose symptoms**	The client is shy or refused to give the symptom at the drug shop level	DN
Referral refused	**Refuse referral**	The client refused to be referred to the dispensary	RR

Please use H codes from the following selection to indicate when the patient is expected at the Dispensary.
H1= mgonjwa atafika ndani ya saa 1
H2= mgonjwa atafika ndani ya masaa 2
H3= mgonjwa atafika ndani ya masaa 3
H4= mgonjwa atafika ndani ya masaa 4
H5= mgonjwa atafika kesho
H6= mgonjwa atafika kesho kutwa

13.8 Appendix 7.2 Dispensary cue card

IntHEC Project
Dispensary/Health Centre Cue Card

The following process must be followed when sending a text message from a Dispensary-Health Centre to confirm the actions taken with a patient who has been referred.

1. Enter AFYA and hit SPACE
2. Enter ID code from the message received from the drug shop. This code will consist of 8 characters
3. Diagnose the patient and choose a diagnosis code from table below depending on your diagnosis e.g. UDS+
4. Treat the patient and choose a treatment code from the table below e.g. T1. A code must be entered whether treatment is given or not. If no treatment is given, choose NOT/AV
5. Give appropriate advice and choose the code of advice given from table below e.g. A1. Type all the codes from the instructions 1 to 4 in a text message and send to toll-free number 15331
6. Example of correct content message is: (e.g. AFYA[space]8 character code[space]UDS+[space]T1[space]A1)
   (First is the ID code that the dispensary receives in the message, then the Diagnosis separated by space, Treatment separated by space and Advice separated by space)

Signs and symptoms presented at dispensary	Likely Service Needed	Keyword	Diagnosis disp	Treatment disp	Advice disp
Symptoms					
Discharge from penis	**Chlamydia/Gonorrhoea test/treatment**	Discharge	UDS+;UDS-	T1; N	A1; A2; A3; A4; A5
Discharge from vagina	**Chlamydia/Gonorrhoea test/treatment**	Discharge	VDS+;VDS-	T2; N	A1; A2; A3; A4; A5
Curdlike discharge from vagina	**Candidiasis**	Curd discharge	VDS+;VDS-	T3; N	A1; A2; A3; A4; A5
Persistent discharge from penis: 2nd visit	**Prolonged Chlamydia, trichomoniasis, 2nd line gonorrhoea**	Discharge-2	PUDS+, PUDS-	T4; N	A1; A2; A3; A4; A5
Persistent discharge from vagina: 2nd visit	**Candidiasis, bacterial vaginosis, prolonged Chlamydia 2nd line gonorrhoea**	Discharge-2	PVDS+, PVDS-	T5; N	A1; A2; A3; A4; A5
Persistent curdlike discharge from vagina	**Mixed infections**	Discharge-3	cPVDS+, cPVDS-	T6; N	A1; A2; A3; A4; A5
Persistent discharge from penis: 3rd visit	**Refer**	Discharge-4	PUDS1, PUDS0	T7; N	A1; A2; A3; A4; A5
Persistent discharge from vagina: 3rd visit	**Refer**	Discharge-5	PVDS1, PVDS0	T8; N	A1; A2; A3; A4; A5
Discharge from vagina not abnormal	**SRH education**	SRH Education	VDS-	T9; N	A1; A2; A3; A4; A5
Lower abdominal pain	**Pelvic inflammatory disease (PID)**	PID	PID+; PID-	T10; N	A1; A2; A3; A4; A5
Lower abdominal tenderness, vaginal discharge and temp equals or >38°C	**PID**	PID	PID+; PID-	T11; N	A1; A2; A3; A4; A5
Abnormal vaginal bleeding, missed period, recent delivery and abortion	**PID**	PID	PID+; PID-	T12; N	A1; A2; A3; A4; A5
Lower abdominal pain, vaginal bleeding, etc 2nd visit no improvement	**PID**	PID	PID+; PID-	T13; N	A1; A2; A3; A4; A5
Lower abdominal pain, vaginal bleeding, etc 2nd visit patient improved	**PID**	PID	PID+; PID-	T14; N	A1; A2; A3; A4; A5
Lower abdominal pain, vaginal bleeding, etc 3rd visit symptoms persist	**PID**	PID	PID+; PID-	T14; N	A1; A2; A3; A4; A5
Scrotal pains, swelling, tenderness and fever	**Painful scrotal swelling (PSS) – gonorrhoea or Chlamydia infections**	PSS	PSS+; PSS-	T1; N	A1; A2; A3; A4; A5
Scrotal pains, swelling, tenderness and fever	**PSS**	PSS	PSS+; PSS-	T15; N	A1; A2; A3; A4; A5
Scrotal pains, swelling, tenderness and fever 2nd visit – No improvement	**PSS**	PSS	PSS+; PSS-	T15; N	A1; A2; A3; A4; A5
Genital sore or ulcer	**Syphilis, Chancroid, LGV and HSV-2**	GUD	GUD+; GUD-	T16; N	A1; A2; A3; A4; A5
Genital sore or ulcer	**Only vesicles found, HSV-2**	GUD	GUD+; GUD-	T17; N	A1; A2; A3; A4; A5
Genital sore or ulcer	**GUD no improvement**	GUD	GUD+; GUD-	T18; N	A1; A2; A3; A4; A5
Painful inguinal swelling	**Inguinal Bubo (IB)**	**Inguinal Bubo**	IB+; IB-	T19; N	A1; A2; A3; A4; A5
Painful inguinal swelling	**Inguinal Bubo (IB), swollen and/or tender inguinal lymph nodes and genital ulcer**	**GUD**	GUD+; GUD-	T16; N	A1; A2; A3; A4; A5
Painful inguinal swelling 2nd visit no improvement	**IB no improvement**	**IB no improvement**	IB+; IB-	T20; N	
Itching: penis	**Chlamydia/Gonorrhoea test/treatment**	Itching	UDS+;UDS-	T1; N	A1; A2; A3; A4; A5
Itching: vagina	**Chlamydia/Gonorrhoea test/treatment**		VDS+; VDS-	T2, N	
Pain in testicles	**Chlamydia/Gonorrhoea test/treatment**	Pain testis	UDS+;UDS-	T1; N	A1; A2; A3; A4; A5
Pain passing urine	**Chlamydia/Gonorrhoea test/treatment**	Pain urinating	UDS+;UDS- or VDS+/-	T1; T2; N	A1; A2; A3; A4; A5
Bleeding (between menses)	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	VDS+; VDS-	T2, N	A1; A2; A3; A4; A5
Heavier periods than usual	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	VDS+; VDS-	T2, N	A1; A2; A3; A4; A5
Bleeding after sex	**Chlamydia/Gonorrhoea test/treatment**	Bleeding	VDS+; VDS-	T2, N	A1; A2; A3; A4; A5
Pain during sex	**Chlamydia/Gonorrhoea test/treatment**	Pain sex	UDS+;UDS- or VDS+/-	T1; T2; N	A1; A2; A3; A4; A5
Growth around genital (or anal) area	**Genital Warts test/Rx - STI**	Growth genital	WRT+; WART-	T21; T22; N	A1; A2; A3; A4; A5
Bump(s) around genital (or anal) area		Bump genital	WART+; WART-	T21; T22; N	A1; A2; A3; A4; A5
Blisters on the genitals	**Herpes Test/Rx - STI**	Blister genital	HERP+; HERP-	T23, N	A1; A2; A3; A4; A5
Blisters on the mouth (cold sores)		Blister mouth	HERP+; HERP-	T23, N	A1; A2; A3; A4; A5
Sore/ulcer on the genitals (or mouth) - painless	**Syphilis - STI**	Sore genital	SYPH+; SYPH-	T24; T25; T26; N	A1; A2; A3; A4; A5
Skin rash and sore throat		Skin rash	SYPH+; SYPH-	T24; T25; T26; N	A1; A2; A3; A4; A5
Muscle pain, blotchy rash, swollen glands	**HIV test - HIV**	Suspect HIV	HIV+; HIV-*	T27; N	A1; A2; A3; A4; A5
Direct Requests	**See Direct Request**				
HIV testing	**HIV and STI**	Test HIV	HIV+; HIV-*	T27; N	A1; A2; A3; A4; A5

STI testing		Test STI	Put diagnosed STI code	Put drug for diagnosed STI e.g. T1	A1; A2; A3; A4; A5
HIV counselling		Counselling HIV	HIV+; HIV-*	T27; N	A1; A2; A3; A4; A5
HIV treatment		Treat HIV		T27; N	A1; A2; A3; A4; A5
STI treatment		Treat STI		Put drug for diagnosed STI e.g. T1	A1; A2; A3; A4; A5
Male condom to prevent pregnancy	**Family planning**	Mcondom preg.		T28; N	A1; A2; A3; A4; A5
Male condom to prevent STI/HIV		Mcondom STI		T28; N	A1; A2; A3; A4; A5
Female condom to prevent pregnancy		Fcondom preg		T29; N	A1; A2; A3; A4; A5
Female condom to prevent STI/HIV		Fcondom STI		T29; N	A1; A2; A3; A4; A5
Pill		FP pill		T30; N	A1; A2; A3; A4; A5
Injection		FP injection		T31; N	A1; A2; A3; A4; A5
IUD		FP IUD		T32; N	A1; A2; A3; A4; A5
Patch		FP patch		T33; N	A1; A2; A3; A4; A5
Diaphragm		FP diaphragm		T34; N	A1; A2; A3; A4; A5
Tubal ligation		FP ligation		T35; N	A1; A2; A3; A4; A5
Vasectomy		FP vasectomy		T36; N	A1; A2; A3; A4; A5
Natural FP method		FP natural		T37	FPN, A1;A2;A3;A4;A5
Pregnancy test	**Pregnancy and delivery**	Pregnancy	PREG+; PREG-	T38	A1; A2; A3; A4; A5
Antenatal all trimesters		Antenatal	ANC1; ANC2; ANC3; ANC4	T39, T40, T41,T42	A1; A2; A3; A4; A5
Delivery at the facility		Delivery	LIVB; STLB	T43	A1; A2; A3; A4; A5
Any symptom presented by the patient	Non-STI symptom, no treatment is needed	NSTINoRx	NSTI	T44	
Any symptom presented by the patient	Non-STI symptom, treatment is needed	NSTIRx	NSTIRx	T45	
Any symptom presented by the patient	STI symptom but no capacity to diagnose/treat	CompSTI	CSTI	T46	
Any symptom presented by the patient	Non-STI symptom and no capacity to diagnose/treat	CompCNSTI	CNSTI	T47	
Generic codes					
Patient did not turn up for the requested appointment		NSA			
Patient did not turn up after 4 weeks		NS4			
Patient not able to pay for drugs	Not treated	NP			

*where HIV test is available, ***provide other RH service(s), put appropriate code(s)
N= Not available
T1 = drugs for gonorrhoea: Ciprofloxacin 500mg oral stat and and Chlamydia: Doxycycline tabs 100mg b.i.d 7/7, educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days
T2= drugs for gonorrhoea: Ciprofloxacin 500mg oral stat and Chlamydia: Doxycycline tabs 100mg b.i.d 7/7, and Metronidazole 2g stat, educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days
T3= drugs for candidiasis: clotrimazole pessaries 100mg o.d 6/7
T4= drugs for prolonged Chlamydia, trichomoniasis, and 2nd line drugs for gonorrhoea: Doxycycline tabs 100mg b.i.d 7/7, Metronidazole tabs 2g stat and inj. Ceftriaxone 250mg i.m stat
T5= drugs for candidiasis, bacterial vaginosis, prolonged Chlamydia and 2nd line drug for gonorrhoea: Clotrimazole vaginal pessaries 100mg o.d 6/7, Ceftriaxone 250mg i.m. stat, Doxycycline 100mg b.i.d 7/7 and Metronidazole tabs 400mg b.i.d 7/7
T6= drugs for mixed infections, Clotrimazole vaginal pessaries 100mg o.d 6/7, Tab Ciprofloxacin 500mg stat, Doxycycline 100mg b.i.d 7/7 and Metronidazole tabs 400mg b.i.d 7/7
T7= refer for lab tests, if no laboratory at your facility, refer to the nearest higher facility with a laboratory
T8= Give patient health education, counsel on risk reduction, promote and provide condoms, offer PITC (provider initiated testing and counselling)
T9= drugs for gonococcol infection, Chlamydia and anaerobic bacteria: ciprofloxacin 500mg stat, Doxycycline tabs 100mg b.i.d 14/7, Metronidazole tabs 400mg b.i.d 14/7, analgesics and educate the patient on importance of drug compliance, give health education, counsel on risk reduction, promote and provide condoms, offer PITC (provider initiated testing and counselling), appointment in 3 days.
T10= refer to in-patient department for management and after educate the patient on importance of drug compliance, give health education, counsel on risk reduction, promote and provide condoms, offer PITC (provider initiated testing and counselling).
T11= Refer to surgeon or gynaecologist. Before referral, set up an I.V and apply resuscitory measures if necessary.
T12= refer to surgeon or gynaecologist
T13= continue with Doxycycline and Metronidazole
T14= 2nd line drug for PID ceftriaxone 250mg i.m stat
T15= Refer to surgeon
T16= drugs for syphilis, chancroid, LGV & HSV-2: Benz. Penicillin 2.4 MU, i.m stat 1/2 in each buttock, Erythromycin 500mg QID 7/7, acyclovir 400mg 8hrly 7/7, educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days
T17= drugs for HSV-2: keep clean and dry, acyclovir tabs 400mg 8hrly 7/7, GV paint, educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days
T18= GUD 2nd line drug: ceftriaxone 250mg i.m stat
T19= drugs for lymphogranuloma venereum and H. Ducreyi: Erythromycin 500mg QID 14/7 educate on importance of drug compliance, provide health education, partner management, promote and provide condoms, offer HIV counselling and testing, appointment in 7 days
T20= refer to surgeon and continue treatment
T21= drugs for genital warts, self-applied by patient, either: podophyllotoxin 0.5% solution or gel, or imiquimod 5% cream or any other locally recommended drug
T22= drugs for genital warts, clinician-administered, either: podophyllin 10–25%, or podophyllotoxin 0.5%, or TCA 80–90% or any other locally recommended drug
T23= drugs for genital herpes: acyclovir
T24= if syphilis diagnosed, follow MoH chart and/or see T16
T25= if syphilis diagnosed, follow MoH chart and/or see T16
T26= if syphilis diagnosed, follow MoH chart and/or see T16
T27= Follow MoH guidelines
T28= Condoms provided
T29= Female condom(s) provided
T30= contraceptive pills provided
T31= contraceptive injection provided
T32= IUD provided
T33= FP patch provided
T34= Diaphragm provided
T35= Tubal ligation performed
T36= Vasectomy performed
T37= natural family planning method explained
T38= ANC advice given
T39; T40; T41; T42= ANC visit accomplished and pregnancy monitored
T43= mother delivered. LIVB means live birth, STLB means still birth
T44= no treatment was needed, advice on the symptom given
T45= Non-STI condition was treated, using MoH guideline
T46= referred to higher health facility
T47= Referred to higher health facility
A1 - Patient was given HIV/STI prevention and family planning information and options; **A2** - Patient was given HIV/STI prevention and family planning information and options then treated and sent home; **A3** - Patient was given HIV/STI prevention and family planning information and options and referred to buy medicine from this facility's collaborating drug store; **A4** - Patient was given HIV/STI prevention and family planning information and options and referred to buy medicine from any drug store; **A5** - Patient was given HIV/STI prevention and family planning information and options and referred to higher health facility for further treatment.

13.9 Appendix 9.1 Household survey questionnaire

Text messaging intervention questions included in the IntHEC household survey

1. Have you gone to a drug shop to buy drugs within the last month?

   1. Yes and I got the drugs
   2. Yes but I did not get the drugs
   3. No (go to q3)

2. If yes, was that for a reproductive health related conditions?
   1. Yes
   0. No

3. If yes, did you get the drugs you needed or were you referred to a dispensary or health centre for further treatment? (Tick all that apply)

   1. Yes I got the drugs and was referred
   2. Yes I got the drugs and was not referred
   3. No I did not get the drugs but I was referred
   4. No I did not get the drugs and was not referred

4. Have you heard of an intervention in which people are referred from drug shops to dispensaries or health centres using mobile phones text messages?
   1. Yes
   0. No (go to 14)

5. Have you ever been referred in this way by a drug shop to a dispensary or health centre?

   1. Yes
   0. No (go to 11)

6. After this referral, did you proceed to access the health service at the dispensary or health centre

   1. Yes (go to 8)
   0. No (go to 10)

7. If yes, why did you go?
   1. To comply with the referral
   2. Because if I am referred I might be very sick
   3. Because I prefer to be treated by skilled practitioners
   4. Because I don't have to pay more at health facility
   5. Because the drug shop thought it would be useful for me
   6. Other

7. I don't know

8. Did you get the treatment you needed at the facility where you were referred?

   1. Yes (go to 11)
   0. No (go to 11)

9. Why did you not go to the health facility to access the service you needed after this referral?

   1. No time
   2. No money
   3. Dispensary/Health Centre are too far
   4. Health facilities have no drugs
   5. Health facility staff are unfriendly
   6. I prefer to buy medicines without attending health facility
   7. I got better
   8. I went to buy drugs at another drug shops
   9. Other (specify)

10. Do you know of anyone else who has been referred this way?
    1. Yes
    2. No (go to 14)

11. Did that person go to the dispensary/health centre after the referral?

    1. Yes they went (go to 14)
    2. No they did not go
    3. I don't know (go to 14)

12. If no, why did they not go?
    1. No time
    2. No money
    3. Dispensary/Health Centre are too far
    4. Health facilities have no drugs
    5. Health facility staff are unfriendly
    6. They prefer to buy medicines without attending health facility
    7. They got better
    8. They went to buy drugs at another drug shops
    9. Other (specify)

13. In future, if you were to be referred this way, would you go to the dispensary/health centre

    1. Yes (go to 15)
    0. No (go to 16)

14. If yes, why would you go?
    1. To comply with the referral
    2. Because if I am referred I might be very sick
    3. Because I prefer to be treated by skilled practitioners
    4. Because I don't have to pay more at health facility
    5. Because the drug shop thinks it is important for to go the health facility
    6. Other
    7. I don't know

15. If no, why would you not go?

1. No time
2. No money
3. Dispensary/Health Centre are too far
4. Health facilities have no drugs
5. Health facility staff are unfriendly
6. I prefer to buy medicines without attending health facility
7. I can buy drugs from somewhere else
8. Other (specify)