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Task shifting for tuberculosis control: A qualitative study of community-based directly observed therapy in urban Uganda

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Abstract

This qualitative study of task shifting examined tuberculosis (TB) therapy under modified community-based directly observed treatment short-course (CB-DOTS) in Kampala, Uganda. New TB patients selected one of two strategies: home-based DOTS and clinic-based DOTS. Relevant socio-economic characteristics, treatment-seeking experiences and outcomes were assessed over eight months of follow-up. Of 107 patients recruited, 89 (83%) selected home-based DOTS. Sixty-two patients (70%) under home-based DOTS and 16 patients (89%) under clinic-based DOTS had successful outcomes following completion of tuberculosis therapy. Treatment supporters' provision of social support beyond observing drug ingestion contributed to successful outcomes under both strategies. Home-based DOTS provides continuity of social support during therapy, strengthening the potential for treatment success. Conventional health facility-based DOTS can be modified in resource-limited urban Africa to offer a viable DOTS strategy that is sensitive to personal preference. Shifting the task of DOTS support away from only qualified health workers to include laypersons in the patients' social-support network may contribute to meeting World Health Organization (WHO) treatment targets. We recommend an intervention evaluating this modified DOTS strategy on a larger scale in TB high-burden, resource-poor urban settings.

Keywords

Tuberculosis; community-based DOTS; task shifting; social network support; Uganda

Introduction

Tuberculosis (TB) remains a public-health problem of significance in the developing world, where already strained health-service delivery systems continue to impede current control efforts (WHO 2008). Globally, it is recognised that limited financial and health resources continue to strain efforts to control infectious diseases like TB, a situation worsened by the advent of HIV/AIDS (Dye *et al.* 1999, Msamanga and Fawzi 1997, Netto *et al.* 1999, Ravigione *et al.* 1995, WHO 2008, WHO *et al.* 2002).

The World Health Organization (WHO) and the International Union Against TB and Lung Disease promote universal adoption of directly observed therapy short-course (DOTS) for TB treatment as a means to improve TB treatment outcomes. They note that if case detection reaches 70%, with treatment success reaching 85%, TB control would reach acceptable levels (WHO 1999, 2003b). Given the fundamental challenge of convincing individuals within the context of their families and communities to adopt and maintain healthy behaviour (WHO *et al.* 2002), a programme of direct observation of treatment allows patients to share responsibility for adhering to treatment with health care workers, public-health officials, governments and communities.

Research on varying socio-economic implications of DOTS, however, finds that TB control remains problematic across the developing world (Raviglione *et al.* 1997, Stop T. B. Partnership and WHO 2006, WHO 2003a). Because of resource limitations in the health-service sector, there is growing recognition of the need to decentralise TB control from hospitals and other primary-care facilities to communities. One recommendation is to decentralise services in the communities through the task-shifting framework (WHO *et al.* 2008). Task shifting calls for reallocating specific roles to health workers who have had shorter training or lesser qualifications, or in some cases, delegating tasks to newly created cadres that have had specific competency-based training (WHO *et al.* 2008). For diseases such as TB, which require strict adherence to long-term daily therapy, it is particularly important that task shifting is implemented successfully.

In response to the need to improve case detection and treatment, Uganda established its patient-centered Community-based Directly Observed Treatment Short-course (CBDOTS) programme in 2002 in a few, mainly rural, districts as a way to address some barriers to successful DOTS (National Tuberculosis and Leprosy Control Programme and WHO 2002, Adatu *et al.* 2003). CB-DOTS permits patients to select their treatment supervisor, thereby incorporating social networks as a means to increase adherence. Additionally, the inclusion of community-based social networks has the potential to increase information and awareness, thereby encouraging others to seek diagnosis and treatment. As such, CB-DOTS situates treatment supervision in the community and shifts the task of observing treatment away from medical workers to 'laypersons'.

Within a year of initiating CB-DOTS in a few demonstration districts in Uganda, the proportion of patients effectively cured doubled and treatment became more acceptable for patients and their families. As expenditures on hospitalisation decreased, resources became available for those in need of specialised care (Adatu *et al.* 2003, Okello *et al.* 2003). This apparent success in improving TB care prompted the National Tuberculosis and Leprosy Control Programme (NTLP) to establish the new strategy countrywide.

Despite implementation of the CB-DOTS in Uganda, however, TB control continues to fall short of the WHO recommended targets for treatment success. From 2007 to 2009 in Uganda, TB detection rates of new smear-positive cases under conventional DOTS ranged from 43% to 51%. And treatment success rates in the same period ranged from 68% and 70% (WHO 2009). Given this situation, there is urgent need to review the CB-DOTS programme.

As Uganda expands implementation of CB-DOTS, the NTLP has recognised that the complex social context of urban areas merits efforts to tailor CB-DOTS to these situations (National Tuberculosis and Leprosy Control Programme and WHO 2002). Research indicates that TB patients in urban areas may prefer different strategies for receiving DOTS, such as standard supervised treatment in the form of clinic visits or private physician consultations; family-based DOTS, in which a family member directly observes pill taking;

and observation by 'lay' health professionals not ordinarily involved in TB care (Cavalcante *et al.* 2007, Chowdhury *et al.* 1997, Clarke *et al.* 2005, Garner and Volmink 2006, Jakubowiak *et al.* 2007, Kaawa-Mafigiri 2007, Kangovi *et al.* 2009, Kironde and Bajunirwe 2002, Mafigiri and McGrath 2007, Mathew *et al.* 2005, Newell *et al.* 2006, Nyirenda *et al.* 2003, Wright *et al.* 2004, Zwarenstein *et al.* 2000). These 'lay' health workers include semi-professional and allied health workers such as drug-shop vendors and midwives. Given this range of possible options for treatment support, it is important to ask how task shifting can be successfully achieved when patients select a treatment supporter from their social-network support system. This research examined modified CB-DOTS as 'proof of concept' by identifying how the patients' social-support system may contribute to treatment seeking through task shifting in a high-prevalence urban setting of Kampala, Uganda.

Methods

Study design

We employed a combination of qualitative and quantitative methods to examine TB patients' therapy under modified treatment strategies. In Uganda, the official CB-DOTS strategy involves the parish development committee (PDC), who are a small group chosen by the community to make decisions on social and economic development issues, including health matters. The PDC in liaison with the sub-county public health worker (SCHW) asks the community to nominate a volunteer who is willing and who is acceptable to the patient to deliver DOTS with overall supervision from the SCHW. In this study, each participant selected a DOTS supporter from their social-support network system (see below).

Using a prospective design, we collected data throughout the participants' treatment period as described below. This approach offered a 'natural laboratory' to examine TB health-seeking processes in relation to the task-shifting framework in the context of national TB management and control.

Study setting

Kampala, the capital city of Uganda, with a population of 3,500,000 people, is divided into five administrative divisions. Each division has one main government public-health facility as well as several private for-profit health facilities through which the NTLCP directs TB-control activities. Kawempe division is one of the five administrative divisions of the city. Kawempe covers an area of approximately 30 square kilometres, with an estimated population of 245,015 inhabitants (UBOS 2002), and is composed of 18 parishes, each made up of 3 to 7 villages. Many parts of this community are of very low socio-economic status, with desperate conditions of poverty, overcrowding, poor hygiene and sanitation (Guwatudde *et al.* 2003a, Guwatudde *et al.* 2003b). Kawempe is typical of many peri-urban communities in Kampala in terms of living conditions.

Even with the potential for underestimation of current surveillance systems, studies show that Kawempe division has one of the highest TB burden areas in Kampala city (Guwatudde *et al.* 2003a, Guwatudde *et al.* 2003b). Encompassed in Kawempe are the National Tuberculosis Treatment Centre and the Uganda-Makerere University-Case Western Reserve University (MUCWRU) TB clinic at Mulago Hospital Complex, and Kawempe Public Health Centre. Many of the tuberculosis cases treated at Mulago Hospital TB Treatment Centre and MUCWRU clinic reside in Kawempe. This study recruited participants from these facilities. The study team was based at the MUCWRU clinic, in Mulago Hospital Complex, where interviews were conducted.

Study population and sample size

The primary study population consisted of new TB patients presenting to the clinic with their first episode of TB. Eligibility criteria were: (i) sputum smear-positive or smear-negative with clinical signs of disease; (ii) within one week of starting therapy; (iii) no previous treatment for TB; (iv) age 18 years and above; (v) willing to consent to participate in the study and sign a consent form; and (vi) resident in Kawempe division, Kampala. To meet the target of 45 participants in each arm (see DOTS strategy below) with 50% representation for gender, 107 participants were enrolled. The sample size was determined after considering the patient flow at the recruitment site in consultation with clinic directors. Morgan's theoretical saturation framework indicates this size is feasible yet large enough to capture a range of attitudes (Morgan 1995, Morgan 1996) about DOTS and ensure generalisability to patients seeking treatment under modified CB-DOTS.

Recruitment procedures

Between May 2005 and September 2006, new TB patients were recruited consecutively as they came for treatment at MUCWU clinic in Mulago Hospital Complex and Kawempe Public Health Centre until the desired sample size was obtained. Treating physicians or nurses informed new TB patients about the study and asked if they were willing to hear more about the study. If the patients expressed willingness to hear more about the study, a study interviewer explained the research in detail and sought written informed consent for participation.

Typically, permission for contact information and for appointments at the participants' homes to ascertain addresses for future follow-up and DOTS supervision were obtained on the first day of participation in the study. The need to ascertain physical addresses by going to the participants' homes was necessitated by either poorly labelled street names or a lack of formal street names and addresses in the study area. This process was repeated for each participant. To minimise the risk of discomfort, the participants were asked if they were comfortable going with a study team member to their home or being 'visited' at home by a study team member at a later date. In case the participants were still uncomfortable, they were asked to provide a convenient way for the study team to get in touch with them if the need arose. The options included the use of a telephone, designation of secondary contact persons in their social networks and identification of other places besides their homes at which they felt they could meet a study team member.

If a participant was not very ill, the baseline interviews were also conducted on this same day. However, if participants were ill or admitted for in-patient care, appointments were made to complete the baseline interview within a period of two weeks after enrollment in the study. Therefore, participants completed their first interview within the first three weeks of enrollment in the study. Data collection occurred through a review of clinic records, field notes and four interviewer-administered questionnaires in English or Luganda (the most widely spoken local dialect in the study area). Altogether, each participant was scheduled to complete a baseline interview and three follow-up interviews at two, five, and eight months, coinciding with recommended clinic visits for TB patients under DOTS. During the second (Month-2) and third (Month-5) follow-up visits, an interview consisting of semi-structured questions was conducted in order to collect data on treatment history related to TB treatment in the context of DOTS. During the third follow-up visit (Month-8 visit timed to coincide with end of treatment), a 'study-closure' instrument elicited patients' experiences of and perceptions about the DOTS process over the duration of the treatment-seeking process. Interviews also focused on who they considered acceptable as treatment supervisors, emphasizing factors such as feasibility, sustainability and perceived quality of support. All interviews were both handwritten and audio-taped. When necessary, participants were traced

while ensuring that the interviews were completed in a setting determined as much as possible at their convenience.

Allocation to modified DOTS strategy

During the enrollment visit, study participants were informed about and asked to designate their preference for a strategy to implement DOTS. They were given the following two options: 1) A home-based DOTS strategy in which the patient identifies his/her treatment supporter. The domain of the supporter could include family members or any other relation, with the main characteristic being provision of DOTS from the patient's home. 2) A clinic-based strategy with a professional, qualified health worker acting as the treatment supporter for DOTS. The participant was free to choose any health unit, private or public, within the study area, where the proposed health worker would be based and willing to be a treatment supporter to the patient. The strategies were identical in all other respects regarding standard DOTS treatment for new smear-positive TB patients recommended by the WHO and the National TB Control Programme.

Participants' medical care provided routinely by the MUCWRU clinic staff was not affected by participation in this study. However, a clinical officer, responsible for TB care and medication as part of routine patient care at the clinic, was recruited as an overall treatment supervisor for our study so as to ensure maintenance of standard care. His role in this study focused on overseeing the DOTS strategy, supervising treatment supporters and patient referral for management of side effects.

In all instances, upon selection of a DOTS strategy and designation of a potential treatment supporter, patients were requested to report with their treatment supporter to the clinic to meet with the study team and discuss the treatment process, including their roles and responsibilities in achieving successful treatment. The discussion was led by the clinical officer acting as the overall DOTS supervisor as described above. Participants also received health-education leaflets routinely provided to clinic attendees. Reminders for follow-up clinic visits were given during all subsequent study visits to the clinic. When necessary, patients who missed clinic visits were traced by the clinical officer to verify that standard recording and reporting procedures were instituted, and treatment cards and records were well kept. No incentives were provided to patients or supporters. However, transport reimbursement was provided when they visited the clinic. It is important to note that these procedures just described were instituted as part of the research tracking process and therefore are beyond standard clinical practice for TB treatment in this setting.

Analysis

Qualitative analysis was performed using QSR NVivo 2 (QSR International Pty Ltd, Doncaster, Victoria, Australia). Emerging themes about the participants' experiences of and perceptions about the DOTS process were examined and compared to treatment outcomes.

Standard WHO definitions were used to classify patient outcomes in this study. Individual treatment outcomes were classified according to one of the following WHO/ International Union Against Tuberculosis and Lung Disease (IUATLD) categories: cured, treatment completion, death, treatment failure, defaulted, and transferred out. For the purposes of analysis, we defined treatment success as the completion of a full course of prescribed therapy (WHO 2003b). Other outcomes included failure of therapy, defaulting from therapy, relapse, and death. This study was not designed to be a rigorous, comparative evaluation of the efficacy of the two DOTS strategies. We estimated the proportion of successful treatment for both DOTS strategies using Fisher's Exact Test derived using SAS version 8.2 (SAS Institute Inc., Cary, NC, USA).

Ethical clearance

Ethics clearance was provided by the Uganda National Council for Science and Technology, the Institutional Review Board at Case Western Reserve University in the USA and the WHO Research Ethics Review Committee. Participants provided written informed consent in either English or Luganda.

Results

Study population

In total, 107 new sputum smear-positive patients were recruited. Eighty-nine participants (83%) selected the home-based DOTS strategy. Overall, participants' socio-economic characteristics did not differ by DOTS strategy utilised (Table 1). The majority of participants (55%) were male, and the mean age (range) of the study sample was 29 years of age (18–57 years old). Most participants who received home-based DOTS reported ever being married (64%) and most (94%) reported completing studies at the secondary school level or below. Thirty-nine percent reported not working at the time of enrollment due to general weakness arising from the illness.

Of the 89 patients who chose home-based DOTS, five (6%) died, five (6%) transferred care, eight (9%) defaulted and nine (10%) were lost to follow-up. Sixty-two patients (70%) under home-based DOTS and 16 patients (89%) under clinic-based DOTS had successful outcomes following complete tuberculosis therapy (Figure 1).

There was no significant difference in the treatment success rate between home-based DOTS and clinic based DOTS (OR=0.29; 95% CI: 0.06 to 1.34) (Table 2).

Treatment support under the modified DOTS process

We explored participants' perceptions and experiences of CB-DOTS, including their expectations, satisfaction and concerns about the DOTS treatment supporter's role during the treatment process. There is a high appreciation of the benefits resulting from CB-DOTS among patients. For instance, among participants who did not report defaulting by month-8, 94% noted that their treatment supporters had helped to ensure their adherence. Specifically, treatment supporters contributed to care beyond watching patients swallow pills; they provided essential non-medical advice and support, including social, informational and material support. Nearly all participants felt that throughout the care-seeking process, their treatment supporters considered it important to treat TB (Table 3). Even then, it is important to note that a few participants perceived that their treatment supporters did not consider their illness to be serious.

Reported benefits of self-selected treatment supporters

The majority of participants reported not having ever missed their medication. Among participants who did not report defaulting by month 8, 93.8 % (75/80) noted that their treatment supporters had helped to ensure that they adhered to treatment. The treatment supporters were reported to have contributed in various ways, including providing social support, free food and concrete assistance to ensure they attended clinic visits, and providing informational support, financial guidance and emotional support to reduce the stigma related to TB. For example, regarding decision-making related to health-care expenditure, 49% (43/87) of the participants reported that they had consulted their treatment supporters early in the treatment process before spending money on their health care.

In addition, treatment supporters were highly regarded for the important role they played in reducing patients' perceived social isolation, especially early in the treatment process.

Patients' narratives revealed that treatment supporters offered advice and counseling about the state of the illness; encouragement to persevere and to adhere to medication; advice regarding alternative care; emotional help through praying with patients or 'chatting' about the illness; financial support such as credit for school fees if needed; transportation to the clinic; nutritional advice, provision of food and/or preparation of meals; and help with household chores such as cooking and childcare, especially when the patients were weak or had clinic appointments. Further, narratives also revealed that treatment supporters were often involved in health-care decision making regarding the current TB illness, particularly by supporting the patient through their treatment process, both in tangible and intangible ways. The quotes below illustrate the importance of DOTS supporters during their treatment process.

'It is for the good of my life and it shows that the doctors who advised this system [DOTS strategy] are concerned. With this arrangement you take drugs at the right time and get encouragement by the 'minder' [treatment supporter] plus the comfort together with the transport provided. She reminds me at the right time which has helped me cure quickly.' **Month-2 interview, Home-DOTS participant**

'Yes I am satisfied with the services, looking at my condition now. I have liked everything. He [treatment supporter] treats me well because he comforts me and instructions are given in a good way. I can even get to see the doctor sometimes even when it is not the time [scheduled visit] because he helps me with means.'

Month-5 interview, Home-DOTS participant

The patients' narratives also revealed that treatment adherence was influenced by their treatment supporters' attitudes towards the disease. When asked how their DOTS supporters had been important in the care-seeking process, many participants cited the emotional support they received to stay in treatment even when they had no more symptoms and were tempted to interrupt the treatment.

'There are benefits because if I didn't have this treatment supporter I wouldn't be better by now since she takes her time to remind me. I don't delay with taking my drugs and I don't waste her time. Taking drugs without missing has been easy in the end because she (treatment supporter) encourages me and this helps as time goes on.' **Month-5 interview, Clinic-DOTS participant**

Patients' perspectives and initial reactions to TB diagnosis

Initial misconceptions about the disease influenced how participants reacted when their TB diagnosis was known. Participants reacted with fear, shock and anger because they regarded TB as a deadly disease with no cure.

'In December [2004] when I first had symptoms, it was flu then later I started coughing so after all the treatment with no improvement, I opted for better treatment here in Mulago. I got to find out from Case Western Mulago about my illness. I got so scared because I have always heard that it doesn't cure.' **Baseline interview, Clinic-DOTS participant**

Many thought TB was sexually transmitted. In this case, they were angry that their sexual partners had spread the disease to them.

'In January [2005] when I got symptoms, my doctor sent me at Mulago X-ray, then after reading the results he sent me to this center. I didn't suspect at any one time to have TB. After coming at this center is when I knew my illness. I lost appetite, when I knew my illness. I think I got this disease through sex with my boy- friend, even if the doctor said it is an airborne disease. Now I think I got TB from my sister because she has got TB. So after the doctor's lecture is when I knew I got it from

her since it is an airborne disease, and more so we share house equipments like cups. **Baseline interview, Clinic-DOTS participant**

There was fear generated in relation to the social implications of being labeled as a TB case. The association of TB with HIV/AIDS often contributed to perceived stigma among participants. Many participants reported having not disclosed their TB diagnosis to members in their social networks for fear of repercussions such as isolation and loss of much-needed social support, especially during the lengthy treatment process. Indeed, some participants reported that instead of getting support from neighbours or workmates, they perceived a sense of being shunned by them. Moreover, because of the stigma associated with TB, some participants reported that they were concerned about their spouses or immediate family members being shunned, as illustrated below:

'Some members of the family like [my] mother [and] some of my sisters treat me with pity and compassion but my big sister always runs away when I come near her; others even insult me at times. My boyfriend doesn't avoid me although he is scared of getting the disease. The doctors treat me according to their morals although some overdo it.' **Month-2 interview, Clinic-DOTS participant**

'I am a student and [the] majority of my schoolmates are not aware though; those that are aware treat me in two different ways, some with compassion, but others look at you as if you are a devil. They do not like to sit very close, even though they pretend not to mind.' **Baseline interview, Home-DOTS participant**

Further, participants perceived formal TB medical care through the hospital or clinics to be expensive, thus preventing them from entering appropriate care early in the disease spectrum.

'It is not easy to treat TB because is it not like malaria whereby you can go to a 'pharmacy' or clinic and prescribe for your own medication or be helped by any health worker. My income is so low and clinics can be expensive. Even a government hospital like this one can be costly. The tests take money; you have to eat special foods for the drugs. Now these drugs are for many months.' **Month-2 interview, Home-DOTS participant**

Changing attitudes and awareness of TB disease

During follow-up there was a noticeable change in the participants' perceptions about TB, including its treatment and the perceived social isolation associated with a TB diagnosis. By the end of treatment, fewer participants expressed negative attitudes. This was partly due to education about the disease that the patients acquired through the treatment process. Patients had frequent interactions with the health-care system under the CB-DOTS strategy through their DOTS supporters and the DOTS supervisor. The home-based DOTS approach may have helped generate greater community awareness and positive attitudes towards TB treatment. For example, one participant noted:

'They say that it [TB] is very dangerous and they say that it is associated with HIV/AIDS. People say it has spread a lot in the community but more know it can be cured. Basing on the conditions that I was in, now my household members think it is important to treat TB because of the improvement and final healing that I have got. Even now my friends believe that it is important to treat TB because I have now cured and am feeling better. TB treatment is easy provided you visit doctors early enough and follow directions of doctors. This system [modified DOTS] is ok. ... You always have someone to remind you. You always have someone to encourage you emotionally.' **Month-8 interview, Home-DOTS participant**

These attitudes may partly be attributed to education about the disease acquired through frequent interactions with the treatment supervisors (Mafigiri and McGrath 2007) but they also highlight the value of having community members directly involved in the delivery of TB care. It appears that the DOTS process generates informational and emotional support, which may contribute to the change in attitudes and, in turn, improved treatment-seeking experiences. We attribute the success of the modified DOTS process in this study, at least in part, to the wide range of support provided as a result of the patients' choice of treatment supporters from within their social network.

Discussion

These findings indicate that conventional health facility-based DOTS can be modified in this setting to offer a viable DOTS strategy sensitive to personal preference. Shifting the task of DOTS support away from reliance only on qualified health workers to include laypersons in the patients' social-support network may contribute to meeting WHO treatment targets. Previous studies have shown that community-based DOTS is both effective and cost-effective (Cavalcante *et al.* 2007, Okello *et al.* 2003, Thiam *et al.* 2007, Wandwalo *et al.* 2004, Wandwalo *et al.* 2006, Wandwalo *et al.* 2005, WHO 2003a). However, task shifting to engage non-clinical staff in direct treatment observation remains a challenge in many settings (WHO *et al.* 2008). This study shows that task shifting in which patients select treatment supporters from their social networks can lead to favorable TB treatment outcomes.

Globally, various studies have shown that having family members as DOTS supervisors instead of other DOTS supervisors leads to better treatment outcomes (Kaawa-Mafigiri 2007, Mafigiri and McGrath 2007, Nyirenda *et al.* 2003, Thiam *et al.* 2007, Wandwalo *et al.* 2006). In Senegal, patients whose family members participated as treatment supervisors were more likely to have successful treatment outcomes than others (Thiam *et al.* 2007). Previous studies have shown the effectiveness of CB-DOTS in rural settings (Aducci *et al.* 2003, Newell *et al.* 2006, Thiam *et al.* 2007, WHO 2003a, Wright *et al.* 2004); our study offers an approach to community based DOTS to achieve successful outcomes in an urban setting. In this regard, we argue that our study supports calls for task shifting for TB control and demonstrates that patients' social-network members, including family members, can be effectively mobilised as treatment supporters by TB-control programmes. Therefore, this approach offers an alternative means to implementing DOTS when it is not feasible to use qualified health workers based at the public-health units (Volmink and Garner 2006, Wandwalo *et al.* 2006, Whalen 2006).

Studies conducted elsewhere have attributed successful TB treatment outcomes partly to the flexibility of the DOTS process (Cavalcante *et al.* 2007, Thiam *et al.* 2007, Wandwalo *et al.* 2004). One study in Tanzania reported that the acceptability of community-based DOTS was high because it allowed patients to adhere to treatment without inconveniencing their daily routines (Wandwalo *et al.* 2006). We argue that successful implementation of DOTS calls for flexibility that allows patients to choose their treatment supporter because when patients are permitted to select a treatment supporter based on their own perception of what would be best for them, this may lead to wider acceptance of DOTS and more favorable treatment outcomes. In this study, the success of DOTS may be partly attributed to such flexibility, but especially as a result of the added social support provided by the self-selected treatment supporter.

Because this was not a randomized evaluation of DOTS delivery, most participants chose home-based DOTS. This limits our ability to make direct comparisons between strategies because the sample size in the clinic-based group is not large enough to observe the full

range of outcomes as seen in the home-based group. Another limitation is that the patient-tracking processes employed for the purpose of the research do not represent standard clinical practice in this resource-limited setting. It is possible that while this measure of care may have contributed to the high rate of acceptability and success of modified CB-DOTS, it may not be sustainable in the current context of national TB control efforts. However, given the need for reorganisation and decentralisation of TB control through effective task shifting, the home-based DOTS strategy may offer a viable alternative to TB patients in resource-limited areas where the conventional health facility –based strategy is not feasible.

Conclusions

Challenges continue to exist in the delivery of TB treatment in TB high-burden, urban settings like Kampala city. We provide evidence of effectively delivering DOTS in urban areas relying on patients' social networks. In this setting, modified CB-DOTS provided more flexibility in treatment supervision and the opportunity for patients' social support in order to enhance the potential for favorable treatment outcomes. Self-selection of a DOTS supporter from the patients' social networks did not diminish the quality of care that patients received. Participants perceived their treatment experiences to be positive and attributed this to the role played by self-selected treatment supporters. Both approaches are in line with the Stop TB Strategy of the WHO, aimed at empowering people with TB, and leading communities to realise high treatment-success rates (Stop T. B. Partnership, WHO 2006).

Our study provides evidence that the DOTS strategy, which remains the cornerstone of TB control, can be effective in urban settings of resource-poor countries when modified with community-based strategies. We show that the task of treatment support can be effectively tailored to utilise 'laypersons' self-selected from the patients' social network. In turn, the strategy may also be acceptable among other similar developing-country urban populations where the provision of DOTS by health workers is not feasible. We recommend evaluating this modified CB-DOTS strategy, including rigorous comparative evaluation to conventional DOTS on a larger scale in high-burden, resource-poor urban settings.

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Figure 1.
Flow of participants through the study

Table 1

Summary characteristics of participants by DOTS strategy (N=107)

	Home-based DOTS (n=89)	Clinic-based DOTS (n=18)
Male n (%)	49 (55)	10 (56)
Female n (%)	40 (45)	8 (44)
Mean age years (SD)	29.3 (8.8)	27.6 (7.1)
Age 18–35 n (%)	73 (82)	16 (89)
Currently or ever married* n (%)	57 (64)	12 (66)
Secondary school or below n (%)	84 (94)	16 (89)
Not involved in any income-generating activity n (%)	35 (39)	8 (44)

* Includes those separated/divorced, living with spouses
SD indicates standard deviation

Table 2

Treatment outcomes compared to participants' characteristics (N=107)

	Treatment Outcome		OR	95% CI
	Successful n (%)	Unsuccessful n (%)		
DOTS strategy				
Home DOTS	62 (70)	27 (30)		
Clinic DOTS	16 (89)	2 (11)	0.29	0.06–1.34
Age range				
18–35	68 (76)	21 (24)		
above 35	10 (56)	8 (44)	2.59	0.91–7.41
Gender				
Male	42 (71)	17 (29)		
Female	36 (75)	12 (25)	0.82	0.35–1.95
Marital status				
Never married	25 (66)	13 (34)		
Ever married	53 (77)	16 (23)	0.58	0.24–1.39

Table 3

Participants' experiences of the DOTS process

Experiences of DOTS process	Study visit type		
	Month-2	Month-5	Month-8
	n (%)	n (%)	n (%)
Participants who changed treatment supporter	11 (12.6)	13 (14.9)	6 (6.9)
Treatment supporter thinks it is important to treat TB	83 (96.5)	85 (97.7)	84 (96.6)
I consult treatment supporter before spending on health	43 (49.4)	34 (39.1)	29 (33.3)
Miss some needs due to cost of care seeking	22 (25.3)	18 (20.9)	15 (17.2)
Ever defaulted (> 1–2 weeks) medication	6 (6.9)	12 (13.8)	7 (8.1)