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Introducing vouchers for malaria prevention in Ghana and Tanzania: context and adoption of innovation in health systems

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There are striking similarities in health system and other contexts between Tanzania and Ghana that are relevant to the scaling up of continuous delivery of insecticide treated nets (ITNs) for malaria prevention. However, specific contextual factors of relevance to ITN delivery have led implementation down very different pathways in the two countries. Both countries have made major efforts and investments to address this intervention through integrating consumer discount vouchers into the health system. Discount vouchers require arrangements among the public, private and non-governmental sectors and constitute a complex intervention in both health systems and business systems. In Tanzania, vouchers have moved beyond the planning agenda, had policies and programmes formulated, been sustained in implementation at national scale for many years and have become as of 2012 the main and only publicly supported continuous delivery system for ITNs. In Ghana national-scale implementation of vouchers never progressed beyond consideration on the agenda and piloting towards formulation of policy; and the approach was replaced by mass distribution campaigns with less dependency on or integration with the health system. By 2011, Ghana entered a phase with no publicly supported continuous delivery system for ITNs.

To understand the different outcomes, we compared the voucher programme timelines, phases, processes and contexts in both countries in reference to the main health system building blocks (governance, human resources, financing, informatics, technologies and service delivery). Contextual factors which provided an enabling environment for the voucher scheme in Tanzania did not do so in Ghana. The voucher scheme was never seen as an appropriate national strategy, other delivery systems were not complementary and the private sector was under-developed. The extensive time devoted to engagement and consensus building among all stakeholders in Tanzania was an important and clearly enabling difference, as was public sector support of the private sector. This contributed to the alignment of partner action behind a single co-ordinated strategy at service delivery level which in turn gave confidence to the business sector and avoided the 'interference' of competing delivery systems that occurred in Ghana. Principles of systems thinking for intervention design

correctly emphasize the importance of enabling contexts and stakeholder management.

Keywords Integration, context, public–private partnership, health systems, ownership, governance, systems thinking, stakeholder management, malaria, prevention, targeted subsidies, discount vouchers, Ghana, Tanzania

KEY MESSAGES

- Contextual requirements for the success of an intervention should be considered before an intervention is picked from one context and piloted in another.
- Investment in long-term, managed stakeholder engagement throughout the design and implementation stages of new complex health interventions appears to be critical for ownership and sustained integration of the intervention in the system.
- Alignment of partners and efforts behind a single delivery strategy for an intervention results in less complexity and unpredictability in how the system will react and perform.
- The governance (stakeholder management) step of systems thinking deserves greater attention in intervention design.

Introduction

There have been extraordinary reductions in under-five mortality in many sub-Saharan countries since 2005 (WHO 2011). Much progress is attributed to improved anti-malarial drug policies for effective treatment, and to the scaled-up provision and use of insecticide treated nets (ITNs) and more recently long-lasting insecticidal nets (LLINs) for malaria prevention. ITNs are among the most cost-effective child survival interventions in malarious areas (Lengeler 2004) and save six lives for every 1000 nets in use. In 2005 only 3% of households in sub-Saharan Africa possessed at least one ITN. In the past 5 years that figure has risen to about 50% (WHO 2011). This rapid increase in coverage has been achieved through a variety of ITN delivery channels.

In comparison with other public health interventions, ITNs can be delivered through a diverse range of systems due to their being both a health intervention and a household commodity. As a result, there has been uncertainty about the most effective systems through which to deliver ITNs to both achieve and then sustain high coverage. Debates have broadly centred upon the level of subsidy and the resulting cost to the end user (Curtis *et al*. 2003; Lines *et al*. 2003), the role of the private sector and public–private partnerships (Lengeler *et al*. 2007), the socio-economic disparities in coverage resulting from different delivery strategies (Grabowsky *et al*. 2005b; Webster *et al*. 2005; Noor *et al*. 2007; Hanson *et al*. 2009) and the relative merits of periodic vertical delivery campaigns compared with continuous delivery through routine health services (Khatib *et al*. 2008; Hightower *et al*. 2010; Roll Back Malaria 2011). Campaign delivery has also included integration of ITNs into measles immunization campaigns (Grabowsky *et al*. 2005b; Grabowsky *et al*. 2007), polio immunization campaigns (Thwing *et al*. 2008) and integrated child health campaigns providing ITNs, measles vaccination, vitamin A and mebendazole (Skarbinski *et al*. 2007; Thwing *et al*. 2008; Thwing *et al*. 2011). Continuous routine delivery has mainly been through mother and child health clinics such as antenatal care (ANC) and the expanded programme on immunization (EPI).

In Africa, much of the focus of investments and implementation of ITN programmes since 2005 has been for campaign delivery with comparatively little attention for routine systems of ITN delivery. It is accepted, however, that 'one strategy will not fit all' for delivery of ITNs, that the key to success is diversity in delivery (Lengeler and de Savigny 2007) and that both campaign and routine systems are needed to achieve and then sustain high coverage (Roll Back Malaria Partnership 2005; Roll Back Malaria 2002; Roll Back Malaria 2006; Roll Back Malaria 2011). Whilst acknowledging the successes of campaign systems in the rapid scale up of coverage with ITNs, there has been a recent push for the use of a more balanced share of resources for continuous delivery systems for ITNs, to match those that have been made available for campaigns (Roll Back Malaria 2011). This has led to renewed interest in understanding the requirements for a successful and sustainable continuous delivery system (Webster *et al*. 2010a).

Two countries, Tanzania and Ghana, have approached continuous ITN delivery by implementing a voucher to target a high value subsidy to high-risk populations to enable them to access the private sector delivery and supply of approved ITNs. Despite many similarities in both the health systems, development partners, available funding and the programmatic approaches of these two countries, in Tanzania vouchers have been sustained nationwide as the primary delivery policy over a period of 7 years, while in Ghana, vouchers were never seen as a national-scale strategy and implementation in any region has now ceased. In this case study, our question was to explore why the same intervention innovation worked in one country and not another despite so many apparent health system similarities and opportunities. As the voucher intervention affects two complex systems simultaneously, the health system and the business system, we explore and document the complex

histories and contexts of the ITN voucher schemes in Tanzania and Ghana with particular emphasis on context, history, local ownership and stakeholder management in both the health and business systems. From this description of events, an attempt is made to understand the enabling and disabling elements of sustained integration of continuous delivery of ITNs by using a systems perspective to compare the two histories.

Methods

This study included a narrative review adopted in order to allow the inclusion of a broad range of information sources. The aim was to document not only the development and implementation of the ITN voucher schemes in the two countries, but also the health systems and business context within which they were situated and the perceptions of those involved. This method allows the synthesis of documented information, both peer reviewed and grey literature, with that from empirical interviews and meetings with stakeholders. This approach, which is interpretative and qualitative in nature, was more appropriate for the aim of this case study and the sources of information than, for example, the narrow focus of a systematic review (Collins and Fauser 2005). Other methods of exploration and synthesis of information such as stakeholder analysis and analysis of 'street-level' implementers, although having their own strengths, would not have allowed the exploration of such a wide range of information and provided interpretation of the holistic context of the voucher scheme. The information sources included a wide variety of documents spanning several years of delivery of ITNs through a range of strategies from Ghana and Tanzania; in-depth interviews with key stakeholders; and key informant workshops discussing timeline reconstruction in both countries.

Over 39 and 52 in-depth interviews were undertaken with stakeholders from the public and private sectors in Ghana and Tanzania, respectively. Purposive sampling was used to select a range of stakeholders in the public and private sectors for the in-depth interviews (Miles 1994). These interviewees were selected to ensure that perspectives of individuals with varied roles in the delivery of mosquito nets in the public and private sectors were addressed. Within the public sector the stakeholders included members of the National Malaria Control Programme (NMCP), members of regional and district health management teams, and health facility staff. Within the private sector interviewed stakeholders included the voucher scheme management agents, importers and distributors of mosquito nets, manufacturers, wholesalers, retailers, pharmacists and members of staff of the non-governmental organization (NGO) co-ordinators of the voucher schemes. Interviews focused mainly on the period of conceptualization, design and implementation of the voucher schemes, and the health systems and business contexts during this time. Interviews in Ghana were conducted during February, May and August 2006, and in Tanzania in June 2011.

Qualitative data were entered into NVivo 8 for management and coding. Open coding and content analysis were used for progressive categorization of themes addressing descriptions of the delivery systems' context and changes that occurred during the period of implementation of the voucher scheme according to the perception of the stakeholders interviewed.

Additional timeline history workshops were held in Ghana and Tanzania in July and December 2011, respectively, and focused on the construction of timelines of events associated with the ITN voucher schemes and with ITN programming in general. Information on the phases of development and implementation of the ITN voucher scheme in each country was collated separately by different authors, and then jointly synthesized around the building blocks of the health system. Contextual factors were analysed in relation to the building blocks of the health system, which are governance, human resources, financing, informatics, technologies and service delivery (WHO 2008), and broadly the same approach was taken within the business sector. The building blocks of the health system and the importance of addressing each of these for health systems strengthening are incorporated into the field of policy implementation in the concept of 'systems thinking'. This concept recognizes the need for stakeholders to manage the 'fit' between the intervention and the system into which it is being introduced, recognizing that each, the intervention and the system/s, are changed during this process (de Savigny and Adam 2009).

The information presented in a narrative review involves the perceptions of authors of the included documentation and interviewees and the interpretation of these by the authors of the review. There are therefore limitations to this method which requires a reflexive approach to interpretation of the findings, as presented in the discussion.

Results

The key events in the comparative histories of the two national ITN voucher programmes are provided in Table 1, which frames the major milestones and phases in the conception, design, piloting and implementation of the respective voucher programmes in Ghana and Tanzania.

We describe the stewardship, stakeholders, financing, duration and relevant contexts associated with each of the main phases of concept, piloting, design and implementation illustrated in Table 1 in each country.

Results for Tanzania

Conception phase

The idea for a voucher-targeted subsidy linked to ANC and/or EPI was raised during a participatory brainstorming in a meeting of over 40 mainly local country-based stakeholders convened and facilitated by the Tanzanian Ministry of Health in February 1996. The goal of the meeting was specifically to brainstorm on how the Ministry could take advantage of the high cost-effectiveness of ITNs for mortality reduction for children under five. The meeting was chaired by the Chief Medical Officer of the Ministry of Health who stated that the Ministry could not afford to provide free nets and challenged the stakeholders to come up with ideas. Stakeholders included the local malaria research community, the World Health Organization (WHO), United Nations Children's Fund (UNICEF), Population Services International

Table 1 Comparative key events and phases relevant to ITN voucher implementation

Year / Quarter		Tanzania	Ghana
1996	Q1	Idea to develop and link an ITN voucher to ANC & EPI	
	Q2	Concept developed	
	Q3	Pilot project proposal developed	
	Q4		
1997	Q1	Pilot project funded	
	Q2	Pilot Voucher Project begins at district scale (KINET)	
	Q3		
	Q4		
1998	Q1	Phase 1 of ITN Social Marketing (SMITN)	Phase 1 of ITN Social Marketing (GSMF)
	Q2		
	Q3	Multi-sectoral stakeholders discuss ITN tax exemptions	
	Q4		
1999	Q1	Three domestic textile mills scale-up production of ITNs	
	Q2	Pilot Voucher Project ends at district scale (KINET)	
	Q3	ITN textile materials exempted for taxes & tariffs	
	Q4	NMCP takes decsion to scale-up ITNs nation-wide	
2000	Q1	1st Meeting of stakeholders for scaling-up	
	Q2	Strategic plan commissioned and developed	
	Q3	2nd Meeting of national stakeholders	
	Q4	National ITN plan (NATNETS) approved by MoHSW ITN insecticides exempted for taxes & tariffs	
2001	Q1	TORs for National Steering Committee chaired by MOH	
	Q2	Consultative Group created	
	Q3	Proposal developed for the TNVS national voucher program	
	Q4		
2002	Q1	Proposal submitted to GFATM Round 1	ITNs exempted from Taxes & Tariffs Delivery of subsidized ITNs through health facilities in selected districts UNICEF ACSD Programme began in Upper East and Northern Regions
	Q2	SMARTNET-1 prepares private sector for TNVS	
	Q3	GFATM Rnd 1 funds National Vouchers (TNVS)	ITN Policy
	Q4	SDC funds TNVS NATNETs unit embedded in NMCP	USAID concept paper on vouchers / NetMark Project starts Integrated measles ITN campaign in Lawra District
2003	Q1	TNVS NATNETs Team Leader appointed	DfID proposes idea of vouchers
	Q2		LSHTM DfID Support to partnership
	Q3		USAID NetMark Design Paper
	Q4	TNVS NATNETs Finance & Administrator appointed	Delivery of subsidized ITNs through health facilities in selected districts
2004	Q1	Tenders let for TNVS private and NGO sector partners	Pilots in Volta (DfID USAID) Accra, Ashanti Regions (Exxon Mobil)
	Q2		Baseline studies in Volta Region and imlementation
	Q3		Baseline studies in Eastern Region
	Q4	TNVS launches 1st vouchers for pregnant women at ANC	Implementation in Eastern Region/ NID ITN campaign in Central Region
2005	Q1		
	Q2		
	Q3	SMARTNET-2 starts in support of TNVS	GFATM Rnd 4 funds vouchers in Eastern Region & Volta Region
	Q4		
2006	Q1	TNVS achieves national ANC coverage for all Regions	Eastern Region Voucher Pilot Evaluation
	Q2	PMI adds infant voucher to EPI	
	Q3		
	Q4		Ashanti and Brong Ahafo Regions Voucher Scale-up
2007	Q1		
	Q2	SMARTNET Phase 2 ends	
	Q3		
	Q4		National Mass Distribution Campaign
2008	Q1	Domestic production of LLINs scaled-up	
	Q2		Central Region starts vouchers under USAID NetMark support
	Q3		GFATM Vouchers end in Eastern & Volta Regions
	Q4		National Mass Distribution Campaign
2009	Q1		GFATM vouchers end in Ashanti & Brong Ahafo Regions
	Q2	Introduction of fixed top-up voucher	Final EXP Momentum Management Report
	Q3		NetMark project ends
	Q4	GFATM Rnd 8 for TNVS ($ 100.4 million USD)	USAID PMI takes over Central Region Modified Voucher
2010	Q1	Under-five rolling catch-up campaign 2009-2010	GFATM RCC consolidation moves funding to Universal Campaigns
	Q2		National Mass Distribution Campaign
	Q3		PMI Central Region ceases last vouchers
	Q4		No further continuous distribution system supported
2011	Q1		
	Q2	Universal rolling catch-up campaign 2010-11	
	Q3	Piloting of e-Voucher	
	Q4		National Mass Distribution Campaign

Voucher Concept
Voucher Pilot Phase
Voucher Planning with stakeholders
Voucher Launch and scale-up
Voucher sustained at national scale
National Mass Distribution Campaign

Notes: LSHTM: London School of Hygiene and Tropical Medicine, MOH: Ministry of Health, MoHSW: Ministry of Health and Social Welfare, NID: National Immunization Day, RCC: Rolling Continuation Channel, TOR: Terms of Reference, USD: United States Dollar.

(PSI), academia, donors and the NMCP. The research community (Ifakara Health Institute and the Swiss Tropical and Public Health Institute) then developed the concept of a voucher into a large-scale pilot project for two districts.

Pilot phase

The large-scale pilot testing of social-marketing with a voucher for pregnant women was first implemented in Kilombero and Ulanga Districts by the Ifakara Health Institute and the Swiss Tropical and Public Health Institute for 2 years between May 1997 and June 1999, with funding from the Swiss Agency for Development Cooperation (SDC) (Armstrong Schellenberg *et al*. 2001; Mushi *et al*. 2003; Tami *et al*. 2006; Marchant *et al*. 2010). Results showed that the vouchers substantially increased ITN coverage and were used appropriately by the population. A number of operational and strategic lessons were learned that informed the eventual design of the Tanzania National Voucher Scheme (TNVS). The pilot project contributed to local capacity development, local leadership and local ownership through six PhDs for Tanzanian scientists who provided a cadre of expertise that later contributed to the design, implementation and evaluation of the TNVS.

Design phase

The design phase for a national ITN programme was long, running from November 1999 to October 2004 and was widely participatory. In November 1999 the NMCP Manager invited all interested stakeholders to a meeting in Dar es Salaam and announced the intention to develop a nationwide strategy to deliver ITNs. Over 40 stakeholders including ITN manufacturers attended the first meeting and pledged support. The main delivery models operating at the time were private sector sales through informal retail arrangements and through a multi-district social marketing programme (SMITN) that promoted branded nets and provided subsidized insecticide in home treatment kits funded by United Kingdom's Department for International Development (DFID) and the Royal Netherlands Embassy. This social marketing delivery continued throughout the TNVS design phase.

In 2000 a major meeting of 60 stakeholders was convened by the NMCP, supported by DFID, PSI and the Tanzania Ministry of Health Essential Health Interventions Program (TEHIP). Stakeholders evenly represented the multi- and bilateral donor partners, NGOs, academia, researchers and the private sector. A consultative group was constituted representing these five constituencies, which in turn commissioned PriceWaterhouseCoopers to work with them to develop a strategic approach. This was presented back to a larger gathering of 90 stakeholders in August 2000 (Pricewaterhouse Coopers *et al*. 2000). This strategy outlined an approach to move from consumer subsidies for a single socially marketed ITN brand towards generic promotion of all local brands of ITNs, while also incentivizing the ITN manufacturers to extend distribution chains to remote rural areas. At the same time, the strategy called for the development of a national approach to a high value ANC voucher based on the Kilombero Net Project (KINET) experience to assist remote populations to access these ITNs at low cost. This concept was developed into a national strategy in November 2000 but was beyond the scope of local donors to cover its costs (Ministry of Health 2000). In January 2002, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) issued its first call for Round 1 proposals. The TNVS proposal was then quickly adapted to the requirements of the GFATM by the NMCP and its partners and submitted. It became the first project funded by the GFATM in April 2002.

The consultative group was then reconstituted as a National Steering Committee, again chaired by the Chief Medical Officer. This group still provides representation to all stakeholder groups and it meets quarterly to oversee the strategic issues of the NATNETS to this day.

Once GFATM funding was received, the Swiss Tropical and Public Health Institute with support from the SDC recruited a professional team to run an ITN Cell embedded within the NMCP. This ITN Cell managed the ITN grants on behalf of the Tanzanian Government and co-ordinated all activities and stakeholders in the country. The key components of the TNVS programme were implemented and managed by four key sub-contractors working hand-in-hand with the government health care system. In the early phases of the TNVS the ITN Cell assisted the procurement and tender boards of the Ministry of Finance and the Ministry of Health to tender major components of the programme such as the voucher logistics (Mennonite Economic Development Associates), training and behaviour change communications activities (Care, World Vision, PSI) and research evaluation (Ifakara Health Institute and London School of Hygiene and Tropical Medicine).

The TNVS was subsequently launched officially in October 2004 and by December 2005 scale up nationwide was complete. Between 2004 and 2010, ITN ownership in Tanzania almost tripled from 22.6% to 63.8% due to the cumulative and combined effects of vouchers and mass distribution (National Bureau of Statistics [Tanzania] and ORC Macro 2005; National Bureau of Statistics [Tanzania] and ORC Macro 2011).

Implementation phase

The implementation phase of the TNVS commenced in October 2004 and continues until the present (summer 2012). It represents a public–private partnership in which the private sector manufacturers undertake to distribute ITNs, and now LLINs, through their wholesale retail distribution chains, and to honour the collection and exchange of TNVS vouchers for ITNs. The NGO sector manages demand creation and behaviour change programmes as well as the distribution and redemption of vouchers and database management/accountability. The public sector handles the interface with the recipients and ensures that vouchers are provided to all qualifying clients attending ANC and EPI clinics. The research community provides evaluation. The NMCP, with its ITN Cell, and the Ministry of Health National Insecticide Treated Nets Program (NATNETS) Steering Committee provide oversight and co-ordinate stakeholders (http://www.natnets.org/). Over the years, new donors and partners have joined the GFATM and SDC, principally Irish AID, the United States Agency for International Development (USAID), US Centers for Disease Control (CDC) and the President's Malaria Initiative (PMI) (Hanson *et al*. 2008; Hanson *et al*. 2009). Continuous evaluation has lead to programme changes and increased efficiencies, and innovations

such as the piloting of electronic vouchers and mobile phone redemption mechanisms. The National Steering Committee has ensured the co-ordination with the other ITN distribution strategies, chiefly the catch-up mass distribution efforts (Koenker *et al*. 2011). See Box 1 for details of the implementation.

Relevant contexts

Specific contexts in Tanzania independent of, but relevant to, the TNVS include: (1) 6 years of prior experience with national social marketing, building trust with the private sector and developing a culture of ITN understanding and use; (2) a vibrant local private sector ITN manufacturing base (up to four domestic manufacturers), supported and promoted by government assistance; (3) a strong tradition in malaria control research and utilization of local research findings; (4) common health policies and strategies across all districts despite socio-economic disparities, avoiding prolonged piloting; (5) a donor partner group that was willing to align behind a single national ITN strategy, even if they did not always totally agree.

Results for Ghana

Conception phase

The concept of delivering ITNs through a voucher scheme in Ghana was first suggested to the Ministry of Health and Ghana Health Service's NMCP by DFID consultants and by USAID in 2003. The concept was then presented to and supported by the national ITN Partnership/Task Force. The Partnership/Task Force was initially built around partners involved in a national social marketing project implemented by the Ghana Social Marketing Foundation and then extended to include other partners with an interest in delivery of ITNs. It included the Ministry of Health, WHO, International Network for Demographic Surveillance of Populations and their Health (INDEPTH) Network, local and international NGOs and health partners [BASICS, Program for Appropriate Technology in Health (PATH), UNICEF, USAID, DFID], local funding partners and the commercial sector. Local manufacturers were not engaged.

Both DFID and USAID supported the development of the voucher scheme concept into a programme designed for implementation initially in one region with comprehensive monitoring and evaluation. The objectives of the voucher scheme were to: (1) improve access to ITNs for pregnant women; (2) develop a sustainable system for delivering targeted subsidies; (3) strengthen the private sector for ITNs through market priming; and (4) enhance health staff capacity. The ITN Partnership agreed that the voucher scheme would be part of a segmented strategy to scale up ITNs based upon the differing economic and health related context of the country's central and southern regions.

Design phase

The voucher scheme was designed by NetMark, a USAID-funded project implemented by the Academy for Educational Development, in a comparatively brief period in 2003 and a draft design document was circulated to partners (Box 2). Consensus of key partners was achieved for the overall national approach to ITN delivery with the plan that the voucher scheme piloted in Volta and Eastern Regions would be scaled up to include seven southern and central regions (Brong Ahafo, Western, Central, Ashanti, Greater Accra, Eastern and Volta) of the ten regions in Ghana. In the economically disadvantaged north, community-based action in partnership with public and civil society (based upon the UNICEF Accelerating Child Survival and Development model) would be scaled up across Northern, Upper East and Upper West Regions (Ghana Health Service 2003). Five year planning (2004 to 2008) for funding for this scale-up was approached on a region by region basis. The one year of DFID funding for Volta and Eastern Regions subsequently transitioned to GFATM funding, as did that of the UNICEF project in Northern and Upper East Regions at the beginning of 2005. The voucher scheme in Greater Accra and Ashanti Regions was supported for 6 months during 2004 by Exxon Mobil, and in Brong Ahafo and Western Regions for 6 months during 2005. All regions planned to have GFATM funding for their respective strategies, voucher scheme or UNICEF model operational by mid-2007.

Pilot phase

In April 2004 piloting began in Volta Region. This region was selected due to its ecological representativeness of the northern, central and southern belts of the country. However, there were

Box 1 The Tanzania National ITN Voucher Scheme (TNVS): how it works

The TNVS distributes vouchers to pregnant women and mothers of infants attending Reproductive and Child Health (RCH) clinics and vaccination days. Vouchers can be redeemed for reduced price nets at participating retailers. In 2004 the TNVS started providing vouchers to pregnant women; infant vouchers were added in 2009. Top-ups initially ranged from about TZS 700 to over TZS 1500 depending on the size of the selected net. In late 2006 the voucher value was increased to Tanzanian Shilling (TZS) 3250 and the infant voucher was introduced. By 2008, the average top-up had reached over TZS 2300 (slightly over US$ $2.00), exceeding the ability to pay of many mothers. In 2009 an upgraded voucher was introduced that fixed the top-up at TZS 500. The small and fixed top-up meant that acquiring a LLIN became widely affordable again for mothers. However, this also meant that an agreement had to be made by the net seller about a single type and size of net, de facto eliminating consumer choice. In addition, procurement rules governing the TNVS funding meant that a single supplier had to be selected and the others largely went out of business. At current levels, the TNVS distributes about 1.5–1.6 million LLINs per year. The network of participating retailers in 2011 was quantified at 5426 retailers. A total of 4428 out of a possible 4891 rural public health clinics participate, including some private clinics. The current model estimates that vouchers reach 90% of the beneficiaries attending clinics and that 80% of vouchers are redeemed (Njau *et al*. 2009a; Njau *et al*. 2009b; Marchant *et al*. 2010; Koenker *et al*. 2011).

Box 2 The Ghana ITN Voucher Scheme: how it worked

The concept and design were such that discount vouchers were given to pregnant women during their first presentation at an ANC clinic. The voucher entitles the recipient to a discount of approximately USD $4.20 on the purchase of an ITN available through retail outlets. The recipient or their representative takes the voucher to a participating retail outlet, stocking approved ITNs and provide the top-up cash required, together with the voucher, for an ITN. The retailer removed a 'proof-of-purchase' sticker from the ITN packaging as it was sold and attached the sticker to the voucher. The retailer exchanged the voucher for more stock from his/her distributor, and kept the top-up value of cash from the client. The distributor exchanged the voucher with its proof-of-purchase sticker attached, for cash from the management agent. Vouchers presented to the management agent without a proof-of-purchase sticker were rejected.

doubts as to its being representative in terms of the local tradition of using locally made nets in the southern area of the region. Eight months after the confirmation of Volta Region as the initial pilot region, the decision was made to expand the pilot to include Eastern Region. This was also due to the availability of funding to expand beyond one region, with Eastern Region selected due to logistical ease as it borders Volta Region.

During the pilot phase, the voucher scheme was led by the Volta and Eastern Regional Health Directorates. The NetMark project, contracted by USAID, provided all the logistics, conducted training together with regional staff, and worked to support and develop the private sector involvement in the scheme. DFID provided support in terms of seed funding for the voucher subsidy and contracted the London School of Hygiene and Tropical Medicine to provide technical advice for the monitoring and evaluation of the scheme. The regional health teams in both regions led the implementation of the monitoring and evaluation activities. A management agent, EXP Momentum, was contracted by USAID to manage the vouchers, which involved supplying vouchers to health facilities, redeeming vouchers with the distributors and monitoring of voucher supplies and redemptions. Management agent fieldworkers went to all health facilities employing at least one midwife to deliver vouchers.

All ITNs were imported by international manufacturers since there were no local manufacturers. The voucher scheme design required the wholesale retailers to stock ITNs, exchange the ITNs for the voucher plus top-up, and then replace the ITNs with more stock in exchange for the voucher. In recognition that the distributors and outlets did not have the financial capacity to lay out funds for this stock, NetMark provided stock advances to the distributors, who were then expected to pass the stock on to the retailers. A requirement of the stock advance was that the distributors would put up a quantity of the stock themselves equal to the advance that they were given. During the pilot phase, DFID provided extra seed funding which did not require matching stock by the distributors, with the aim of increasing geographic coverage of the voucher scheme. The extra funding was based upon the premise that it is only when the partners have sufficient stock that they can 'sacrifice' and take stock to areas where it will stay in the system for longer. When they do not have adequate stock, they opt for where they sell the fastest.

During pilot implementation, changes occurred to the original design of the voucher scheme. Based upon the interviews with stakeholders in both regions and at the national level, changes in the voucher scheme from its original design occurred at four points (Figure 1). The first change was precipitated by the receipt of funding for ITNs from the GFATM by the NMCP, who sought assistance from an international ITN manufacturer to import the ITNs. This international ITN manufacturer established a warehouse in Accra (the capital city) to supply their market in both Ghana and other countries of West Africa, and to reduce lead times on supply of nets into these countries.

A similar and linked change in the system of the public sector delivery of ITNs was again facilitated by increased funding and the recognition by the NMCP of the difficulties faced by the regions and districts in transporting mosquito nets from the central medical stores (CMS). A distributor was contracted to deliver mosquito nets from the CMS to the regions. The distributor who won the contract was also a distributor of ITNs for the international ITN manufacturer through the formal commercial sector, including within the voucher scheme.

During the voucher scheme, distributors established a new delivery point for ITNs, which was a structure under the management of the distributors. This took the form of one salesperson sitting under a branded 'umbrella' redeeming vouchers but also selling nets commercially, immediately outside health facilities. Vouchers plus the top-up charge were exchanged for ITNs at these sales points.

Distributors took ITNs to midwives for them to sell, including redemption of vouchers, and possibly at full commercial price. These distributors were amongst those who were distributing ITNs to the formal commercial sector for the voucher scheme.

The introduction of a 6-month voucher scheme in Greater Accra and Ashanti Regions, the commercial hubs of the country, was met by larger demand than anticipated. Insufficient supply of ITNs in the country to meet the demand resulted in the withdrawal of ITNs from the Volta Region outlets to meet the higher demand in Greater Accra and Ashanti Regions. The withdrawal of ITNs from retail sector outlets in Volta Region precipitated complaints from the health facilities involved in the voucher scheme that there were no ITNs available in the retail sector and therefore the voucher scheme could not function. Due to pressure from facilities on District Health Management Teams (DHMTs), and from DHMTs on the Regional Health Directorate (RHD), the RHD asked for the assistance of the NMCP in the form of public sector nets to send to the health facilities. The result was the supply of ITNs to health facilities that were part of the voucher scheme and a loss of trust by the public sector in the private sector's commitment to the voucher scheme.

During the pilot evaluation period there was a significant increase in the proportion of households owning a mosquito net

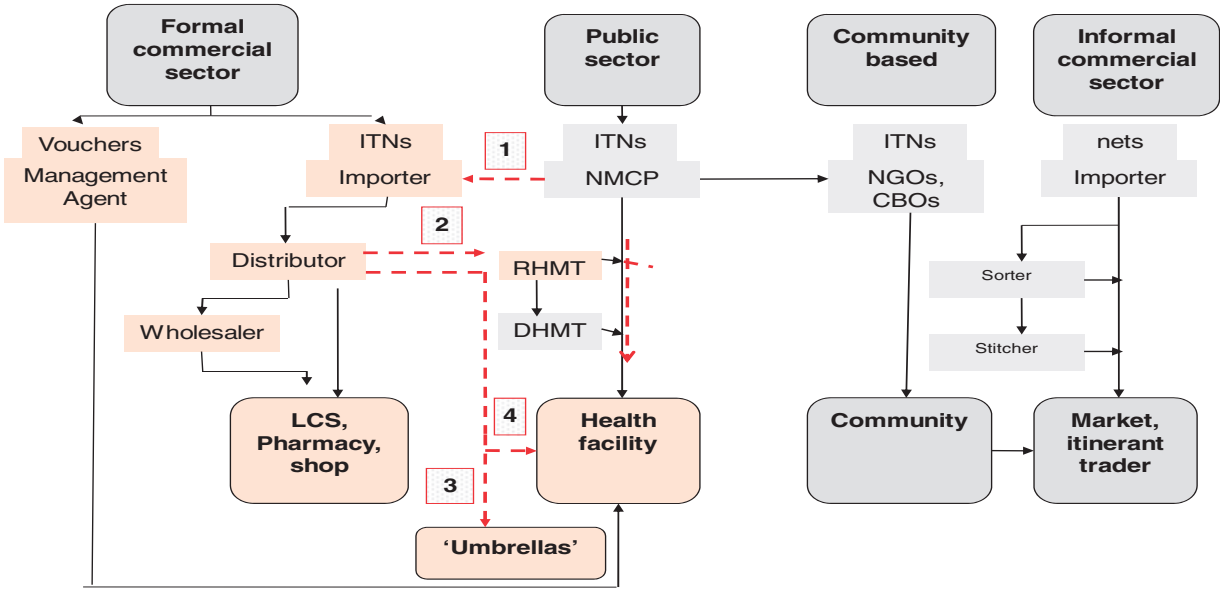

Figure 1 Diversity of mosquito net delivery systems during implementation of the ITN voucher scheme in Volta and Eastern Regions.
Notes: CBO: Community Based Organization, LCS: Licensed Chemical Seller, RHMT: Regional Health Management Team.

in Eastern Region but not in Volta Region. However, in Eastern Region the increase was not attributable to the voucher scheme but was due to increased delivery of ITNs through ANC (Webster *et al*. 2010b)

Implementation phase

Scale-up of the various voucher schemes in Ghana did not aim to achieve national scale but aimed to include the seven southern regions of the country. After the completion of the pilot in Volta and Eastern Regions, DFID funding was withdrawn as planned and continuation was funded through GFATM. The scheme was scaled up in 2006 to Ashanti and Brong-Ahafo Regions through GFATM funding. The voucher scheme in Central Region began in 2008, just before the end of the scheme in Volta and Eastern Regions. Household ownership of ITNs rose from 2.5% and 0.7% in 2003, to 33.3% and 29.2% in 2008, in Volta and Eastern Regions, respectively (Ghana Statistical Service Noguchi Memorial Institute for Medical Research ORC Macro 2004; Ghana Statistical Service Ghana Health Service and ICF Macro 2009). Given the context of multiple complex delivery strategies in play, these increases in household ownership of ITNs cannot be directly attributed to the voucher scheme.

Relevant contexts

The length of time during which the private sector have been delivering mosquito nets in Ghana is unknown. However, unlike Tanzania, there was no manufacturing of nets in country. Before the large-scale introduction of ITNs, Ghana had a thriving market, to different extents in different parts of the country, with local nets delivered through the second-hand clothing market. It is clear that there is a long tradition of use of nets (Agyepong 1992; Agyepong and Manderson 1999) but these nets differed, and were delivered through different supply systems, from ITNs. Nets are delivered through the formal retail sector where the outlets are a variety of types of shops, and through the informal retail sector where the outlets are mainly local market stalls and itinerant vendors within these markets. Immediately prior to development of the voucher scheme in Ghana there was a public–private partnership for the sustainable marketing of insecticide-treated materials which began in 1998 and finished in 2002. The objectives of the three-year Ghana Social Marketing Foundation project were the creation of increased demand for nets, increased demand for net (re)treatment, and increased availability of nets and insecticides for net treatment through making them more affordable. Social marketing was implemented across all 10 regions of the country.

Ghana's first ITN policy, formulated in February 2002, was built around a 'twin track approach' for distribution, broadly involving targeting of subsidies to vulnerable groups through the public sector, and promotion of widespread availability and distribution of ITNs through the private sector. During 2002, three forms of delivery within the public sector were operating: the ACSD 'intervention package' sponsored by UNICEF, ITNs provided by the NMCP to districts for delivery through routine health facilities, and a one-off delivery integrated with a measles campaign (Grabowsky *et al*. 2005a; Grabowsky *et al*. 2007) These systems had different delivery points, costs to the end-user, and scale of implementation. Alongside these systems some DHMTs were proactive in managing the *ad hoc* delivery of nets/ITNs through health facilities within their districts. In Upper East and Northern Regions some districts have been beneficiaries of both the ACSD and NMCP ITNs. The differing pricing policies caused some confusion. The policy on cost to the recipient for ACSD ITNs was US$0.56 for pregnant women and children under five, and US$2.22 to the rest of the population, whereas the NMCP ITNs were US$2.22 to pregnant women and children under 5 years.

During 2003, funding from the GFATM facilitated another round of ITN distribution by the NMCP to the districts, which was extended to include distributions to community-based NGOs. The 20 districts targeted for this distribution were different to the 20 targeted for the NMCP distribution in 2002. In October 2004, encouraged by the success of the integrated delivery of ITNs with measles immunization during 2002, the

NMCP embarked upon a distribution integrated with polio immunizations in Central Region. During this integrated delivery, discount coupons were given along with polio immunizations to children under five. In Ghana the use of a paper subsidy delivered in the public sector for redemption in the private sector was called a voucher, whereas those delivered in the public sector for exchange for an ITN in the public sector were called coupons. The coupons were then exchanged together with a top-up value of US$2.22 for an ITN.

Discussion

Tanzania and Ghana have much in common as a basis for scaling-up malaria prevention interventions. They have similar orders of magnitude in Gross National Product per capita [$1350 and $1530 purchasing power parity (ppp), respectively] and total health expenditures ($28 and $57 ppp, respectively) (WHO 2011). Both countries have received to date similar cumulative per capita support from the GFATM for malaria control ($7.56 and $6.44, respectively). Both countries have a policy (as opposed to service delivery) oriented Ministry of Health using separate agencies for service delivery (local government authorities in Tanzania and the Ghana Health Service in Ghana). Both Ministries have strong National Malaria Control Programmes with stable and long-term experienced NMCP Managers. Both countries have wide geographic disparities in socio-economic status. In both countries, donors aligned behind the direction on the government in designating the ITN voucher scheme as appropriate for all regions (Tanzania) or specific regions (Ghana) based upon economic indicators. Both countries have strong health research institutions with traditions in ITN research. Both countries started preparing the ground with the private sector through social marketing of ITNs as early as 1998. Both have a strong wholesale retail tradition in private sector distribution of nets. Both countries have the same bilateral and multilateral donors supporting malaria control. Both countries had consultative multi-stakeholder committees advising on ITN programming.

Nevertheless, the introduction of a new and complex health intervention requiring significant adjustments in the health system and the private sector business system followed very different trajectories. Our case review of the integration of voucher schemes and the ultimate sustainability of this integration focused on both health system contexts as well as external contexts in the two countries. We identified a number of contrasts between the two experiences. We discuss these under the following headings: (1) objectives and scale; (2) alternative delivery systems; (3) the nature and response of the private sector; and (4) health system stewardship and governance for alignment of partners.

Objectives and scale

The sense of what could and what should be achieved by the voucher scheme differed in the two countries. The voucher scheme in Tanzania had an objective of increasing coverage of ITNs in all regions and districts of the country irrespective of socio-economic disparities. In Ghana the objective was to scale up to seven of the ten regions only, due to differences in the economic context of the northern and southern regions of the country. The three northern regions were to be covered by a non-voucher strategy involving direct delivery of ITNs through the public sector and community, which did not involve the private sector. These differing objectives may have been a reflection of the differing levels of confidence in the private sector delivery channels in the two countries to reach disadvantaged populations. But they added substantial complexity to programme management. There are similar socio-economic disparities in Tanzania with the most disadvantaged being in the south. However, the final phase of the national social marketing programme (SMARTNET) that preceded the TNVS was aimed at pulling the private sector distributors into disadvantaged areas to strengthen the voucher scheme there.

Alternative delivery systems

Social marketing of ITNs was the first major delivery strategy for ITNs in both countries and began around the same time, 1997 (Tanzania) and 1998 (Ghana). In Tanzania in 2002 the social marketing project entered a second phase and changed its strategy from promotion of a public sector social market brand, to generic promotion of all private sector brands to prepare the private sector for the advent of a national voucher scheme. In Ghana, funding for social marketing simply finished at the end of the first phase and the project closed. During that same year, three different ITN delivery strategies were implemented in Ghana. These new strategies did not involve the private sector, and could in fact be seen as directly competitive. In selected districts of regions of the country, ITNs were directly delivered through health facilities, mainly through ANC, and constituted a directly competing strategy to the voucher scheme during the pilot. In Tanzania, PSI have been a major player in the delivery of ITNs for several years with adaptation in strategies based on directions from within Tanzania, whereas in Ghana the input of local and international NGOs was less constant, with the Ghana Social Marketing Foundation leading the social marketing for 3 to 4 years and NetMark taking a very different approach within the voucher scheme.

The nature and response of the private sector

Both Tanzania and Ghana have many polyester textile mills, all of which are capable of making nets for ITN purposes. However, only in Tanzania did these mills convert some of their textile production into nets. This was in response to direct appeals and the opportunity provided by the initial social marketing that directly engaged the local manufacturers and primed the market for them. Concerted stakeholder management consistently included the manufacturers in all meetings and official launches, and addressed their concerns, particularly around achieving tax and tariff exemptions. This public sector stakeholder engagement in Tanzania thus contributed to a thriving, competitive private sector for ITNs, with eventually four factories and distribution networks by 2009. Of the four ITN manufacturers, two have since ceased production (TMTL and MOTEX), one continues producing unbundled polyester nets (SUNFLAG), while one local ITN producer (A-Z Textiles), who converted early to innovative LLIN production of polyethylene nets, now dominates the domestic market since public

subsidies are now restricted to LLINs. International LLIN producers have not yet been able to penetrate this market in Tanzania. Conversely, in Ghana, existing textile mills were not engaged and did not enter production. There was only one major agricultural distributor who also distributed ITNs. However, there was a thriving informal private sector in locally sewn mosquito nets in some areas of the country. This informal market in Ghana was not a recognized industry and involved relatively small-scale informal networks of suppliers to local markets. This was very different to the formal business sector manufacturers and distributors involved in Tanzania.

The result was that in Tanzania, the voucher scheme worked with the established system of ITN supply in the country, whilst in Ghana this was ignored, with the aim of building a new system of supply within the country. In Ghana it was hoped that the voucher scheme would promote the private sector in ITNs, and in fact this was an objective of the scheme. In Tanzania the flourishing private sector meant that the voucher scheme was an appropriate strategy to adopt, rather than subsidized delivery through the public sector which would compete. The relatively poorly developed ITN private sector in Ghana contributed significantly to problems that arose during the pilot. The distributors involved in the voucher scheme and in the formal private sector had limited resources and therefore limited capacity to buy ITNs in bulk. With the long lead times for importing nets into the country, the market was not able to respond sufficiently quickly to the increased demand generated by the short-term voucher scheme in Greater Accra. As a result ITNs were withdrawn from Volta Region outlets. This in turn precipitated a loss in trust by the public sector and the distribution of ITNs to health facilities, where midwives then had the option of offering a voucher or an ITN to pregnant women. These are classic stock and flow issues that systems thinking can foreshadow and mitigate.

Stewardship and governance

Genesis of the idea for the voucher scheme was indigenous in Tanzania and arose out of a challenge laid out by the Ministry of Health to its malaria control community. Consequently the idea was locally owned. In contrast, the idea for the voucher scheme in Ghana was to a large extent imported and based upon what was happening in Tanzania, and driven more by external partners. The general feeling within Ghana that the private sector had an important role to play in the delivery of health care, as reflected through their initial support to social marketing, meant that the voucher scheme was an attractive concept.

Whilst recognizing the overwhelming contextual differences between the two countries in the nature, development and strength of the private sector, the time devoted to engagement and consensus building among stakeholders was also a critical factor. The design of the voucher scheme in Tanzania spanned years and deliberately took time to engage a maximum range and number of stakeholders representing all interests, including manufacturers. Senior Ministry of Health officials took leadership and ownership from the beginning and throughout the entire period, chairing a multi-stakeholder steering committee. They also made structural change in the NMCP putting in place and securing sustained funding for a dedicated ITN Cell to manage the TNVS. In Ghana, the design phase spanned only months and was conducted largely by one partner, NetMark, a USAID contractor. It was felt by some that the design paid insufficient attention to the context of mosquito net delivery through the informal commercial sector in Ghana. These differences indicate greater cohesion and alignment of partner action in support of a single co-ordinated strategy at service delivery level in Tanzania. In Tanzania there was a belief that the ITN voucher scheme should and could work and that, given the basis of the strong private sector in terms of factories and priming through social marketing, this was the appropriate strategy. In Ghana, the voucher scheme was one amongst several ITN delivery strategies that was being tested.

In Tanzania, donor partners aligned behind a single delivery strategy for the whole country, initially for social marketing and later for the transition to the TNVS. In Ghana, there were an increasing number of parallel delivery systems in play which were defined by regions and their partners, some of which undermined the voucher implementation. In Ghana, regions were, in essence, assigned to or adopted by different funding partners. This resulted in a far more complex and fragmented scene for both the public and the private sectors in Ghana compared with Tanzania.

The pilot phase was conducted by researchers in Tanzania prior to engaging stakeholders in designing the national system. It formed an important evidence base and motivation for the public and private sector stakeholders. In Ghana, the pilot phase occurred after the design phase and was executed by a variety of implementers. The agents of donor partners played a leading role, working mainly with the Regional Health Directors rather than the central Ghana Health Service or NMCP officials. The public sector played a relatively small role.

The implementation phase in Ghana became a series of extended pilots in various parts of the country with frequent design changes. Several of these pilots were confounded by the continuance of other delivery models that confused providers, clients and the private sector, and eroded the effectiveness of the voucher intervention. Partners were funding different interventions in different regions of the country rather than working toward a common set of strategies for all regions. Although these institutional partners were the same as those in Tanzania, they acted sub-nationally in Ghana, while in Tanzania they were aligned to support a common national approach to all regions.

In Tanzania, social marketing was a single strategy which allowed, over time, the development of strengthened trust and understanding between the public sector and the private manufacturers, and it primed the market. This led to an easy transition for the manufacturers, wholesalers and retailers to respond quickly to the voucher implementation. In Ghana we could find no evidence that the social marketing period had built this sort of relationship. The private sector reacted in a much more fragmented and unpredictable way. Again the strong stewardship and governance of the TNVS as a single strategy led to a relatively simple business model for the private sector in Tanzania. In Ghana the pluralistic approach of multiple simultaneous delivery models was mirrored in an equally complex business system in the private sector retailing of ITNs. The result was unmanageable complexity.

All information included in this review involves a level of subjectivity of those involved, from the documentation available for the ITN voucher schemes in Tanzania and Ghana through to the in-depth interviews and stakeholder reconstruction of timelines of events. All should therefore be considered as based upon the perceptions of those involved. Bias in interpretation cannot be excluded. All authors have some involvement in the voucher schemes in one of the countries; none were involved in both countries. Each therefore sees the events through their own experiential lens and this could have influenced their interpretation of the data. However, because of the varying roles of the authors from national programme managers to implementers and evaluators across the two countries, the events and interpretations presented here are representative of a wide group of stakeholders.

Conclusions

From a systems thinking view point this case illustrates an example where internal system structures and stakeholders (e.g. the ITN Cell) drove system change in Tanzania in ways that determined the eventual behaviour of the system. In Ghana, external ideas, events and actors were more prominent in driving events, and subsequent system change and adoption of the innovation did not occur. Despite many similar contextual factors which provided an enabling environment for the voucher scheme in Tanzania, these did not do so in Ghana. The fragmentary approach taken by stakeholders added complexity and led to multiple concurrent delivery systems that were difficult to manage, and indeed ran into conflict with each other. The private sector context for manufacturing was under developed, not promoted, and remained under developed and unavailable to the system. Hence the voucher scheme was never seen as an appropriate national strategy. From a systems thinking perspective on the design of interventions, this case study also illustrates the critical importance of starting with and sustaining broad and long-term stakeholder management and alignment with visible national ownership and stewardship. This proved valuable for managing and reducing complexity of the system in Tanzania, and for strategically implementing and adjusting complex health interventions that provoke and require health system changes over time on a system-wide basis.

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Conflict of interest

Some authors were also policy implementers during the period described in this historical case study. This provides an insider view and may compromise objectivity but care was taken to focus on factually verifiable events.

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