# Promoting Universal Health Coverage in Tanzania: Towards Improved Health Service Quality and Financial Protection

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# **Table of contents**

Table	of cor	ntents	iv
List of	figure	es	vii
List of	tables	S	ix
List of	abbre	eviations	xi
Ackno	wledg	ement	xiii
Summ	nary		xv
1. lr	ntrodu	ction	1
1.1	The	e concept of Universal Health Coverage	1
1.2	Ba	sics of health system research	3
1.3	Ov	erview of the Tanzanian health system	5
1.4	Un	iversal Health Coverage in Tanzania	9
1	.4.1	Health service coverage	9
1	.4.2	Financial protection coverage	17
1	.4.3	Equity in coverage	19
1.5	The	e Initiative to Strengthen Affordability and Quality of Healthcare	22
1	.5.1	Assessing and improving quality of primary healthcare	23
1	.5.2	Strengthening and expanding coverage of Community Health Funds	24
2. A	im an	d objectives	25
2.1	Ain	n	25
2.2	Ob	jectives	25
3. N	1ethoc	ds and study setting	26
3.1	Me	thods	26
3.2	Stu	udy setting	28
3.3	Eth	nical considerations	29
4. E	mbed	ding systematic quality assessments in supportive supervision at primary	
health	care l	evel: application of an electronic Tool to Improve Quality of Healthcare in	
Tanza	ınia		30
4.1	Ab	stract	31
4.2	Inti	oduction	32
4.3	Me	thods	36
4.4	Re	sults	49
4.5	Dis	cussion	55
4.6	Co	nclusion	58
47	Ac	knowledament	59

	4.8	Declarations	60
5.	Tov	vards improved health service quality in Tanzania: Appropriateness of an electro	onic
toc	ol to as	ssess quality of primary healthcare	61
	5.1	Abstract	62
	5.2	Introduction	63
	5.3	Methods	66
	5.4	Results	72
	5.5	Discussion	80
	5.6	Conclusions	85
	5.7	Acknowledgement	86
6.	Tov	vards improved health service quality in Tanzania: Contribution of a supportive	
su	pervis	ion approach to increased quality of primary healthcare	87
	6.1	Abstract	88
	6.2	Introduction	89
	6.3	Methods	92
	6.4	Results	99
	6.5	Discussion	107
	6.6	Conclusion	111
	6.7	Acknowledgement	112
7.	Tov	vards improved health service quality in Tanzania: An approach to increase cos	t-
eff	ective	ness of routine supportive supervision	113
	7.1	Abstract	114
	7.2	Introduction	115
	7.3	Methods	119
	7.4	Results	125
	7.5	Discussion	140
	7.6	Conclusion	145
	7.7	Acknowledgement	146
	7.8	Supplementary data	147
8.	Adr	ninistrating the Tanzanian Community Health Fund within a complex system	150
	8.1	Abstract	151
	8.2	Introduction	152
	8.3	Methods	156
	8.4	Results	161
	8.5	Discussion	172
	8.6	Conclusion	178
	8.7	Acknowledgment	179

#### Table of contents

8.	8	Supplementary data	180
9.	Disc	cussion	188
9.	1	Contribution to Universal Health Coverage	190
9.	2	Methodological considerations	192
9.	3	Implications and recommendations for research	195
9.	4	Implications and recommendations for policy and practice	198
10.	Co	onclusion	203
11.	Re	eferences	204
12.	Αp	ppendices	227
12	2.1	Appendix 1: Paper-based version of e-TIQH assessment tool (2014 final	version)
			228
12	2.2	Appendix 2: Example of poor data quality in CHF administration	264
12	2.3	Appendix 3: Detailed list of potential areas for further research	266
13.	Cı	ırriculum Vitae	268

# **List of figures**

Figure 1 The three dimensions of Universal Health Coverage according to WHO	1
Figure 2 Staircase effect between intervention efficacy and effectiveness	4
Figure 3 Key stakeholders within the Tanzanian health system	6
Figure 4 Trend of key health service coverage indicators in Tanzania Mainland	11
Figure 5 Healthcare quality assessment and improvement approaches in Tanzania Mai	inland
	15
Figure 6 Interventions of the ACCESS and ISAQH projects on supply and demand side	€22
Figure 7 The three-stage process of the e-TIQH supportive supervision approach	23
Figure 8 World map with the United Republic of Tanzania and map of the United Repul	blic of
Tanzania with councils where ISAQH interventions were implemented (status	S
2008)	28
Figure 9 "Front end" of e-TIQH – start pages	42
Figure 10 "Front end" of e-TIQH. Only one question displayed on the screen at a time	43
Figure 11 "Front end" of e-TIQH. The score is displayed immediately after assessment	43
Figure 12 Scores per quality dimension, Iringa council (2012)	44
Figure 13 Disease-specific score, Kilosa council (2012)	45
Figure 14 Design options of healthcare quality assessment tools	64
Figure 15 Map of Tanzania with councils where the e-TIQH supportive supervision app	roach
was implemented (status 2008)	66
Figure 16 Number of indicators assessed in each quality dimension (QD) by indicator to	ype for
the 183 indicators used	67
Figure 17 Number of health facilities assessed in each year across selected councils, b	ру
health facility owner and level category (bars); number of indicators assessed	d
across years and councils (horizontal lines at bottom)	68
Figure 18 Performance of health facility levels (A) and owners (B) for the year 2014	73
Figure 19 Average difference in health facility score and rank as a function of the total	
number of indicators (the score with the largest number of indicators serving	as
reference)	77
Figure 20 Map of Tanzania with councils where the e-TIQH supportive supervision app	roach
was implemented (status 2008).	92
Figure 21 Number of health facilities assessed in each year (bars) across selected cou	ncils
(horizontal lines at bottom)	93
Figure 22 Number of indicators per quality dimension (1-6; inner circle) and thematic	
category (1.1-6.1; outer circle) by responsible health system level	94

Figure 23	Time trends for performance by quality dimensions (A) and by thematic categories
	of quality dimension 1 (B)102
Figure 24	Key features of the e-TIQH supportive supervision approach118
Figure 25	Map of Tanzania with councils where the e-TIQH supportive supervision approach
	was implemented (status 2008)119
Figure 26	Activities conducted during routine CHMT and e-TIQH supportive supervision125
Figure 27	Comparison of routine CHMT and e-TIQH supportive supervision126
Figure 28	Possible supportive supervision schedule showing assessment days required by
	the supportive supervision approach in an average rural (A) and urban (B) council
	135
Figure 29	Key stakeholders of cost sharing and insurance fund implementation at council
	level
Figure 30	Spending pattern of CHF revenues in council A for the FY 2013/14166
Figure 31	Estimated annual amount of hours spent on CHF administration within a council by
	type of personnel and activity169
Figure 32	Contribution of different financing sources to the opportunity and financial cost
	incurred for CHF administration by council170
Figure 33	Summary of research conducted in health service quality and financial protection
	along the value chain form innovation to validation and application189
Figure 34	CHF data consistency between health facility and council level for council A
	(FY2013/14)265

# **List of tables**

Table 1 The six building blocks of a health system according to WHO	3
Table 2 Main challenges of the Tanzanian health system by health system building blocks	s 8
Table 3 Ranking of prevalence of health problems as well as causes of death and disabili	ties
in Tanzania for 2015	10
Table 4 Main issues around quality of care in Tanzania by administration level	12
Table 5 Main health financing sources of the national health budget	17
Table 6 Overview of quantitative and qualitative methods used, by chapter	27
Table 7 The six quality dimensions and respective assessment tools	38
Table 8 Example of the sub-tool structure: Sub-tool 3: Knowledge, skills and ethics of	
healthcare providers	40
Table 9 Verification criteria and maximum number of points per quality dimension/sub-too	ol.41
Table 10 e-TIQH coverage in eight councils of Tanzania, based on the 2013 assessment	50
Table 11 Assessment results by quality dimension (tool) and year, by council (score %)	51
Table 12 Differences in average overall and quality dimension (QD) scores, expressed as	}
percentages of maximum achievable scores, according to year, health facility lev	⁄el
and owner category, while the variable council was set as a random effect	72
Table 13 Comparison of qualitative and quantitative rank of six public dispensaries	76
Table 14 Comparison of indicator allocation between factor analysis and e-TIQH quality	
dimensions (QDs)	79
Table 15 Description of councils selected for the qualitative study	96
Table 16 Number of in-depth interviews done in the three study councils (Mvomero DC/ R	≀ufiji
DC/ Iringa MC)	97
Table 17 Differences in average quality dimension (QD) and thematic category scores,	
expressed as percentages of maximum achievable scores, according to year, when the score is a second of the score is a se	nile
the variable council was set as a random effect	.100
Table 18 Description of councils selected for the study	.120
Table 19 Number of in-depth interviews done in the three study councils (Mvomero DC/ R	≀ufiji
DC/ Iringa MC)	.121
Table 20 Relevant characteristics of an average rural and urban council in Tanzania	.123
Table 21 Cost of introducing e-TIQH supportive supervision in a new council in 2016 USE	) by
type of council, resource and activity	.133
Table 22 Estimated hours required by the assessment team for one round of routine CHN	/IΤ
and e-TIQH supportive supervision, by type of council and activity	.134

Table 23 Cost for one round of CHMT (A) and e-TIQH supportive supervision (B&C) in 20	116
USD by type of council, resource and activity	.137
Table 24 Annual dissemination meeting cost in 2016 USD by type of council, resource and	d
activity	.139
Table 25 Description of study councils (status 2014)	.157
Table 26 CHF related data collected at public health facilities for the year 2014 by level of	:
care and for the total council	.162
Table 27 Contribution of various funding sources to overall health financing stratified by	
resources approved, brought forward, received and spent for each council in the	
FY2013/14	.164
Table 28 Average annual health facility level, council level and council overall cost in 2014	4
USD by input, council, type of resource and activity	.167
Table 29 Summary table including cost revenue ratios and cost per CHF member househ	old
for the year 2014	.171

## List of abbreviations

AIC Akaike Information Criterion

BRN Big Results Now

CC City Council

CCHP Comprehensive Council Health Plan

CFAPC Council Finance, Administration and Planning Committee

CHF Community Health Fund

CHMT Council Health Management Team

CHSB Council Health Services Board

CMO Council Medical Officer

CSIF Cost Sharing and Insurance Fund
CSSC Council Social Services Committee

DC District Council

DMO District Medical Officer

e-TIQH electronic Tool to Improve Quality of Healthcare

FY Financial Year

HFGC Health Facility Governing Committee

HFS Health Financing Strategy

HFMT Health Facility Management Team

HMIS Health Management Information System

HRH Human Resources for Health HSSP Health Sector Strategic Plan

IEC Information, Education and Communication
IMCI Integrated Management of Childhood Illnesses

IPC Infection Prevention and Control

ISAQH Initiative to Strengthen Affordability and Quality of Healthcare

LGBG Local Government Block Grant

LMIC Low- and Middle-Income Countries

MMAM Mapango wa maendeleo wa afya ya msingi (Swahili for Primary Health

Service Development Programme)

MC Municipal Council

MDG Millennium Development Goal

MMO Municipal Medical Officer

MoHCDGEC Ministry of Health, Community Development, Gender, Elderly and Children

MSD Medical Store Department

NA Not Applicable

NCD Non-Communicable Disease

NHIF National Health Insurance Fund

NIMR National Institute for Medical Research

NSSF/SHIB National Social Security Fund/Social Health Insurance Benefit

OOP Out-Of-Pocket

ORS Oral Rehydration Salt

ORT Oral Rehydration Therapy

P4P Pay-for-Performance

PO-RALG President's Office for Regional Administration and Local Government

PPP Private Public Partnership

QD Quality Dimension

RAS Regional Administrative Secretary

RBF Result Based Financing
RCT Randomized Control Trial

RHMT Regional Health Management Team

SARA Service Availability and Readiness Assessment

SAM Service Availability Mapping
SDG Sustainable Development Goal

SPA Service Provision Assessment

TC Town Council

TFDA Tanzanian Food and Drug Authority

TFPIR Technical and Financial Performance Implementation Report

THE Total Health Expenditures

TIKA Tiba Kwa Kadi

TSh Tanzanian Shilling

UHC Universal Health Coverage

VC Village Council

WDC Ward Development Committee

WHO World Health Organization

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"Choose a job you love and you will never have to work a day in your life" – Confucius

## **Summary**

Following the publication of the World Health Report 2010 and the formulation of the health-related Sustainable Development Goal 3, Universal Health Coverage (UHC) has gained high priority in many countries. UHC implies that everyone has access to needed health services of sufficient quality to be effective without incurring financial hardship. This emphasises that there is no benefit to UHC if poor quality of care leads to unsatisfactory outcomes and unwillingness of people to use services. This thesis intended to improve the understanding of how to promote UHC in Tanzania. The findings aimed to provide actionable evidence and recommendations to help move towards improved health service quality and financial protection in an equitable manner.

In the area of health service quality, we evaluated an approach to strengthen routine supportive supervision of healthcare providers through their Council Health Management Teams (CHMTs). Part of the approach was a systematic assessment of quality of primary care using an electronic tool called the "electronic Tool to Improve Quality of Healthcare (e-TIQH)". In the first part of this research we described the methodology of the e-TIQH supportive supervision approach. Secondly, we assessed the appropriateness of the e-TIQH assessment tool to measure quality of primary care. Afterwards, we then investigated the contribution of the e-TIQH supportive supervision approach to increased quality of primary healthcare. Lastly, a comparison was made between the e-TIQH supportive supervision approach and routine CHMT supportive supervision. In the area of financial protection, we investigated reasons for differences in Community Health Fund (CHF) coverage, a voluntary health insurance scheme for the informal sector. To do this we undertook an in-depth analysis of the CHF administration and its interaction with other health financing mechanisms and policies.

Given the fact that this research was analysing the routine implementation of health interventions and no comparison areas or groups existed, a mixed methods approach was considered the most suitable study method to investigate most topics presented. Thus, a wide range of different quantitative and qualitative methods were used and triangulated.

The results demonstrated the accuracy of the e-TIQH assessment tool to measure and monitor quality of primary healthcare for its intended purpose. Thus, the e-TIQH quality assessment tool offers a unique opportunity to establish routine monitoring of healthcare quality countrywide. Findings also revealed that the e-TIQH supportive supervision approach managed to improve and maintain crucial primary healthcare quality standards. Therewith

the approach showed to be a powerful tool to support, guide and drive quality improvement measures within a council. Compared to routine CHMT supportive supervision, the e-TIQH approach made supportive supervision more effective and efficient, and thus also more sustainable. Consequently, it increased feasibility of supportive supervision and hence the likelihood of its implementation. If used as the standard supportive supervision approach by CHMTs, the e-TIQH approach could contribute to increased and more equitable health service coverage in a cost-effective way. Importantly, the findings also provided informed guidance to overcome several problems of healthcare quality assessments and supportive supervision in low- and middle-income countries. Thus, the Tanzanian experience may prove useful to enhance quality of care in such settings.

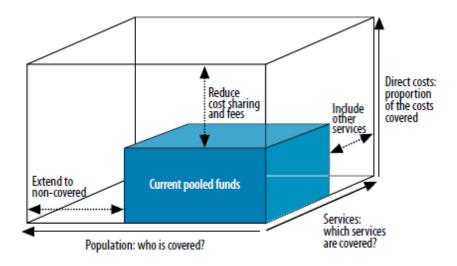
In terms of financial protection, our findings showed that bottlenecks in CHF administration processes led to serious implementation problems, which were likely to have affected CHF enrolment. Exemption policies and healthcare seeking behaviour influenced negatively the maximum potential enrolment rate of such a voluntary scheme. Furthermore, user fee policies and fund pooling mechanisms might have set incentives for care providers to prioritize user fees over CHF revenues, or vice versa. These results therefore raised questions whether efforts to fix bottlenecks of CHF administration processes were feasible, scalable and value-for-money, given the context in which the CHF is currently being implemented. Thus, the evidence provided in the frame of this study called for a realistic reconsideration of approaches taken to address the challenges in the Tanzanian health financing system.

In addition, the research of this thesis provided valuable insights for conducting implementation research. Mixed methods proved to be a feasible and effective design for analysing interventions that were routinely implemented in complex real world settings, with no comparison areas or groups. Yet, proper conduct of mixed methods is essential. Additionally, the work re-emphasised the importance of data quality in research, especially in an era of data abundancy. It also demonstrated the need to look beyond a single component of the healthcare system and to acknowledge that complexity is a necessary part of good health system research. Finally, system processes turned out to be an essential component when trying to improve health interventions, and thus ought to get increased attention in the future.

## 1.Introduction

## 1.1 The concept of Universal Health Coverage

Since the year 2000 the fastest reduction in poverty has been seen in human history driven by a combination of economic growth, better policies, and the global commitment to the Millennium Development Goals (MDGs) (United Nations, 2013). However, despite these huge successes, the final MDG report of 2015 acknowledged that the work is incomplete (United Nations, 2015). Consequently, a summit of Heads of State adopted the Sustainable Development Goals (SDGs) in September 2015 (Sustainable Development Solution Network, 2015). Central to the SDGs is the eradication of extreme poverty for all people by 2030 (Open Working Group, 2014). Among other things, this goal can only be achieved if [1] people no longer face the risk of being impoverished due to payments for health services and [2] their education and work opportunities are not constrained by illness (World Health Organization and The World Bank, 2013). Thus, Universal Health Coverage (UHC), a widelyaccepted concept of the World Health Organization (WHO), became a prominent target of the health-related Sustainable Development Goal 3 (World Health Organization, 2010, Sustainable Development Solution Network, 2015). UHC is defined as the desired outcome of health system performance whereby all people are provided with access to needed health services of sufficient quality to be effective while at the same time the use of these services does not expose the user to financial hardship (Figure 1) (World Health Organization, 2010).



**Figure 1** The three dimensions of Universal Health Coverage according to WHO (World Health Organization, 2010).

UHC consists of three inter-related components: [1] the full spectrum of good-quality essential healthcare services according to needs, [2] the protection from financial hardship due to out-of-pocket payments for health services, and [3] coverage for the entire population (World Health Organization and World Bank Group, 2014). This is to be measured based on [1] health service coverage, [2] financial protection coverage, and [3] equity in coverage (World Health Organization and World Bank Group, 2014). To assess financial protection the out-of-pocket (OOP) payments made for health services at the time of utilization has been used as a standard measure (World Health Organization and The World Bank, 2015a). To measure health service coverage the concept of effective coverage was mentioned (World Health Organization and World Bank Group, 2014). Effective coverage is given when people who need health services obtain them in a timely manner and at a level of quality that allows achieving the desired effects (World Health Organization and The World Bank, 2015a). It consists of three components: health service needs, use and quality (Ng et al., 2014). Effective coverage stands in contrast to the usual approach of measuring crude coverage, which only focuses on health service access or use conditional on need (Ng et al., 2014). Consequently, measuring and improving quality of care is clearly key to UHC (World Health Organization and The World Bank, 2015a).

For quality measurement, Donabedian proposed to distinguish between structure, process and outcome assessments (Donabedian, 2005). Outcome assessments measure the medical outcomes of care, but their usefulness is limited due to the attribution gap between quality of care and outcomes (Donabedian, 2005, Edward et al., 2009). Process assessments examine the process of care delivery itself and might be more relevant for whether healthcare is properly practiced (Gilson et al., 1995, Donabedian, 2005). Lastly, structure assessments refer to the setting in which healthcare takes place, but the direct link between increased structural quality and better health outcomes is weak (Donabedian, 1988, Lindelöw and Wagstaff, 2003, Donabedian, 2005). However, no agreed means for monitoring quality exist and data on quality of healthcare in low- and middle-income countries (LMICs) is hardly available (Boerma et al., 2014, Horton, 2014, Akachi et al., 2016, Reddock, 2017, Akachi and Kruk, 2017). Given the difficulty to measure quality of care, the UHC monitoring framework pointed out that assessing effective coverage, especially quality, is one of the three main challenges for tracking UHC (World Health Organization and The World Bank, 2015a). The other two challenges found were [2] sourcing reliable data and [3] disaggregating data to monitor equity (World Health Organization and The World Bank, 2015a). Chapter 4-7 of this thesis will primarily look into the issue of measuring and improving quality of care in the context of Tanzania. The challenge of sourcing data cuts across all chapters, but becomes in particular evident in chapter 8 for data on financial protection in Tanzania.

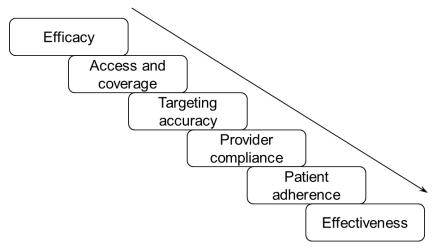
## 1.2 Basics of health system research

The WHO defines a health system as "all organizations, people and action whose primary intent is to promote, restore or maintain health" (World Health Organization, 2007). Based on health system functions the WHO also distinguishes between six "building blocks" that together constitute the system (Table 1) (World Health Organization, 2007). However, only with their multiple relationships and interactions amongst each other these building blocks make up a complete system (de Savigny and Adam, 2009).

**Table 1** The six building blocks of a health system according to WHO (World Health Organization, 2007).

Health system building block	Description
Service delivery	Service delivery of effective, safe, quality personal and non-personal health interventions to those who need them, when and where needed, with a minimum waste of resources.
Health workforce	Health workforce who works in ways that are responsive, fair and efficient to achieve the best health outcomes possible, given available resources and circumstances.
Information and research	Health information system that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health systems performance and health status.
Medical products and technology	Equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use.
Healthcare financing	Health financing system which raises adequate funds for health, in ways that ensure people can use needed services, and are protected from financial catastrophe or impoverishment associated with having to pay for them.
Leadership and governance	Ensures strategic policy frameworks exist and are combined with effective oversight, coalition-building, the provision of appropriate regulations and incentives, attention to system-design, and accountability.

The overall goal of health systems is to "improve health and health equity, in ways that are responsive, financially fair, and make the best, or most efficient, use of available resources" (World Health Organization, 2007). This also implies that the route from inputs to health outcomes requires special attention. In this regard, it is crucial to be aware of the difference between health intervention efficacy and effectiveness. Efficacy measures how well an intervention can work under ideal circumstance in controlled studies. Effectiveness assesses how well an intervention works in real world settings (Tugwell et al., 2006). There is often a substantial difference between efficacy and effectiveness due to a so called "staircase effect" known to exist between ideal circumstances and real world settings (Figure 2) (Tugwell et al., 2006). This drop from efficacy to effectiveness is a result of various system factors: [1] access and coverage, [2] targeting accuracy, [3] provider compliance, and [4] patient adherence (Vlassoff and Tanner, 1992, Tugwell et al., 2006).



**Figure 2** Staircase effect between intervention efficacy and effectiveness adopted from (Vlassoff and Tanner, 1992).

The staircase effect also makes clear that health systems are complex and adaptive (Holden, 2005, de Savigny and Adam, 2009, Paina and Peters, 2012). Yet, their understanding is crucial in order to improve them (de Savigny and Adam, 2009).

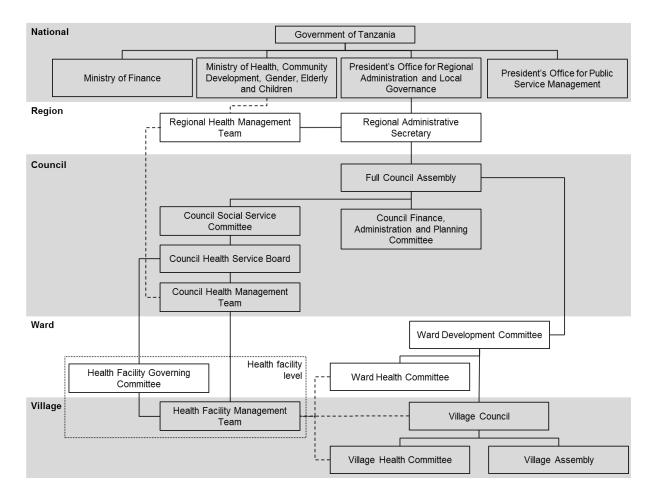
The basics of health system research will be important to keep in mind throughout this thesis to better understand the context in which this research was conducted.

## 1.3 Overview of the Tanzanian health system

The United Republic of Tanzania, which is the union of Tanganyika (Tanzania Mainland) and the archipelago of Zanzibar, is administratively divided into regions and further split into councils. Generally, councils are either classified as rural if they are District Councils (DCs) or urban if they are Municipal Councils (MCs), Town Councils (TCs) or City Councils (CCs). Councils are the most important administrative unit for public services, as most government function are decentralised to this level (Ministry of Health and Social Welfare, 2013b). A council has numerous wards and wards consist of several villages in rural councils or streets in urban councils (National Bureau of Statistics, 2013a).

In Tanzania healthcare is offered through community-based health activities (promotion and prevention) as well as at public and private dispensaries, health centres and hospitals (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2013b). Dispensaries only provide out-patient primary care, whereas health centre might also offer inpatient care. Council hospitals have basic surgical services, while regional and central hospitals provide specialist and advanced medical care. Referrals are made from dispensaries to health centres, to council hospitals and from there to regional or central hospitals. The government aims to have at least one dispensary per village, one health centre per ward and one hospital per council (Ministry of Health and Social Welfare, 2007a). However, this has not yet been achieved and the health facility increase is just primarily keeping up with population growth (Ministry of Health and Social Welfare, 2013d, Ministry of Health and Social Welfare, 2013b).

The President's Office for Regional Administration and Local Governance oversees management and administration of public services (including health services) at regional and council level through the Regional Administrative Secretary (RAS) and the Full Council Assembly (Figure 3) (Ministry of Health and Social Welfare, 2013b). The Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) is responsible to provide technical guidance, define and control quality standards, and mobilise resources (Ministry of Health and Social Welfare, 2013b). The Ministry of Finance sets the health sector budget and has an important say over income generating activities, including insurance schemes (Ministry of Health and Social Welfare, 2013b). Lastly, the President's Office for Public Service Management manages human resources in public services and therewith plays a central role in the availability of human resources for health (Ministry of Health and Social Welfare, 2013b).



**Figure 3** Key stakeholders within the Tanzanian health system. Solid lines indicate administrative interactions, dashed lines indicate technical advisory interactions, and stakeholders within the dotted box belong to the health facility level. The health facility level is overlapping with the ward and village level as health centres are administered at ward level, but dispensaries at village level. The Council Social Service Committee is sometimes also referred to as the Council Education, Health and Water Committee.

Within a region, Regional Health Management Teams (RHMTs) report to the RAS and provide technical support and supervision to regional referral hospital and Council Health Management Teams (CHMTs) (Ministry of Health and Social Welfare, 2013b)

At council level, CHMT core and co-opted members are in charge of managing health services provided at all hospitals, health centres and dispensaries within their council (Ministry of Health and Social Welfare, 2013b). They are also responsible for developing the annual Comprehensive Council Health Plan (CCHP), including operational plans and budgets, and in-charge of preparing the quarterly and annual combined Technical and Financial Performance Implementation Reports (TFPIRs) (Kessy et al., 2008, Kessy, 2014). The Council Health Service Board (CHSB), which consists of community and private health

sector representatives, is the governance body overseeing the CHMT (Kessy et al., 2008, Kessy, 2014). The CHSB has among other things the responsibility to ensure delivery of appropriate and affordable healthcare services, as well as mobilize and allocate resources (Kessy et al., 2008). The board is also supposed to review the CCHP and the quarterly and annual TFPIRs and subsequently submit them to the Council Social Service Committee (CSSC) and the Council Finance, Administration and Planning Committee (CFAPC) (Kessy et al., 2008). Upon their revisions the CSSC and the CFAPC are then meant to pass the CCHP and the quarterly and annual TFPIRs on to the full council assembly for final approval (Kessy et al., 2008).

At ward level, the Ward Health Committee, which reports to the Ward Development Committee, oversees the planning and coordination of community health plans as well as the collection and use of funds (Ministry of Health and Social Welfare, 2011a). Within a village the Village Health or Social Service Committee, which is overseen by the Village Council (VC), sensitises and mobilizes the community to participate in health related activities (Ministry of Health and Social Welfare, 2011a). The VC is elected by the Village Assembly, which consists of all people living in a particular village (United Republic of Tanzania, 1982).

At health facility level the Health Facility Governing Committees (HFGCs), consisting of community representatives, ought to oversee the facility operations, mobilize financial resources to run the health facility and liaise with the CHSB (Kessy et al., 2008, Kessy, 2014). The Health Facility Management Team (HFMT), headed by the health facility incharge, is responsible for the day-to-day management of the health facility (Ministry of Health and Social Welfare, 2011a). There is also a cascade system through which the health centres are supposed to carry out supportive supervision of dispensaries within their catchment area (Ministry of Health and Social Welfare, 2010).

The main challenges of the Tanzania health systems are summarized in Table 2. The Health Sector Strategic Plans (HSSPs) III (2009-2015) and IV (2015-2020), which are the crosscutting strategic plans for the health sector in Tanzania, formulated several objectives and strategies to address these problems (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2015b).

**Table 2** Main challenges of the Tanzanian health system by health system building blocks (Ministry of Health and Social Welfare, 2009a, Musau et al., 2011, Hickmann et al., 2014, Ministry of Health and Social Welfare, 2015b).

Health system building block	Main challenges
Service delivery	<ul><li>Lack of equity</li><li>Low quality</li><li>Non-functional referral system</li></ul>
Health workforce	<ul> <li>Too few qualified staff</li> <li>Low health worker's performance</li> <li>Unclear/multiple roles and responsibilities</li> <li>Retention and performance incentives</li> </ul>
Information and research	<ul> <li>Quality and usage of routine data</li> <li>Linkage and harmonization of data</li> <li>Human resource capacity for information system management</li> <li>Incomplete disease surveillance</li> <li>No feedback of research findings to policymaking level</li> </ul>
Medical products and technology	<ul><li>Weak supply chains</li><li>Rational use of medicines</li><li>Product quality</li></ul>
Healthcare financing	<ul> <li>Fragmentation of the health financing system</li> <li>Funding gap</li> <li>Access to financial protection</li> <li>Off-budget funding</li> </ul>
Leadership and governance	<ul> <li>Existence of national vertical programs and projects with weak coordination</li> <li>High donor fragmentation</li> <li>Inefficient allocation of limited resources (financial, human, commodities)</li> <li>Lack of clear prioritization of interventions</li> <li>Weak accountability mechanism</li> <li>Incomplete decentralisation</li> <li>Cumbersome administration processes</li> <li>Ineffective operationalisation of public-private-partnerships</li> <li>Weak community participation</li> </ul>

## 1.4 Universal Health Coverage in Tanzania

The HSSP IV stipulated that a comprehensive Health Financing Strategy (HFS) ought to guide progress toward UHC in Tanzania (Ministry of Health and Social Welfare, 2015b). Yet, the description of its key elements suggests that achieving UHC might primarily be seen as a health financing challenge (Ministry of Health and Social Welfare, 2015b, Dutta, 2015). A similar situation is found in scientific publications about UHC in Tanzania, where most focus on the financial protection component. The problem of access to quality essential healthcare services and equity is frequently less extensively discussed or seen as an independent issue (Mtei et al., 2014). Nevertheless, it is acknowledged by most authors that these components will affect the achievement of UHC (Mills et al., 2012a, Mills et al., 2012b, Borghi et al., 2012, McIntyre et al., 2013). The next three sections will therefore provide a description of all three UHC components within the Tanzanian context.

#### 1.4.1 Health service coverage

To describe health services coverage in Tanzania the definition of effective coverage with its three components (need, use and quality) as suggested by Ng *et al.* will be used (Ng et al., 2014). However, as the components "need" and "use" of healthcare are of less importance for this thesis their description will be kept short.

#### Need for healthcare

Prevalence of health problems as well as causes of death and disabilities in Tanzania for 2015 is given in Table 3. Since 2005 there has been a decrease in the burden of communicable diseases and an increase in non-communicable diseases (NCDs) (Institute for Health Metrics and Evaluation, 2016). The upsurge of NCDs has been leading to a double burden of diseases for which the health system does not have the capacity to respond to adequately (Ministry of Health and Social Welfare, 2015b).

**Table 3** Ranking of prevalence of health problems as well as causes of death and disabilities in Tanzania for 2015 (Institute for Health Metrics and Evaluation, 2016).

Ranking	Prevalence health problems <sup>1</sup>	Causes of death	Causes of disability
1	Oral disorder°	HIV/AIDS*	Iron-deficiency anaemia*
2	Skin disease°	Lower respiratory infections*	Depressive disorders°
3	Intestinal nematode*	Diarrheal disease*	Skin disease°
4	Hemoglobinopathies°	Ischemic heart disease°	Sense organ disease°
5	Iron-deficiency anaemia*	Cerebrovascular disease°	Low back and neck pain°
6	Malaria*	Congenital defects°	Migraine°
7	Sexual-transmitted diseases*	Malaria*	Asthma°
8	Sense organ diseases°	Tuberculosis*	Anxiety disorders°
9	Schistosomiasis*	Neonatal encephalopathy*	HIV/AIDS*
10	Tension headache°	Neonatal sepsis*	Malaria*

<sup>\*</sup>Communicable, maternal, neonatal, and nutritional diseases

The highest risk factors for death and disabilities combined are child and maternal malnutrition and unsafe sex (Institute for Health Metrics and Evaluation, 2016). Looking back at the health-related MDGs, the weakest performing area was maternal health (Ministry of Finance, 2014). Maternal mortality rate remained high: 556/100'000 live births in 2015 with a target of 133/100'000 live births. The proportion of births attended by skilled health personnel did not increase as required (64% in 2015 with a target of 90%) and the reduction of neonatal mortality was unsatisfactory (25/1'000 live births in 2015 with a target of 19/1'000 live deaths) (Ministry of Finance, 2014, Ministry of Health and Social Welfare, 2015b, Ministry of Health Community Development Gender Elderly and Children et al., 2016, Ministry of Finance and Planning, 2016).

#### Use of healthcare

Primary healthcare can be accessed by 90% of the population within five kilometres (Ministry of Health and Social Welfare, 2009a). The percentage of ill individuals, who consulted any healthcare provider for curative services during their illness episode slightly increased from 69% in 2007 to 71% in 2011/12. Out of these 78% sought care at a formal private or public healthcare provider (National Bureau of Statistics, 2013b). Health Management Information System (HMIS) data of 2009 to 2014 showed a declining trend in the number of out-patient department visits for new cases per person and year (0.85 in 2009 to 0.64 in 2014) (Ministry of Health and Social Welfare, 2013b). A brief

<sup>°</sup>Non-communicable diseases

<sup>&</sup>lt;sup>1</sup>Most prevalent causes (new and existing)

overview of trends in other relevant healthcare service coverage indicators is given in Figure 4.

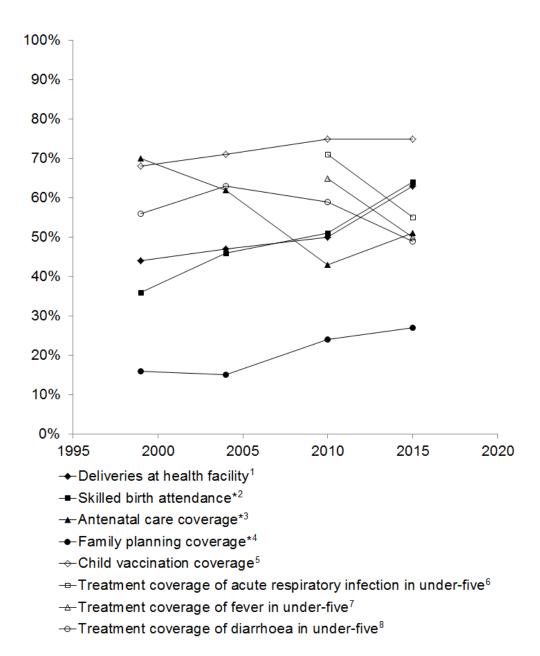


Figure 4 Trend of key health service coverage indicators in Tanzania Mainland (National Bureau of Statistics and Macro International Inc., 2000, National Bureau of Statistics and ORC Macro, 2005, National Bureau of Statistics and ICF Macro, 2011, Ministry of Health Community Development Gender Elderly and Children et al., 2016). <sup>1</sup>Percentage of total live births delivered in health facilities; <sup>2</sup>Percentage delivered by a skilled birth provider\*; <sup>3</sup>Percentage of women age 15-49 with at least 4 ANC visits to any care provider during pregnancy\*; <sup>4</sup>Percentage of all women age 15-49 currently using any modern contraceptive method\*; <sup>5</sup>Percentage of children 12-23 months who are fully vaccinated; <sup>6</sup>Percentage of children under age 5 with symptoms of acute respiratory infection, who were taken to a health facility or provider for advice or treatment; <sup>7</sup>Percentage of children under age 5 with

fever for whom advice or treatment was sought from a health facility or provider; <sup>8</sup>Percentage of children under age 5 with diarrhoea, who were given oral rehydration therapy (ORT includes fluid prepared from oral rehydration salt (ORS) packets, pre-packaged ORS fluid, and recommended home fluids); \*Indicator is recommended as UHC coverage indicator by (World Health Organization and The World Bank, 2015a)

#### Quality of healthcare

Given the expansion of health services within the country, quality of care has been a major concern for many years (Ministry of Health and Social Welfare, 2011b). Service Availability and Readiness Assessments (SARAs) as well as the Service Provision Assessments (SPAs) are the two main measures used to systematically evaluate service quality (Ministry of Health and Social Welfare, 2013f, Ministry of Health and Social Welfare, 2016). Both assess general service and service specific readiness and use a sample of health facilities designed to provide national-level representative results. However, the SARA only examines the existence of structures (structural quality) and does not investigate how services are delivered (quality of process) (Ministry of Health and Social Welfare, 2013f). In contrast, the SPA looks into both: structural quality and process through clinical observations (Ministry of Health and Social Welfare, 2016). Overall, both assessments indicate important deficit in the capability of facilities to deliver quality services (Ministry of Health and Social Welfare, 2013f, Ministry of Health and Social Welfare, 2016). Main issues around quality of care in Tanzania are summarized in Table 4.

**Table 4** Main issues around quality of care in Tanzania by administration level (Leonard and Masatu, 2010, Ministry of Health and Social Welfare, 2011b, Nangawe, 2012, Ministry of Health and Social Welfare, 2013e, Ministry of Health and Social Welfare, 2016).

#### **National level:**

- Inadequate coordination of quality improvement initiatives at ministry level and amongst partners
- Insufficient sustainability of quality improvement initiatives after partner support has ended
- No clear reporting mechanism on quality of care from councils to regions, central level and policy makers
- Lack of national standards and indicators for monitoring and evaluating quality of care
- No country-wide effective system for recognition and rewarding good performance
- Poor linkage between HMIS and quality improvement initiatives
- Health insurance schemes legislation and contracts are not used as a tool for quality assurance and improvement

#### Council/regional level:

- Ineffective and inadequate supportive supervision, mentoring and coaching
- Poor access to information about quality of care
- Poor coordination in data collection leading to parallel reporting systems and burdening health workers
- Poor feedback and exchange of information about quality of care
- Limited capacity to conduct operational research on quality of care
- No organized quality improvement system

#### Health facility/community level:

- Lack of ownership of quality improvement initiatives
- Low sensitivity to issues related to quality of care
- Poor work environment and inadequate infrastructure in terms of quantity and quality
- Hygiene and sanitation standards not followed
- Insufficient focus on safety
- Inadequate attention to overall clinical skills
- Know-Do gap amongst health workers for quality of care related issue
- Inadequate adherence to professional and ethical conduct
- No or little reflections of client's needs and expectations
- Low motivation and productivity of health workers
- Weak community involvement

Already the HSSP III (2009-2015) stipulated the need of putting quality improvement systems in place (Ministry of Health and Social Welfare, 2009a). The implementation of this ought to be guided by the National Health and Social Welfare Quality Improvement Strategic Plan 2013-2018 and the Tanzanian Quality Improvement Framework 2011-2016 (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). The topic of quality received even greater attention in the subsequent HSSP IV (2015-2020), where one of five objectives was fully dedicated to quality improvements of primary healthcare. According to this objective quality of essential services should be enhanced through activities in four key result areas of a bigger cross-sectorial initiative called Big Results Now (BRN): [1] Human resources for health, [2] health commodities, [3] health facility performance management improvement, and [4] reproductive, maternal, neonatal, adolescent, and, child health. Of particular relevance for this thesis is the key result area 3 (health facility performance management improvement). Within this area operationalization of quality improvements ought to be done through the introduction of [1] a performance-based certification system (star rating), [2] clients' charters, [3] pay-for-performance (P4P) schemes, and [4] an integrated quality improvement program. The latter is supposed to include a national quality improvement toolkit and monitoring system, facility self-assessments and comprehensive CHMT and RHMT supportive supervision, mentoring and coaching. Additionally, exchange of lessons learned and best practices as well as peer learning are to

be promoted and facilitated through locally organised forums (Ministry of Health and Social Welfare, 2015b).

The HSSP IV also specifies the need for harmonizing, coordinating and integrating the improvement initiatives of the disease specific national control programs (Ministry of Health and Social Welfare, 2015b). Apart from these initiatives, there are also quality assessment and improvement approaches from many other stakeholders. Unfortunately, most of these approaches are rather uncoordinated and sometimes duplicative (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e, Mwidunda and Eliakimu, 2015). Figure 5 tries to give an overview of healthcare quality assessment and improvement approaches in Tanzania Mainland, but it is acknowledged that given the large number of initiatives this overview is likely to be none-exhaustive. Approaches were grouped in [1] externally conducted health facility surveys, [2] assessments conducted in the frame of certification or accreditation procedure, [3] P4P or result-based-financing scheme assessments, [4] supportive supervision, mentoring and coaching approaches, and [5] selfassessments approaches, which often made use of the so called Plan, Do, Study and Act cycle (Nangawe, 2012). Supportive supervision, mentoring and coaching approaches implemented by external stakeholders were usually preceded by training sessions on the topic to be followed up afterwards during the health facilities visits. Of particular importance for this thesis is routine CHMT supportive supervision at council level. CHMTs are supposed to conduct supportive supervision in all health facilities within their council on a quarterly basis using a paper-based check list (Ministry of Health and Social Welfare, 2010). Yet, it's effective and efficient implementation is hampered by various factors, which will be further elaborated in chapter 7.

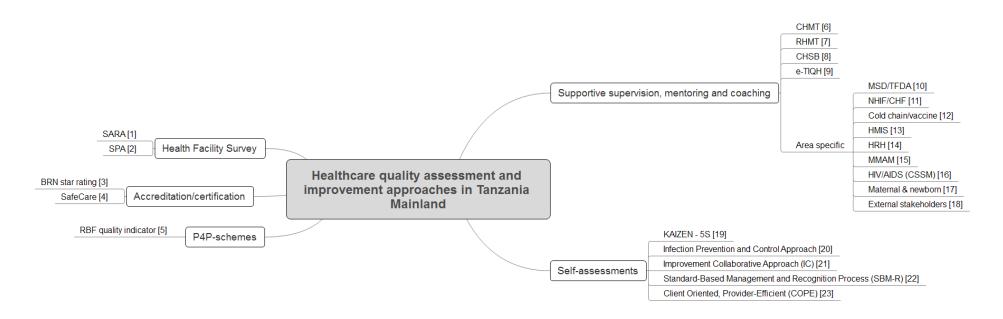


Figure 5 Healthcare quality assessment and improvement approaches in Tanzania Mainland.

- [1] Service Availability and Readiness Assessment (SARA), successor of the Service Availability Mapping (SAM) (see text or (Ministry of Health and Social Welfare, 2013f, Ministry of Health and Social Welfare, 2007b))
- [2] Service Provision Assessment (SPA) (see text or (National Bureau of Statistics and Inc.. 2007, Ministry of Health and Social Welfare, 2016))
- [3] Big Results Now (BRN) initiative (see text or (Ministry of Health and Social Welfare, 2015a))
- [4] See (Ministry of Health and Social Welfare, 2014b, Johnson et al., 2016, Ugo et al., 2016)
- [5] Result Based Financing (RBF) (Ministry of Health and Social Welfare, 2015c, Binyaruka et al., 2015, Binyaruka and Borghi, 2017)
- [6] Routine Council Health Management Teams (CHMTs) supportive supervision (see text)
- [7] Regional Health Management Teams (RHMTs) have the responsibility to ensure implementation of routine CHMT supportive supervision and do spot-checks for verification (Ministry of Health and Social Welfare, 2010)

- [8] Council Health Service Boards (CHSBs) are also doing spot-checks on the quality of service delivery if financial resources are available (Source: Comprehensive Council Health Plans collected during the PhD study)
- [9] electronic Tool to Improve Quality of Healthcare (e-TIQH) (see chapter 1.5.1)
- [10] Medical Store Department (MSD) and Tanzanian Food and Drug Authority (TFDA) do medical supply specific supportive supervision
- [11] National Health Insurance (NHIF) does NHIF and Community Health Fund (CHF) specific supportive supervision
- [12] Cold chain and vaccine specific supervision is often conducted by the CHMT independent of routine CHMT supportive supervision
- [13] Health Management Information System (HMIS) is often conducted by the CHMT independent of routine CHMT supportive supervision
- [14] Human Resources for Health (HRH) supportive supervision is often conducted by the CHMT independent of routine CHMT supportive supervision
- [15] MMAM (Mapango wa maendeleo wa afya ya msingi (Swahili for Primary Health Service Development Programme)) supportive supervision is often conducted by the CHMT independent of routine CHMT supportive supervision
- [16] HIV/AIDS supportive supervision, under the Comprehensive Supportive Supervision and Mentoring approach, is often conducted by the CHMT independent of routine CHMT supportive supervision (National AIDS Control Programme, 2014)
- [17] Maternal and newborn supportive supervision is often conducted by the CHMT independent of routine CHMT supportive supervision
- [18] There are lots of external stakeholders conducting supportive supervision, mentoring and coaching approaches or training follow-up visits (e.g. Tunajali in the area of HIV/AIDS)
- [19] See (Ministry of Health and Social Welfare, 2011b, Nangawe, 2012, Ministry of Health and Social Welfare, 2013a, Kanamori et al., 2016)
- [20] See (Ministry of Health and Social Welfare, 2011b, Nangawe, 2012, Ministry of Health and Social Welfare, 2012b)
- [21] See (Kinoti et al., 2010, Ministry of Health and Social Welfare, 2011b, Tanzania Spread Study Team, 2011, Nangawe, 2012, Hanson et al., 2014, Jaribu et al., 2016)
- [22] See (Necochea and Bossemeyer, 2005, Ministry of Health and Social Welfare, 2011b, Nangawe, 2012, Necochea et al., 2015)
- [23] See (Dohlie et al., 2000, EngenderHealth, 2003, Bradley and Igras, 2005, Nangawe, 2012)

#### 1.4.2 Financial protection coverage

The Tanzanian healthcare system primarily depends on funds from central level coming either from general tax revenues (29% of total health expenditures (THE) in 2014) or from external donors (36% of THE in 2014) (World Health Organization, 2014, Dutta, 2015). However, there are also user fees and insurance schemes in place to supplement these funds, leading to 35% of THE being funded by households (World Health Organization, 2014). The OOP expenditures as a percentage of THE were around 23% in the years 2012 to 2014, but with a slight upward trend in actual OOP spending per capita (World Health Organization, 2014). 1.7% of the population suffers from catastrophic health expenditures and 2.7% is pushed into poverty due to OOP payments (World health Organization and The World Bank, 2015b).

Overall, the health financing system is extremely fragmented, both within the central level funding system and in terms of health insurance schemes (McIntyre et al., 2008, Haazen, 2012, Borghi et al., 2013, Dutta, 2015). Table 5 provides an overview of the main health financing sources, which are part of the national health budget. However, there is also substantial and weakly aligned off-budget funding from additional partners and vertical programs (Ministry of Health and Social Welfare, 2015b). Consequently, these different funding streams make financial stewardship of the health sector challenging, which frequently leads to delays in fund disbursement (Ministry of Health and Social Welfare, 2015b).

**Table 5** Main health financing sources of the national health budget.

Central level	
Local Government Block Grants	General tax revenues, divided in "Personal Emolument" (salaries) and "Other Charges" (statutory employment benefits) (Frumence et al., 2014a)
Health Sector Development Grants	Capital development grant primarily for infrastructure; contributions come from the central government and development partners (Tidemand, 2013, Prime Minister's Office Regional Administration and Local Government, 2014, Tidemand et al., 2014)
Local Government Development Grants	Capital development grant primarily for infrastructure; contributions come from the central government and development partners (Prime Minister's Office Regional Administration and Local Government, 2014, Tidemand et al., 2014)

Health Sector Basket Fund	Funds expenditures of recurrent nature; purely financed by development partners that pool un-earmarked resources (Frumence et al., 2014a, Tidemand et al., 2014)
Medical Store Department (MSD)	Receipt in-kind at health facility level; funds are disbursed from the central level to MSD to be put into the health facility account and then be spent on medical supplies (Euro Health Group, 2007)
Council level	
Council Own Sources	Locally at council level created revenues (e.g. local taxes) (Frumence et al., 2014a)
Insurance schemes	
National Health Insurance Scheme (NHIF)	Compulsory insurance scheme for all public servants, which also includes their dependants. Covers both in-patient and outpatient care with a spending limit (McIntyre et al., 2008).
National Social Security Fund/Social Health Insurance Benefit (NSSF-SHIB)	Compulsory insurance scheme for all private sector employees, that has a SHIB as part of the benefit package to which members could voluntarily sign up to. Covers both in-patient and out-patient care (McIntyre et al., 2008, Haazen, 2012, Mills et al., 2012a)
Community Health Fund (CHF)	Voluntary insurance scheme for the informal rural population managed at council level. Covers a whole household. Annual premium and benefit package are defined by the council. Funds raised are doubled through "matching grants" from the central government via the NHIF (Haazen, 2012, Chakupewa and Maluka, 2016)
Tiba Kwa Kadi (TIKA)	Voluntary insurance scheme for the informal urban or peri-urban population managed at council level. Covers an individual. Annual premium and benefit package are defined by the council. Funds raised are doubled through "matching grants" from the central government via the NHIF (Haazen, 2012)
Out-of-pocket	
User fees	User fees are levied at the point of access, whereas the poor and other definite priority groups (children under five, pregnant women, elderly above 60, and people with certain disease conditions, including chronic illnesses, HIV/AIDS, TB and leprosy) are exempted and supposed to receive free care at public health facilities without clear compensation mechanism for the cost incurred. The amount of user fee for each level of care is determined by the council (Mubyazi, 2004, McIntyre et al., 2008, Ministry of Health and Social Welfare, 2013e).
Drug Revolving Fund	Money obtained from selling medicines at hospital level (McIntyre et al., 2008)

As a consequence of the fragmented health insurance system, there is no cross-subsidisation between the risk pools of the different insurance schemes (Ministry of Health and Social Welfare, 2015b). Also, individual schemes struggle to reach efficiency in scale due to low number of members (Ministry of Health and Social Welfare, 2015b). According to the National Health Insurance Fund (NHIF) database the overall health insurance coverage rate in 2013 was 19%. Yet, reliability of this number is questionable as the 2012 census only reported a coverage rate of 8.1% for Tanzania Mainland (National Bureau of Statistics and Office of Chief Government Statistician, 2014). For the Community Health Fund (CHF) enrolment rate in 2015 was around 4.5% based on the findings of the Demographic and Health Survey 2015/16 (Ministry of Health Community Development Gender Elderly and Children et al., 2016), indicating that the target of 30% coverage by 2015 had clearly not been reached (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2015b). Chapter 8 will elaborate more on reasons for such low enrolment. The remaining uninsured population are often the people working in the informal sector and the very poor, who both depend on the public sector (Mills et al., 2012a, Dutta, 2015).

To address the problems in health financing the earlier mentioned HFS has been developed (Ministry of Health and Social Welfare, 2015b). Key elements of the HFS are [1] the establishment of a single national health insurance, [2] the development of a standard minimum benefit package of healthcare services, and [3] the increase of domestic revenues for health financing through existing or new tax-funded sources as well as innovative financing mechanisms (Ministry of Health and Social Welfare, 2015b). Therewith, the aim is to reach a health insurance enrolment rate of 50% by 2020 (Ministry of Health and Social Welfare, 2015b). Apart from the HFS, the HSSP IV also raises the need to improve Public Financial Management to guarantee efficient and effective flow and use of resources (Ministry of Health and Social Welfare, 2015b).

## 1.4.3 Equity in coverage

The Tanzanian health system is facing inequities in terms of place of residences (urban-rural, region), wealth quintile and gender (Ministry of Health and Social Welfare, 2013d). Regional differences in health outcomes are large, which was shown to be connected with lower socioeconomic status and weaker health systems (Ministry of Health and Social Welfare, 2013d). On average the more deprived groups have a pooper health status, leading to a higher need of healthcare (Ministry of Health and Social Welfare, 2013d). However, these groups were shown to seek less care than others due to geographical, quality, financial and social barriers (Smithson, 2006, Chomi et al., 2014). This was also shown by the fact that the

poorest quintile receives a lower share of healthcare benefits relative to their share of needs compared to the other quintiles (Mills et al., 2012b, Mtei et al., 2012). One of the main problems is that geographic accessibility, availability and quality of health services in rural areas, where poverty incidence is much higher, lags behind urban areas (National Bureau of Statistics, 2013b, Ministry of Health and Social Welfare, 2015b, Mtenga et al., 2016). Rural areas are more affected by the shortage of qualified human resources and the problem of staff retention (Ministry of Health and Social Welfare, 2015b). This is confirmed by the substantial inequity in salary allocation between and within councils, whereas facilities in the periphery typically receive fewer staff resources than those close to council centre (Tidemand et al., 2014). Additionally, in rural areas the referral system is functioning less well, which is particularly problematic for maternal and newborn health (Ministry of Health and Social Welfare, 2015b). In these areas infrastructure is also less adequate and a poor transport system within the council is hampering peripheral distribution of medical supplies and supervision (Smithson, 2006, Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2015b).

In terms of financial protection, the percentage of population whose health expenditures exceed 10% of total and 30% of non-food expenditures was proportionally greater in the poor and the extreme poor than in the non-poor (Haazen, 2012). For the health insurance schemes, there is considerable inequity between the NHIF and the CHF, as well as within the CHF. It was shown that whether, when and where healthcare was sought depends on health insurance affiliation (Chomi et al., 2014). Additionally, quality and quantity of services entitled to NHIF members are higher compared to the CHF (Chomi et al., 2014). Among CHF members distribution of healthcare benefits, OOP payments and contribution to the CHF were generally regressive, meaning the poorer groups contribute a relatively higher proportion of their income than richer groups (Mtei et al., 2012, Macha et al., 2012, Mills et al., 2012b). Lastly, exemptions for the poor are inadequately implemented, which leads to further inequity in financial protection (Maluka, 2013, Idd et al., 2013).

Given these problems of inequity, the HSSP IV stipulated the objective of improving equitable access to services by focusing on geographic areas with higher disease burden and vulnerable groups with higher risk factors (Ministry of Health and Social Welfare, 2015b). This should be achieved through [1] the focus of the BRN initiative on the most underserved councils, [2] the reallocation of qualified staff to ensure equitable distribution within all regions, [3] the increased accessibility to social welfare, [4] special attention to vulnerable groups in terms of access to care, and [5] gender equity measures (Ministry of Health and Social Welfare, 2015b). Additionally, the planned risk pooling under the single national health

insurance and the provision of a minimal benefit package ought to allow access to those unable to pay (Ministry of Health and Social Welfare, 2015b).

# 1.5 The Initiative to Strengthen Affordability and Quality of Healthcare

The Initiative to Strengthen Affordability and Quality of Healthcare (ISAQH) was implemented between 2012 and 2015 in the study area described in chapter 3.2. It was the successor project of the ACCESS programme, which was in place between 2003 and 2011. The ACCESS program aimed to improve access to prompt and effective malaria treatment and care (Hetzel et al., 2007). To do so the programme implemented interventions on the supply and demand side (Figure 6) (Hetzel et al., 2007). For the ISAQH it was then decided to mainly focus and scale up two previous components with the goal of improving [1] quality of healthcare, and [2] financial access to health services.

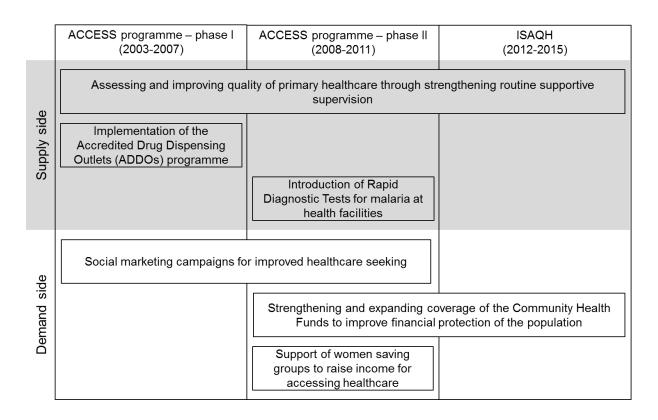


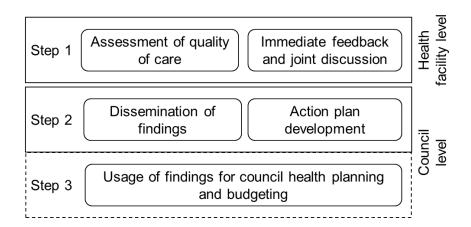
Figure 6 Interventions of the ACCESS and ISAQH projects on supply and demand side.

This was done based on findings from previous studies which clearly indicated that overall quality of care affected effective coverage, and that treatment seeking was influenced by economic capabilities (Hetzel et al., 2008, Dillip et al., 2009, Gross et al., 2011b, Gross et al., 2011a, Gross et al., 2012b, Gross et al., 2012a). It was further recognized that good quality of care was a prerequisite for the people's willingness to contribute to the CHF and increased

CHF contributions were linked to more resources for quality improvements. The following two paragraphs give a brief overview of the two ISAQH components.

# 1.5.1 Assessing and improving quality of primary healthcare

In 2007 the ACCESS programme introduced the approach to strengthen routine CHMT supportive supervision (Figure 7).



**Figure 7** The three-stage process of the e-TIQH supportive supervision approach. Dashed lines indicate that ISAQH was not involved in this step.

In a first step, a systematic assessment of the quality of primary care was carried out in all health facilities within a given council. In 2011, the assessment tool was transformed from a paper-based into an electronic version called the "electronic Tool to Improve Quality of Healthcare (e-TIQH)". The assessment methods included checklists, structured interviews and direct clinical observations. In total, six quality dimensions were assessed: [1] Physical environment and equipment, [2] Job expectations, [3] Professional knowledge, skills and ethics, [4] Management and administration, [5] Staff motivation, [6] Client satisfaction. Points were given for each indicator met within a dimension, and percentage scores (of total possible points) were calculated per quality dimension. CHMT core and co-opted members formed the core of the assessment team, but to increase objectivity and reduce bias community representatives and healthcare providers from the public and private sector were involved as well. Supervision was done by ISAQH staff. Importantly, the assessment concluded with an immediate constructive feedback to the healthcare providers, and joint discussions about how to address the identified quality gaps. In a second step, findings and options for improvement were discussed at council level during a dissemination meeting with all relevant stakeholders. These findings were then meant to provide inputs for the third step, the annual council health planning and budgeting process. This subsequently ought to lead to more efficient resource allocation and ultimately improved quality of care. The supportive supervision approach and in particular the e-TIQH assessment tool itself will be described in more detail in chapter 4 (Mboya et al., 2016). The e-TIQH approach's appropriateness to measure and improve quality of primary healthcare will be discussed in chapter 5 and 6. Finally, chapter 7 will compare the e-TIQH supportive supervision approach with routine CHMT supportive supervision as it is currently implemented.

# 1.5.2 Strengthening and expanding coverage of Community Health Funds

Between 2009 and 2014 the ACCESS and ISAQH projects implemented various activities to strengthen and expand the coverage of the existing CHF. During this period the intervention councils (chapter 3.2) benefited from: [1] training for all relevant stakeholders on their roles and responsibilities as well as CHF administration (including provision of CHF manuals and data collection tools), [2] CHF fora to facilitate the development of council action plans on CHF promotion, [3] CHF radio spots aired for community mobilization, [4] supportive supervision on CHF data management, and [5] sensitization meetings (including the distribution of information, education and communication materials) in villages as well as at schools and colleges for group membership. Chapter 8 will make use of the improved availability of routine CHF data thanks to the supportive supervision on CHF data management.

# 2. Aim and objectives

#### 2.1 Aim

Building on findings from ISAQH interventions the aim of this PhD thesis is to provide actionable evidence and recommendations to help move towards improved health service quality and financial protection in an equitable manner. Therewith it is intended to improve the understanding of how to promote UHC in Tanzania.

# 2.2 Objectives

Given the above aim the following objectives were defined:

- 1. To conduct an evaluation of the e-TIQH supportive supervision approach through:
  - a. Describing the methodology of the e-TIQH supportive supervision approach (Chapter 4)
  - b. Assessing the appropriateness of the e-TIQH assessment tool to measure quality of primary healthcare (Chapter 5)
  - c. Investigating the contribution of the e-TIQH supportive supervision approach to increased quality of primary healthcare (Chapter 6)
  - d. Comparing the e-TIQH supportive supervision approach with routine CHMT supportive supervision, including a costing analysis (Chapter 7)
- 2. To undertake an in-depth analysis of the CHF administration and its interaction with other health financing mechanisms and policies (Chapter 8)

# 3. Methods and study setting

#### 3.1 Methods

The research presented in this thesis can be considered as implementation research. According to Peters *et al.* implementation research aims to understand what, why and how interventions work under real world conditions, rather than trying to control for these conditions or remove their influence as causal effects (Peters et al., 2013a). Given that implementation research is conducted in real world settings, this implies that the context, in particular the overall health systems, plays a central role (Peters et al., 2013a). Understanding these complex and adaptive systems is fundamental to implementation research (de Savigny and Adam, 2009). For the research presented here this context knowledge could be obtained by spending over two and half years in the country prior and during the research. Working in complex and adaptive systems has also implications for the research design and study methods used. One of them is that multiple methods and different information sources are needed to understand implementation problems (Peters et al., 2013b). Throughout the research presented this has been done through triangulation of methods thereby investigating an issue from different angles and points of view.

Another implication of studying complex systems is that the research design and the study methods need to be sufficiently flexible to account for the unpredictable and variable ways intervention are implemented (Peters et al., 2013b). Thus, study methods that support a plausibility or adequacy design are likely to be the most adequate, although their results have a lower level of certainty for managers and policy makers (Peters et al., 2013b, de Savigny and Adam, 2009). Given that the research presented here was analysing routine implementation and no comparison areas or groups existed (leading to the exclusion of plausibility designs), the mixed methods approach was seen as the most suitable study method (de Savigny and Adam, 2009). The mixed methods approach integrates qualitative and quantitative methods to either validate or supplement findings (Steckler et al., 1992). Table 6 provides an overview of quantitative and qualitative methods used throughout the chapters 4-8.

**Table 6** Overview of quantitative and qualitative methods used, by chapter.

Method used	Chapter 4	Chapter 5	Chapter 6	Chapter 7	Chapter 8
Basic descriptive statistics*	Х	Х		Х	X
Linear regression models*		X	X		
Factor analysis*		X			
Economic costing*				X	X
Routine health facility data analysis*					X
Secondary data analysis*#1			Χ	Χ	X
In-depth interviews analysis#		Χ	Χ	Χ	
Field notebook analysis#2		X	Χ	X	

Asterisks indicate quantitative methods, hashtags qualitative methods

<sup>1</sup>Secondary data included: CCHPs, quarterly or annually combined Technical and Financial Performance Implementation Reports (TFPIRs), council routine supportive supervision checklists and reports, health facility guest books, receipts books, cash books, CHF reports, CHF counter books, CHF register books designed by NHIF, CHF membership cards, outpatient registers, monthly or yearly health facility out-patient or financial reports, ISAQH documents, and other official documents

<sup>&</sup>lt;sup>2</sup>The field notebook included observational data and personal communication

# 3.2 Study setting

The data for this thesis was collected within the intervention councils of ISAQH, operating mostly in rural Tanzania. By the end of the project the e-TIQH supportive supervision approach had been implemented in six councils of Morogoro Region (Kilosa DC, Gairo DC, Mvomero DC, Morogoro DC, Kilombero DC, Ulanga DC), two councils of Pwani Region (Bagamoyo DC, Rufiji DC) and one council of Iringa Region (Iringa MC) (Figure 8).

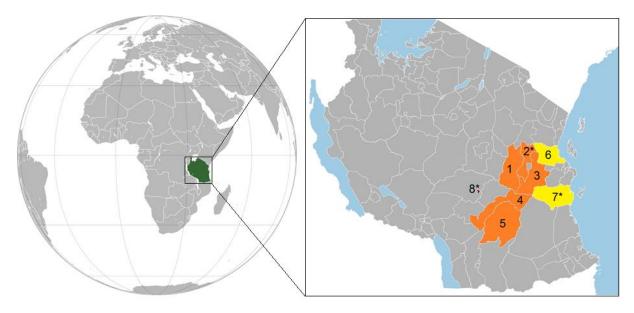


Figure 8 World map with the United Republic of Tanzania and map of the United Republic of Tanzania with councils where ISAQH interventions were implemented (status 2008). Morogoro Region (orange): [1] Kilosa DC (later split into Kilosa DC and Gairo DC), [2] Mvomero DC, [3] Morogoro DC, [4] Kilombero DC, [5] Ulanga DC; Pwani Region (yellow): [6] Bagamoyo DC, [7] Rufiji DC; Iringa Region (red): [8] Iringa MC. Asterisks mark the three study councils used for the evaluation of the e-TIQH supportive supervision approach (Chapter 5-7). Council used for the CHF analysis in chapter 8 cannot be disclosed due to confidentiality reasons.

# 3.3 Ethical considerations

Ethical clearance for chapter 4 was obtained in the frame of the intervention study protocol approved by the respective Review Board of the National Institute for Medical Research (NIMR) (reference number: NIMR/HQ/R.8a/VOL.IX/236) and the Ifakara Health Institute (former Ifakara Health Research and Development Centre) (reference number: IHRDC/IRB/No.A:018). Permission to publish the findings of chapter 5-8 was given by NIMR in Tanzania. Ethical clearance for all studies conducted in chapter 5-8 was granted by the same institution (original: NIMR/HQ/R.8a/Vol.IX/1839, extension: NIMR/HQ/R.8c/Vol.II/521) and the Institutional Review Board of the Ifakara Health Institute (IHI/IRB/No:37-2014) in October 2014 as well as the Ethic Commission of Northeast and Central Switzerland (EKNZ 2014-347) in November 2014.

# 4.Embedding systematic quality assessments in supportive supervision at primary healthcare level: application of an electronic Tool to Improve Quality of Healthcare in Tanzania

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# 4.1 Abstract

Background: Assessing quality of health services, for example through supportive supervision, is essential for strengthening healthcare delivery. Most systematic health facility assessment mechanisms, however, are not suitable for routine supervision. The objective of this study is to describe a quality assessment methodology using an electronic format that can be embedded in supervision activities and conducted by council health staff.

Methods: An electronic Tool to Improve Quality of Healthcare (e-TIQH) was developed to assess the quality of primary healthcare provision. The e-TIQH contains six sub-tools, each covering one quality dimension: infrastructure and equipment of the facility, its management and administration, job expectations, clinical skills of the staff, staff motivation and client satisfaction. As part of supportive supervision, council health staff conduct quality assessments in all primary healthcare facilities in a given council, including observation of clinical consultations and exit interviews with clients. Using a hand-held device, assessors enter data and view results in real time through automated data analysis, permitting immediate feedback to health workers. Based on the results, quality gaps and potential measures to address them are jointly discussed and actions plans developed.

Results: For illustrative purposes, preliminary findings from e-TIQH application are presented from eight councils of Tanzania for the period 2011–2013, with a quality score <75 % classed as 'unsatisfactory'. Staff motivation (<50 % in all councils) and job expectations (≤50 %) scored lowest of all quality dimensions at baseline. Clinical practice was unsatisfactory in six councils, with more mixed results for availability of infrastructure and equipment, and for administration and management. In contrast, client satisfaction scored surprisingly high. Over time, each council showed a significant overall increase of 3–7 % in mean score, with the most pronounced improvements in staff motivation and job expectations.

Conclusions: Given its comprehensiveness, convenient handling and automated statistical reports, e-TIQH enables council health staff to conduct systematic quality assessments. Therefore e-TIQH may not only contribute to objectively identifying quality gaps, but also to more evidence-based supervision. E-TIQH also provides important information for resource planning. Institutional and financial challenges for implementing e-TIQH on a broader scale need to be addressed

*Keywords:* Quality of health services, Quality assessment tool, Supportive supervision, Tanzania, Universal health coverage

## 4.2 Introduction

Adoption of the Millennium Development Goals (MDGs) as a global framework for action mobilized resources on an unprecedented scale, and resulted in major health gains for many people in low- and middle-income countries. Global improvements in child mortality, and deaths from tuberculosis or malaria, are among the most encouraging results to date (United Nations, 2014). Yet substantial challenges remain, leading to a critical re-appraisal of the MDG framework. One of the most widely-expressed criticisms is that the focus of health-related MDGs on specific diseases and population groups has largely been through vertical strategies, at the expense of more comprehensive measures to strengthen health systems and healthcare delivery (Fehling et al., 2013).

The concept of Universal Health Coverage (UHC) – a prominent sub-target of the health-related Sustainable Development Goal (SDG) – is a broad-based approach. UHC is defined as "ensuring that all people can use the promotive, preventive, curative, rehabilitative and palliative health services they need, of sufficient quality to be effective, while also ensuring that the use of these services does not expose the user to financial hardship" (O'Connell et al., 2014). While protection from financial hardship has received most attention, other aspects of UHC such as the quality of health services have been less widely discussed. Consequently, quality of services was described as the missing factor when translating intervention coverage into positive health outcomes. As a result, it was postulated that the third revolution in global health – after those for metrics and accountability – would be a revolution in quality of care (Horton, 2014).

However, there is currently no common understanding of what constitutes 'quality' owing to its multi-dimensional and subjective nature. A widely cited definition proposed by a pioneer in work on quality of care is: "the application of medical science and technology in a manner that maximizes its benefits to health without correspondingly increasing the risk" (Donabedian, 1980). The United States Institute of Medicine defines quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Institute of Medicine, 2001).

Donabedian's distinction between structural, procedural and outcome elements is useful when attempting to differentiate between dimensions of quality. Structure refers to physical and staffing characteristics, such as medical staff, supplies, equipment and premises. The procedural element comprises the interactions between users and the healthcare system, i.e. the actual delivery and receipt of care. It involves two types of processes: technical and

interpersonal care, defined as "...technical care refers to the application of clinical medicine to a personal health problem...interpersonal care describes the interaction of healthcare professionals and users or their carers" (Campbell et al., 2000). Lastly, outcomes are the consequences of clinical care and the interaction between individual users and the healthcare system. The effectiveness of clinical and interpersonal care determines health status and user satisfaction (Campbell et al., 2000, Obrist et al., 2007).

Many interventions aimed at improving the quality of care have focused on structural improvements, since these are tangible and relatively easy to achieve. However, evidence indicates that there is only a weak direct link between structural improvements and better health outcomes (Donabedian, 1988). According to Campbell et al. (Campbell et al., 2000), this is because structures are only indirect or contingent influencing factors. Structural measures impact on processes, and indirectly on outcomes, since without the necessary skills, supplies and equipment no provider can, for example, carry out an effective examination. However, the limited evidence available suggests that improved quality of care and health outcomes can be achieved more effectively through process changes than through structural measures, even in resource-constrained settings (Peabody et al., 2006). Hence a number of policy and program interventions focus on process elements (Buckley and Pittluck, 2015). They can be assigned to two categories: measures that indirectly influence provider behaviour and practice by altering structural conditions (e.g. organization, financing, design of healthcare systems), and interventions that *directly* target the providers. Indirect measures include accreditation programs, targeted retraining, organizational change models, and initiatives to strengthen community participation in health governance and social accountability. Direct measures include peer-review feedback as well as performance-based remuneration and professional recognition (Peabody et al., 2006).

Improving quality requires its accurate measurement. A recent systematic review of health facility assessment mechanisms identified 10 comprehensive tools. Most of the tools focused on health service delivery, especially at primary healthcare level. Healthcare financing and leadership/governance of the health workforce, and some areas of healthcare such as mental health and injury rehabilitation (Nickerson et al., 2014), were rarely included.

Moreover, it was striking that the majority of these tools were for use in surveys or censustaking and were not routinely applied by regional or council health management teams, for instance in the context of supportive supervision. Yet, systematic identification of quality gaps should be part of supportive supervision as stipulated in the following definition. Accordingly supportive supervision is "...a process that promotes quality ... by ... focusing on the identification and resolution of problems, and helping to optimize the allocation of resources ... by providing the necessary leadership and support for quality improvement processes and

by promoting high standards, teamwork, and better two-way communication" (Marquez and Kean, 2002). If done this way supportive supervision can foster quality improvements (Bailey et al., 2016). Several approaches and guidelines have been developed to promote supportive supervision, mainly focusing on a specific clinical area, for example malaria case management, reproductive health services or routine immunization services (Children's Vaccine Program at PATH, 2003). However, achieving sustained supportive supervision is challenging and must be combined with other measures to effectively improve the quality of service (Marquez and Kean, 2002, Reynolds et al., 2008, Rowe et al., 2010, Bello et al., 2013, Hoque et al., 2014, Panda et al., 2015).

Following development of the first health sector strategic plan in 1999, Tanzania introduced supportive supervision at council level in the early 2000s and has since updated national supportive supervision guidelines on a regular basis (Ministry of Health and Social Welfare, 2010). The guidelines state that Council Health Management Teams (CHMTs) are supposed to visit health facilities on a quarterly basis to assess service delivery, share their analysis, then seek solutions with the providers and provide on-site training. However, in the Tanzania Quality Improvement Framework in Health Care 2011–2016, it is stated that such visits are often ineffective in improving quality because supervisors lack time and financial resources, as well as the necessary technical, managerial and supervisory skills, to conduct proper supportive supervision (Ministry of Health and Social Welfare, 2011b, Bailey et al., 2016). Further evidence suggests that in general, supervision is often limited to a review of records and medical supplies and negative feedback. It occurs regularly but remains hierarchical, and there is no systematic follow-up in terms of planning and collaborative problem-solving (Children's Vaccine Program at PATH, 2003, Bosch-Capblanch and Garner, 2008, Rowe et al., 2010). The goals of the Ministry are therefore to strengthen supportive supervision as well as to ensure more comprehensive monitoring and surveillance.

The "Initiative to Strengthen Affordability and Quality of Healthcare" (ISAQH) program was developed with the aim of informing the expansion of UHC in Tanzania. It includes two key interventions: [1] assessing and improving quality of health services at primary care level as part of supportive supervision and [2] strengthening Community Health Funds (CHFs), i.e. council-based prepayment (insurance) schemes (Mtei and Mulligan, 2007, Ministry of Health and Social Welfare, 2010, Maluka and Bukagile, 2014). By early 2015, ISAQH had been rolled out in eight councils. In this article we aim to describe the electronic Tool to Improve Quality of Healthcare (e-TIQH) which is used by CHMTs to assess and foster the quality of health service provision in the context of a broader supportive supervision approach. We focus on the quality assessment methodology and present, for illustrative purposes only, preliminary findings from its application. This paper is the first in a series of forthcoming

papers. In these papers we will examine in more depth the trends in quality of health services and the factors driving quality improvements, including the potential effects of e-TIQH on supportive supervision and quality. In this context, we will also compare the e-TIQH-based supervision approach with the conventional routine supervision approach.

## 4.3 Methods

The quality assessment method described below forms part of a broader supportive supervision approach. Accordingly, data on quality is not collected from research surveys, but is instead gathered by CHMTs in charge of health-related activities. The overall goal of this approach is not only to assess, but also to improve and to maintain quality of primary healthcare provision in resource-constrained settings in a cost effective way, through a three-stage process:

Step1: Assessing the quality of primary healthcare provision in all functioning health facilities with the help of an electronic device, including immediate feedback to healthcare providers and their respective facility governing committee and joint discussions on the causes of quality gaps and possible measures which can be implemented to address those gaps at health facility level.

Step 2: Disseminating the comprehensive assessment findings at council level to healthcare providers, council authorities and a representative from the regional level as well as developing an action plan to address the identified and jointly discussed quality gaps.

Step 3: Using the assessment findings as additional source for evidence-based planning and budgeting in Comprehensive Council Health Plans (CCHPs), to optimize resource allocation and ultimately quality of health services.

Preliminary results of the use of the e-TIQH were obtained from longitudinal data collected during 2011–2013 from 439 health facilities located in three regions and eight councils of mainland Tanzania: Ulanga, Kilombero, Kilosa/Gairo, Morogoro and Mvomero district councils in Morogoro Region, the Iringa municipal council in Iringa Region as well as Rufiji and Bagamoyo district councils in Coast Region.

#### The electronic Tool to Improve Quality of Healthcare (e-TIQH)

Before the introduction of the electronic version of the quality assessment tool in 2011, a paper-based version was used in the two pilot district councils of Ulanga and Kilombero (see appendix 1). An electronic version was developed, with the same content as the paper version, in order to simplify and make data entry more efficient as well as to automate data analysis. The electronic format also permits immediate and more accurate feedback on

results to the health facility staff, so that findings and possible solutions can be discussed at the time of the assessment.

The e-TIQH contains six sub-tools, each covering one essential quality dimension and answering one central question (Table 7).

**Table 7** The six quality dimensions and respective assessment tools.

Sub-tool	Quality dimension	Central Question	Assessment tool	Main Focus
1	Physical environment and equipment	Do health facilities have sufficient resources and provide a supportive environment to enable providers to fulfil the job expectations that are placed on them?	Checklist	Cleanliness of health facility; availability of equipment and supply; implementation of infection prevention and control (IPC); basic infrastructure of health facility
2	Job expectations	Do providers know what is expected from them in terms of service delivery?	Structured interview and checklist	Knowledge of services provided at the health facility; availability of and knowledge about job descriptions; availability of treatment of algorithms and guidelines
3	Professional knowledge and skills	Do health providers have sufficient knowledge and skills to fulfil job expectations?	Direct observation checklist	Adherence to principles of clinical history taking, physical examination and IPC; management of children under 5 years of age (IMCI), pregnant women, fever patients above 5 years of age and HIV/TB suspects or patients.
4	Management and administration of the facility	Do health facilities have a sound management system that provides supportive supervision and feedback to providers and the community?	Checklist	Staffing level; availability of medicines, general patient information, IEC materials and functioning referral system; implementation of record keeping, reporting, mandatory meetings and supervision visits
5	Staff motivation	Are providers motivated to fulfil job expectations?	Structured interview	Participation at trainings and in-house education sessions; implementation of training follow up supervision; timeliness of salary; implementation of promotion scheme; availability of statutory employment benefits
6	Client satisfaction	Are community expectations of health service performance met?	Structured exit-interview	Provision of privacy and courtesy during consultancy, explanations, advice, opportunity to express state of health and ask question

Sub-tools 1, 3 and 4 are checklists, sub-tool 2 is a combination of structured interview and check-list, and sub-tools 5 and 6 are structured interviews for providers and patients. Subtool 1 covers items such as the cleanliness and physical infrastructure of the health facility (water and sanitation, waiting and service delivery area, examination room, etc.), implementation of Infection Prevention and Control (IPC) measures and the availability of essential medical equipment and supplies. Sub-tool 2 focuses on the availability of job descriptions and treatment guidelines as well as on providers' knowledge about their tasks and services to be provided. Sub-tool 3 assesses clinical consultations by means of direct observation, including adherence to the principles of clinical history, physical examination and IPC. It also includes four scenarios for direct observation of consultations with different types of patients: children under 5 years of age (Integrated Management of Childhood Illnesses, IMCI), pregnant women, fever (malaria) patients above 5 years of age, and TB and HIV suspects and patients. Direct observation is considered by the Tanzanian national health authorities an appropriate method for quality control and therefore recommended in the national supportive supervision guidelines (Panda et al., 2015). Sub-tool 4 investigates the availability of medicines and supplies, general patient information and Information, Education and Communication (IEC) material. It also captures staffing levels and compliance with record keeping as well as reporting requirements, mandatory meetings and supervision visits at the health facility. Sub-tool 5 examines whether staff have received training, in-house education sessions, training follow up supervision, promotion, regular salary payments and other statutory employment benefits. Based on exit interviews with patients sub-tool 6 captures client satisfaction in terms of patient privacy, staff friendliness, explanations and advice provided by the medical personnel, and opportunity to express state of health and to ask question during consultation.

Each sub-tool contains one or more quality standards accompanied by a set of verification criteria. Standards are qualitative statements defining quality expectations. The criteria are measureable, quantifiable indicators which determine whether the standards have been met. Each criterion is assigned a weight between 1 and 5: 1 indicates a less important criterion, and 5 indicates that the criterion is essential for good quality care. An example of a quality standard is: "Does the provider adhere to principles of clinical history and physical examination?", in sub-tool 3. The corresponding verification criteria are "the provider asks open-ended questions", "the provider systematically performs a physical examination as required on an individual basis", etc. (Table 8). Each criterion can be answered with either "yes" (value = 1), "no" (value = 0) or "Not Applicable" (NA). A criterion does not apply if the health facility does not have certain tools and infrastructure or delivers specific services.

Table 8 Example of the sub-tool structure: Sub-tool 3: Knowledge, skills and ethics of healthcare providers.

Indicator	Quality standard to be met	Sub-indicator	Weight	Verification criteria	Score: YES=1, NO=0, NA=99
3.1	Does the provider adhere to principles of clinical history and physical examination?	3.1a	3	The provider greets the client.	
		3.1b	3	The provider sees the client in privacy.	
		3.1c	4	The provider recognizes and addresses non-verbal communication from the client.	
		3.1d	4	The provider asks open ended questions during history taking.	
		3.1e	4	The provider gives the client the opportunity to ask questions, listens and responds.	
		3.1f	4	The provider performs physical examination systematically as per individual case requirement.	
		3.1g	4	The provider requests / performs investigations required and gives clear explanations to the client concerning the purpose of tests and the procedures.	

#### Score calculation with the e-TIQH

To determine the quality level for each dimension (sub-tool), a percentage of the maximum possible number of points is calculated. In a first step the average percentage score for each verification criteria is computed, which depends on two factors: the number of responses (healthcare providers or patients interviewed) or direct observations and whether the verification criterion was met (i.e. answered with "yes"). In a second step this score is weighted according to the weight which was attributed to the verification criterion in question (1–5). Therefore the total number of points achieved is yielded by dividing the sum of the weights of all average percentage scores per verification criteria by the total number of points achievable. The maximum possible number of points for the respective sub-tools is given in Table 9. In a dispensary one to three providers need to be interviewed with sub-tool 2 and 5. while in hospitals 10 interviews with providers are needed. This approach is flexible and consistent with the purpose of the tool but the amount of data generated necessitates automated data analysis. Finally, the overall quality in a given health facility is calculated as the average percentage score across all six quality dimensions (sub-tools), This score can be used to compare health facilities of a council or even councils and regions, which may be of relevance for resource allocation processes or result-based payments of providers and councils.

**Table 9** Verification criteria and maximum number of points per quality dimension/sub-tool.

Qu	Quality dimension / sub-tool Verification criteria and maximum number of points					
1.	Infrastructure and equipment of the health facility	41 indicators, 117 points				
2.	Job expectations	17 indicators, 34 points*				
3.	Knowledge, skills and ethics	124 indicators, 477 points**				
4.	Health facility management and administration	33 indicators, 217 points				
5.	Staff motivation	23 indicators, 66 points*				
6.	Clients' satisfaction	6 indicators, 24 points*				
		TOTAL: 935 points				

<sup>\*</sup>Maximum number of points per provider/patient interviewed.

<sup>\*\*</sup> Maximum number of points if all four clinical scenarios are observed.

#### Structure and presentation of the e-TIQH

The electronic version was developed by Vodafone Company UK. It comprises a "front end", i.e. a handheld data collection device (a tablet computer or a smart phone) for the assessors/supervisors, and a "back end", i.e. a user-friendly dashboard for decision makers with an overview of results, accessible via a laptop, personal computer or a smart phone.

#### Front end

The assessor downloads the assessment tools and stores them on the handheld device. At each assessment, he or she chooses one of the six tools and works systematically through the checklist or questionnaire (Figure 9 and Figure 10). Once completed, the overall score for the assessment appears (Figure 11). A list with all verification criteria can also be accessed, whereby criteria marked in green were met and those marked in red were not met. This enables the assessor to give immediate detailed feedback to the provider regarding their own performance or that of the facility, and discuss possible improvement measures.



Figure 9 "Front end" of e-TIQH – start pages.

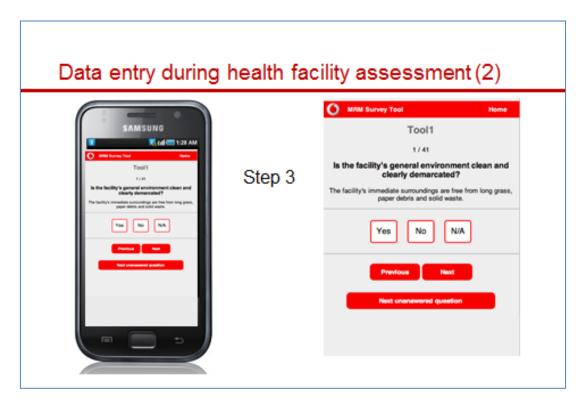


Figure 10 "Front end" of e-TIQH. Only one question displayed on the screen at a time.

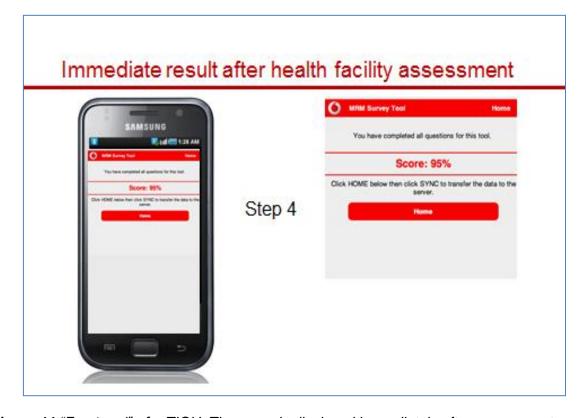


Figure 11 "Front end" of e-TIQH. The score is displayed immediately after assessment.

#### Back end

The system automatically generates statistical reports once the data has been uploaded from the front end device. These can be viewed immediately using a password-protected website by health system managers and decision makers. The following standardized analyses are provided by health facility, council or region:

- 1. Overall quality across all six dimensions
- 2. Quality level in each of the six dimensions (Figure 12) with disaggregated data by verification criterion
- 3. Quality with regard to disease-specific care (e.g. children under 5 years) (Figure 13) with disaggregated data by verification criterion
- 4. Quality of services by health facility ownership category (faith-based, public, private or institutional)
- 5. Historical trends for a given health facility, council or region, and for ownership categories or disease-specific care.

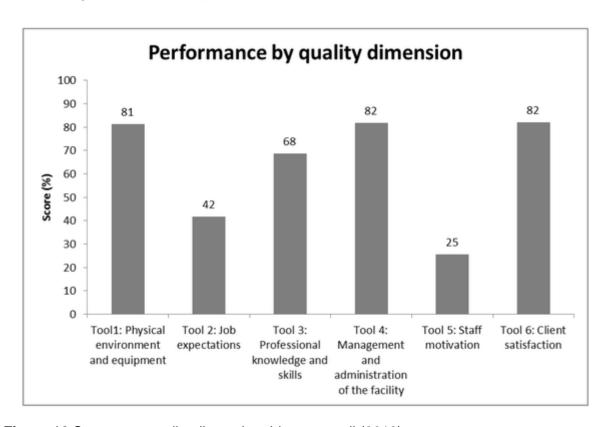


Figure 12 Scores per quality dimension, Iringa council (2012).

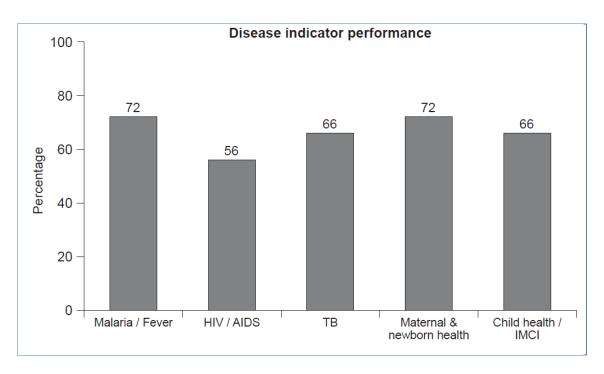


Figure 13 Disease-specific score, Kilosa council (2012).

#### Use of the e-TIQH in the context of supervision activities

The Tanzanian health sector, as other public sectors, is characterized by decentralization by devolution. This principle links decentralization of public service provision e.g. in health and education to devolution of political powers to lower levels as far as possible and feasible. Accordingly, the Tanzanian President's Office for Regional Administration and Local Government (PO-RALG) oversees and guides the implementation of the policy but local councils have the discretionary power to plan, budget, administer and organize services. At the regional level, Regional Health Management Teams (RHMTs) are strategically positioned to assist the central level in its supervisory and technical support role. RHMTs provide managerial support to CHMTs to ensure delivery of quality health services, particularly by conducting routine supportive supervisions to CHMTs. They also have a role in quality improvement of district plans and reports by doing administrative verification after submission of plans and reports by CHMTs and thereafter monitor the progress of the implementation in respective councils within a region. There are various oversight committees at the council level including the Council Social Services Committee (CSSC) which is in charge of education, water and health issues in the council. This committee also oversees the Council Health Services Board (CHSB) which is the governance body overseeing health operations and approving CCHPs and budgets. At operational level, the CHMTs, headed by the District or Municipal Medical Officer (DMO/MMO) are responsible for all health-related activities. The

Health Facility Governing Committee (HFGC) oversees the operations at facility level, including the funds generated from cost-sharing arrangements (Kessy, 2014).

For the e-TIQH assessment, CHMTs form the core of the assessment teams. However, to maximize objectivity and minimize bias community representatives of the CHSB or the CSSC, providers of private health facilities, as well as selected healthcare professionals from the council, are also assigned to the assessment team. In each council, two teams of six people each conduct annual quality assessments in all primary healthcare facilities (dispensaries, health centres and out-patient departments in council hospitals).

Before the arrival of the assessment team, the chair of the CHMT, who is the District (in the case of a district council) or Municipal (in the case of municipal council) Medical Officer (DMO or MMO) notifies the staff member in charge. Upon arrival, the assessment team leader gives a short overview of the aims and procedures for the visit, either to all staff on duty at a dispensary or health centre, or to the medical director, matron(s), hospital administrator(s) and the doctors and nurses in charge of out-patient departments at a hospital. Each of the six members of an assessment team is then assigned to one sub-tool according to his or her expertise and experience. They first observe the physical environment and check the availability of equipment and tools. This is usually recorded by an assessment team health officer in collaboration with the other five team members. They withhold their comments until the health officer has recorded all details. The other five quality areas are then assessed concurrently. Interviews with healthcare providers about job expectations, and direct observations of clinical consultations, require a team member with a medical background. Tool 4 (administration and management of the health facility) and tool 5 (staff motivation) are usually managed by a CHMT member. To complete tool 4, the assessor also receives a list of all essential medicines and supplies which should be available in the health facility. Tool 6 (client satisfaction) is usually managed by the Chairperson of the CHSB or CSSC, most often a Councillor. Depending on the type of health facility, 3–10 medically trained healthcare providers are interviewed with regard to job expectations. The same number of providers (clinicians or nurses) is observed during clinical consultations. Between 5 and 10 trained healthcare providers or patients are interviewed for the assessment of staff motivation and client satisfaction, respectively. Once all the assessors have completed their work, the data are uploaded via a mobile data link to a secure central server. If no internet connection is available, data are stored on the device and uploaded automatically once a connection is established.

#### Post-assessment activity

After completion of the assessments, the assessment team assembles in a separate room to compile a summary sheet of the main observations per quality dimension, including strengths and weaknesses. Then, immediate feedback is given to the health providers and the Chairperson of the HFGC. Even without internet access, the assessors can view the score of each checklist or questionnaire and go systematically through it to show the provider which verification criteria were met (marked in green) and which ones were missed (marked in red). The focus of the feedback session is to first identify quality gaps that can be addressed by the providers and their HFGC without support from the council health authorities. Feedback is followed by a discussion of potential solutions to overcome quality gaps, including issues that need to be addressed by the council or higher level. Finally, one copy of the summary sheet is left with the facility manager; the other is kept by the CHMT as a reference for the conventional quarterly supervision visits that do not include quality assessments.

The key results are disseminated to the DMO/MMO and the CHMT. Since the DMO/MMO is registered as a statistics user, he or she can view all results online. Comprehensive findings and possible measures to address the quality gaps are discussed in an annual forum which includes representatives of council authorities (the Council chairperson, selected councillors, the Council Executive Director, the Council Planning Officer, the CHMT and CHSB members), the managers and the HFGC chairpersons of all health facilities in the council, and the owners of private, faith-based and institutional health facilities. A representative from the RHMT and other interested stakeholders such as locally-active NGOs, are also invited. During the forum representatives from the facility level develop an action plan to be implemented at their level, while the council concentrates on measures to be taken at its level. Inputs of all stakeholders are then combined and used for evidence-based planning and budgeting at council level. In councils with a large number of health facilities, the council level forum is followed by zone-based forums to cover all facilities.

#### Development and validation of the electronic version of the tool

The tool was developed in two stages. During the first stage (2007–2010), a preliminary paper-based tool introduced by the Ministry of Health, Community Development, Gender, Elderly and Children with support from United States Agency for International Development in the late 1990s and subsequently adapted by the United Nations Population Fund for use elsewhere in Tanzania was field-tested in 2007 in several health facilities of two pilot district councils, Ulanga and Kilombero. After this first test run all quality standards and criteria were reviewed and adapted in consultation with key stakeholders, including clinical experts and representatives from the Ministry as well as regional and council health management teams.

This process strictly followed existing national treatment and other guidelines. In the absence of a gold standard against which e-TIQH could be validated, this was considered the best option to ensure validity of the chosen verification criteria. Through unambiguous and clear wording of the verification criteria, additional short explanations for some of the verification criteria and high quality training of the assessors, we strived to allow for reliability of e-TIQH. The tool was then rolled out in all the health facilities in the two pilot district councils, followed by further refinements of the questionnaire and the method of calculating scores per quality dimension. To do this, health facility staff was asked about their experience after each round of interviews, with the aim of identifying missing data. Moreover, the stakeholders agreed on an appropriate weighting system.

During the second stage (2010–2011), the tool was transferred into its electronic format and validated qualitatively and quantitatively using 2010 data, which was available in both the paper-based and electronic formats. For the quantitative part, it was first verified that all quality standards and related criteria were captured in the "front end". Then, mean scores by council (across all quality dimensions and all health facilities) were compared between the automated analyses of the electronic version and results generated from the paper-based data collection to ensure 100 % consistency.

As part of the qualitative validation of the electronic format, user friendliness of the electronic tool was assessed. After the initial one-day training, assessors navigated without major difficulties through the application, and there were no problems with downloading the application and uploading data. Furthermore, the electronic assessment of a dispensary took on average 1.5 h to complete, compared to 3 h with the paper-based version. Finally, data entry mistakes could be reduced through: 1) a programmed data entry mask (e.g. only one question/criterion visible per electronic page); 2) a "bounce-back" function if a question was not answered; and 3) internal consistency checks.

## 4.4 Results

Preliminary results are reported here based on data from 2011 to 2013, for illustrative purposes only.

#### e-TIQH coverage

The electronic version was first introduced in 2011 in two pilot councils in Tanzania, Ulanga and Kilombero, and was then extended in 2012 and 2013 to a further six councils. In total, these councils include more than 2.5 million people served by 467 health facilities, accounting for approximately 7 % of the country's health facilities (Ministry of Health and Social Welfare and Prime Minister's Office Regional Administration and Local Government, 2013). In 2013, 431 (92 %) of these 467 health facilities were assessed: 14 were hospitals, 43 were health centres and the remainder were dispensaries (Table 10).

#### Baseline quality of health service provision

Baseline scores were documented when e-TIQH was introduced (Table 11). A score below 75 % was considered "unsatisfactory".

Staff motivation and job expectations scored lowest of all quality dimensions. Except for the pilot councils of Ulanga and Kilombero, all other councils scored <45 % for staff motivation. Even in Ulanga and Kilombero, where quality assessments based on an earlier pilot version of the tool had been introduced in 2008, the score at the time of e-TIQH introduction was <50 %. For job expectations, baseline scores did not exceed 50 % other than in the two pilot councils (Kilombero: 61 %; Ulanga: 76 %) and in Kilosa/Gairo (67 %), where quality assessments based on the earlier pilot version began in 2010. Quality with regard to clinical practice (professional skills, knowledge and ethics) of healthcare providers was unsatisfactory in the year of e-TIQH introduction with all councils other than Ulanga and Bagamoyo scoring <75 %. Thus, in these councils at least one in four standard procedures with regard to patient-provider communication, counselling, diagnosis and treatment were not followed by healthcare providers.

Table 10 e-TIQH coverage in eight councils of Tanzania, based on the 2013 assessment.

	Council		e-TIQH assessment coverage				
Region/Council <sup>1</sup>	Population <sup>2</sup>	No. of health facilities	No. of assessed health facilities <sup>3</sup>	Dispensaries <sup>4</sup>	Health centres	Hospitals	
Morogoro Region							
Ulanga DC	265,203	37	37	32	3	2	
Kilombero DC	407,880	58	55	49	5	1	
Kilosa/Gairo DC	631,186	81	75	64	8	3	
Mvomero DC	312,109	63	57	48	6	3	
Morogoro DC	286,248	65	55	48	7	0	
Iringa Region							
Iringa MC	151,345	28	28	22	4	2	
Coast Region							
Bagamoyo DC	311,740	66	64	58	5	1	
Rufiji DC	217,274	69	60	53	5	2	
Total	2,582,985	467	431	374	43	14	

<sup>&</sup>lt;sup>1</sup>DC = District Council; MC = Municipal Council

<sup>&</sup>lt;sup>2</sup>United Republic of Tanzania 2012

<sup>&</sup>lt;sup>3</sup>Out of 467 facilities 36 could not be assessed because the health facility was closed down temporarily by the Ministry of Health and Social Welfare for lack of providers or unsatisfactory infrastructure (14); the health facility was only opened in 2014 (1); facilities were too remote and not reachable by car due to floods or lack of bridges (14) personnel were on leave at the time of assessment (5); access was denied (military base) (2). Not all facilities were assessed in all years

<sup>&</sup>lt;sup>4</sup>Between the start of the e-TIQH exercise in 2011 and the end of the reporting period in 2013 four dispensaries were upgraded to health centres.

Table 11 Assessment results by quality dimension (tool) and year, by council (score %).

Council/Year	Tool 1 Infrastructure and equipment	Tool 2 Job expectations	Tool 3 Skills, knowledge and ethics	Tool 4: Administration and management	Tool 5 Staff motivation	Tool 6 Client satisfaction	Mean <sup>1</sup>
Morogoro Region							
Ulanga District Council							
2011 (n=31)	82.1	75.5	87.4	69.9	49.2	93.7	76.4
2012 (n=35)	80.2	76.5	84.8	74.5	65.2	92.6	79.0 ***
2013 (n=37)	78.9	77.7	90.3	75.1	71.7	96.6	81.8 ***
Kilombero District Council							
2011 (n=50)	84.9	61.5	69.9	75.5	45.3	86.9	70.1
2012 (n=51)	84.4	65.3	69.5	84.9	52.9	81.5	73.1 *
2013 (n=55)	80.8	71.2	75.3	82.3	62.9	84.4	76.2 ***
Kilosa/Gairo District Council							
2012 (n=71)	70.2	67.0	74.2	73.3	43.2	77.9	67.7
2013 (n=75)	76.1	70.4	77.8	78.5	49.4	83.9	72.5 ***
Mvomero District Council							
2013 (n=57)	62.8	44.9	65.5	66.3	34.5	77.5	58.5
Morogoro District Council							
2013 (n=55)	58.1	38.0	60.5	59.9	36.0	80.9	55.8
Iringa Region							
Iringa Municipal Council							
2012 (n=25)	81.1	41.5	68.5	81.7	25.4	81.9	63.6
2013 (n=28)	85.1	53.8	80.9	82.4	33.9	85.6	70.3 ***
Coastal Region							
Bagamoyo District Council							
2012 (n=61)	60.7	49.5	77.7	69.3	37.9	81.3	62.7
2013 (n=64)	72.0	55.8	77.0	72.8	41.7	81.1	66.8 ***
Rufiji District Council							
2012 (n=53)	56.5	41.0	61.6	68.8	31.5	68.1	54.6
2013 (n=60)	57.8	49.8	63.9	68.4	34.6	72.1	57.8 **

<sup>1</sup>Asterisks are presented for general orientation purposes and refer to p-values of paired t-test comparing mean post-baseline score to mean baseline score: \* <0.05, \*\* <0.01, \*\*\* <0.001.

Note however that the mean difference tested cannot be exactly derived from means reported in the table as it is computed for complete pairs.

Scoring for availability of infrastructure and equipment were relatively low in the rural district councils (56–70 %), but higher in the Iringa municipal council (81 %), an urban council with a smaller number of relatively well-equipped health facilities, and in the two pilot district councils of Ulanga and Kilombero (82–85 %). A similar pattern was seen regarding the administration and management of health facilities: Kilombero (76 %) and Iringa (82 %) scored above the threshold of 75 % while the remainder scored 60–73 %. In contrast, client satisfaction as reported by patients (or their caregivers) during exit interviews was generally high: scores ranged from 68 % in the remote rural district council of Rufiji to 94 % in the pilot district council of Ulanga.

#### Trends in quality of health services

Changes over time in the overall quality of health services were assessed in the six councils where at least two consecutive electronic assessments were performed, comparing baseline and post-baseline values by a paired *t*-test. Each council showed a statistically significant increase of 3–7 % in mean score, with the most pronounced improvements in staff motivation and job expectations, the two quality dimensions with the lowest initial score. In Ulanga, Kilombero and Iringa councils, the score for staff motivation increased substantially between 2011 (2012 for Iringa) and 2013 by 23 %, 17 % and nearly 9 %, respectively. However, the absolute score remained at ≤50 % in almost all councils, and no council achieved a satisfactory level (≥75 %). The score for job expectations increased by around 10 % in Kilombero, Iringa and Rufiji but except for Ulanga job expectations remained 'unsatisfactory' in all other councils with scores as low as 50 % in Rufiji.

Improvements in clinical practice and facility administration and management were slightly less marked. Iringa municipal council improved its score in clinical practice by more than 10 % within one year (from 68 % in 2012 to 81 % in 2013), while the other councils showed an increase of 2–5 %. Only Bagamoyo remained unchanged at approximately 77 %. Five of the six councils where at least two assessment rounds had been carried out scored above 75 %, with Ulanga reaching 90 %. For health facility administration and management, increases ranged from 4 to 7 %, with the exception of Rufiji and Iringa. Four councils reached a score >75 %, with Iringa and Kilombero achieving the highest scores (82 %).

In terms of the physical environment and availability of functional equipment, increases of around 4–11 % within one year were seen in the Kilosa/Gairo, Iringa and Bagamoyo. Results for this quality dimension were more heterogeneous, however: Rufiji remained at a low score (58 %), and the score for the two pilot district councils of Ulanga and Kilombero declined, though from a high level.

Client satisfaction increased in all councils, except for Kilombero (2011: 87 %; 2013: 84 %), and Bagamoyo, which showed a slight downward trend. Notably, the level of satisfaction in Ulanga was 97 % in 2013.

#### 4.5 Discussion

The e-TIQH assesses a comprehensive range of structural and process aspects of quality in health service provision. The dimensions of infrastructure, equipment, job expectations and facility administration and management mainly contain structural elements, while the areas of professional knowledge, skills and ethics and staff motivation include many procedural aspects. The low score levels in staff motivation observed from preliminary data underline the importance of evaluating the process aspects of quality.

A key element of e-TIQH is that its technology can be applied independently by CHMTs. Experience from the eight participating councils shows that council health staff can handle assessments after proper introductory training and coaching without the help of technical experts. This is mainly because the electronic version includes pre-specified standardized analyses and no data cleaning or analyses have to be performed. E-TIQH reduces the data entry bias and the need for technical and managerial skills which addresses one of the previously stated challenges of routine supportive supervision. Moreover, the technology makes it possible to give real-time feedback which is key to effective mentorship (Manzi et al., 2014).

A second key characteristic of presented methodology which is often lacking in both quality assessment tools and supportive supervision approaches is the evaluation of clinical practice, in the case of e-TIQH through direct observation (Chambers and Long, 1995, Bradley et al., 2013, Nickerson et al., 2014, Bailey et al., 2016). Whilst this method has its merits, it also has limitations: the presence of the assessor might lead to changed provider behaviour and hence biased data. Standardized patients, often considered as gold standard, and clinical vignettes may measure quality more rigorously and control for case mix, but they do not seem feasible alternatives in the framework of routine supervision. Both methods are relatively expensive and in the case of standardized patients, they are ethically questionable (Peabody et al., 2000). Another limitation of direct observation especially in low-income settings is that it requires qualified assessors with solid medical expertise in order to do ensure reliability of the method (Bailey et al., 2016). But even standardized patients method and vignettes require properly trained and instructed observers or interviewers. A validation study comparing direct observation by CHMTs for example with clinical vignettes would generate further evidence on the methodological robustness of e-TIQH.

Moreover, the fact that CHMTs indirectly are assessing their own performance in terms of quality improvements may lead to biased assessments and better results. An accreditation system operating independently from supervision processes, with assessments conducted

by national and regional health authorities may help to control potential bias. Another option could be to deploy CHMT members from neighbouring councils to assess the health facilities of the council in question. This has been done twice in the two pilot district councils of Ulanga and Kilombero. As a rule, members of CHTMs should not measure quality in those health facilities of which they are otherwise in charge in the frame of supportive supervision.

Finally, as for any supervision or assessment activity, the real challenge for effectively implementing e-TIQH on a broader scale will be institutional and financial sustainability (Bailey et al., 2016). Supervisors need to be adequately skilled, willing to organize and conduct supervision and facilitate follow-up measures, and have sufficient resources to carry out visits. Council and regional health managers need to consult the evidence which is generated and make use of it in their resource planning. Continuous quality improvement must become part of an organizational culture for both assessors and providers.

The presented results illustrated that the e-TIQH-based analysis provides a fairly comprehensive synopsis of quality gaps. For health facilities mainly located in rural Tanzania, the quality dimensions with the lowest scores were staff motivation and job expectations. This may have contributed to the modest clinical practice observed, and hence presents a threat to quality healthcare provision. Although the standardized statistical e-TIQH reports do not provide evidence on the causes for low staff motivation and job expectations, or determine the drivers for observed improvements, some potentially significant aspects have emerged that merit further research. They can be analysed in forthcoming papers with the e-TIQH data set. First, anecdotal evidence suggests that quality assessments which are embedded in supervision activities and not solely limited to a review of records and medical supplies may increase staff motivation (Valadez J. et al., 1990, Bailey et al., 2016). An important element for this seems to be the immediate feedback to providers after assessment and subsequent collaborative problem-solving including action plans, especially when it is coupled with consistent follow-up from the CHMTs (Bradley and Igras, 2005, Suh et al., 2007, Agha, 2010). For instance, council health staff in Kilombero, Ulanga, Iringa and Mvomero have established regular follow-up by phone and physical visits for health facilities with low quality scores to discuss and check progress on agreed improvement measures. Regular follow up supervision, as stipulated in the Tanzanian national supportive supervision guidelines, is essential for the assessments to be of value because health facilities in the eight studied councils have only benefitted from one assessment exercise per year due to resource and time constraints. Addressing the quality gaps identified in the previous assessment round requires some time. However, two assessments per year would be ideal. Another example is a meeting between council health authorities, the project team and healthcare providers from faith-based facilities and church representatives in Ulanga and

Kilombero district councils to address low staff motivation in these facilities due to irregular salary payments. In some councils, e-TIQH assessment scores were used by councils on the occasion of World Workers Day to reward providers of the best-performing facilities.

With regard to job expectations, providing missing job descriptions and essential treatment guidelines may have contributed to the increase in scores for this quality dimension. Immediate feedback after direct observation of clinical consultations and targeted on-the-job training (e.g. on infection prevention and control and clinical skills) may have played a role in the positive trend in professional knowledge, skills and ethics observed in health workers in Ulanga, Kilombero, Kilosa/Gairo and Iringa.

Regarding the changing scores for physical environment and equipment, some of the encouraging increases in Kilosa/Gairo, Iringa and Bagamoyo councils could be due to the fact that e-TIQH results informed the council health authorities to budget accordingly in their CCHP. On the other hand, the decreasing scores of the two pilot districts councils Ulanga and Kilombero from a baseline score above 80 % suggest that maintaining infrastructure and equipment over time is a challenge to many health facilities.

A surprising result was the relatively high level of client satisfaction across all councils, contrasting with the low level of staff motivation and the modest score for technical quality of care. This could mean that healthcare providers do not show their frustrations and low motivation when managing patients, or that patients have low expectations with regard to provider behaviour. It may also reflect the fact that most patients cannot judge the professional knowledge and skills of healthcare providers, but appreciate the availability of medicines and the friendliness of staff. Methodological reasons may also have contributed: since client satisfaction is assessed through exit interviews conducted near the health facility, clients may not want to disclose their true opinion in case of sanctions from the healthcare provider. Home interviews conducted as part of the community or household survey would be more reliable than exit interviews (Glick, 2009) but are logically unfeasible in the framework of supportive supervision exercises.

The fact that the pilot district councils of Ulanga and Kilombero scored higher in many of the quality dimensions than the rest of the assessed councils may indicate a benefit over time of the e-TIQH-based assessments that are embedded in regular supportive supervision activities. In 2008, these two district councils introduced a paper-based forerunner of e-TIQH and have therefore benefitted from the intervention over a longer period of time.

### 4.6 Conclusion

The quality of health services must be improved if the goal of UHC in low- and middle-income settings is to be advanced. Extension of service coverage and provision of social health protection for disadvantaged populations will not alone achieve the health-related SDG targets. With the strategic objective of "achieving objectively measurable quality improvement in primary healthcare services", the upcoming fourth Tanzanian Health Sector Strategic Plan (2015–2020) embraces this rationale. By linking regular systematic quality assessments to supervision activities, e-TIQH may not only contribute to objectively measuring quality of primary healthcare, but also to facilitating evidence-based supervision. At the same time, e-TIQH provides important information for resource planning at higher level which is important to address structural quality gaps that cannot be solved at provider level.

The strengths of e-TIQH are its multi-dimensional quality concept and comprehensive data analysis as well as its manageable technology which enables CHMTs to do systematic assessment work and eases its integration in their supportive supervision activities. Immediate structured feedback, discussions on how to address quality gaps and the development of action plans put health workers and HFGCs in an active role to pursue quality improvement.

In terms of planning and budgeting health interventions, e-TIQH can inform the allocation of resources for CCHPs, national health sector strategic plans and even national proposals for global financing facilities. If effectively implemented and used, e-TIQH can contribute to more effective decentralization in the health sector by providing an innovative tool to councils for facilitating supportive supervision and improving the quality of healthcare delivery.

# 4.7 Acknowledgment

We thank Vodafone Company UK for the development of the electronic version of the tool as well as for its competent and prompt service delivery.

### 4.8 Declarations

### **Funding**

The e-TIQH study was fully funded by the Novartis Foundation.

### Availability of data and material

The datasets generated during and analysed during the current study are not yet publicly available because a series of additional papers is currently being prepared that relies on these datasets. However, the datasets are available from the corresponding author on reasonable request.

### **Authors' contributions**

DM and AS wrote the manuscript; SA, SR and DM cleaned the data; SA, SR and DM analysed the data, and CL, FK, BVP, SA, SR, MAM and CM commented on and made critical contributions to the manuscript. All authors contributed to the design of the study and the interpretation of the results. All authors read and approved the final manuscript.

### Competing interests

The authors declare that they have no competing interests.

### **Consent for publication**

Not applicable.

### Ethics approval and consent to participate

The intervention study protocol was approved by the respective Review Board of the National Institute for Medical Research (reference number: NIMR/HQ/R.8a/VOL.IX/236) and the Ifakara Health Institute (former Ifakara Health Research and Development Centre) (reference number: IHRDC/IRB/No.A:018). Verbal informed consent was obtained from all healthcare providers and patients (in the case of children from their caretakers) who participated in the health facility assessments. These included the observation of clinical consultations as well as provider and patient satisfaction interviews.

# 5.Towards improved health service quality in Tanzania: Appropriateness of an electronic tool to assess quality of primary healthcare

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Short title: Appropriateness of an electronic quality assessment tool

Under review as a companion paper with chapter 6 in the International Journal of Health Planning and Management

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### 5.1 Abstract

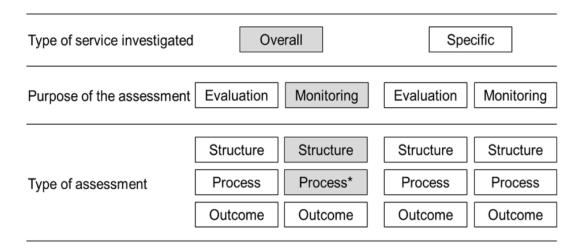
Progress in health service quality is vital to reach the target of Universal Health Coverage. However, in order to improve quality it must be measured and the assessment results must be actionable. We analysed an electronic tool, which was developed to assess and monitor the quality of primary healthcare in Tanzania in the context of routine supportive supervision. The electronic assessment tool focused on areas in which improvements are most effective, in order to suit its purpose of routinely steering improvement measures at local level. Due to the lack of standards regarding how to best measure quality, we used a range of different quantitative and qualitative methods to investigate appropriateness of the quality assessment tool. The results showed good consistency across the methods, underpinning the accuracy of the assessment tool to measure and monitor quality of primary healthcare for its intended purpose. This was true for different level and owner categories of primary healthcare facilities. However, the results also revealed that the use of the electronic assessment tool outside its intended purpose, for example for performance-based payment schemes, accreditation and other systematic evaluations of healthcare quality, should be considered carefully because of the risk of bias, adverse effects and corruption.

Key Words: Quality of care, quality assessment tool, Tanzania, electronic tool, supportive supervision, universal health coverage

### 5.2 Introduction

A core part of Universal Health Coverage (UHC) is access to essential health services of sufficient quality to be effective (World Health Organization, 2010). To assess health service coverage the UHC monitoring framework uses the concept of effective coverage (World Health Organization and World Bank Group, 2014). Effective coverage is given when people who need health services obtain them in a timely manner and at a level of quality that allows achieving the desired effects (World Health Organization and The World Bank, 2015a). Thus, effective coverage combines intervention need, use and quality. It stands in contrast to crude coverage, which only focuses on intervention access or use (Ng et al., 2014). Consequently, to reach the target of UHC, it is vital to address the issue of quality of healthcare. Therefore, it must be assessed and monitored and the results have to be actionable. However, data on quality of healthcare in low- and middle-income countries (LMICs) is hardly available (Boerma et al., 2014, Akachi et al., 2016, Akachi and Kruk, 2017). This is consistent with the previous focus on increasing access and use rather than on providing high-quality services (Akachi et al., 2016). Additionally, quality of care is much more difficult to assess routinely, and no agreed means to monitoring quality exist (Roemer and Montoya-Aguilar, 1988, Horton, 2014). Current quality measures are insufficiently validated and not implemented consistently, making it hard to compare between settings (Akachi et al., 2016, Akachi and Kruk, 2017).

Generally, the design of healthcare quality measurements is given by the service whose quality is being investigated as well as the purpose and the type of assessment (Figure 14) (Edward et al., 2009).



**Figure 14** Design options of healthcare quality assessment tools. Shaded in grey the design of the e-TIQH assessment tool; asterisk indicates the uniqueness of the e-TIQH assessment tool.

Quality assessment tools found in literature either look at overall quality of care, or focus on more specific services (for example on HIV/AIDS). Some tools primarily aim to systematically evaluate service quality with the purpose of providing evidence for national policy, planning or management decisions, as well as for accreditation and licensing (Hozumi et al., 2006, Edward et al., 2009, Nickerson et al., 2014, Johnson et al., 2016). When examining overall quality of care, such assessment tools tend to be lengthy, time-consuming and technically demanding (Edward et al., 2009). In contrast, other tools mainly intend to routinely monitor service quality with the purpose to either report on progress made or steer improvement measures at local level (Hozumi et al., 2006, Edward et al., 2009, Nickerson et al., 2014).

In terms of quality measurement type, Donabedian proposed to distinguish between structure, process and outcome assessments (Donabedian, 2005). Outcome assessments measure the medical outcomes of care, but their usefulness is limited due to the attribution gap between quality of care and outcomes (Donabedian, 2005, Edward et al., 2009). Thus, process assessments, which examine the process of care delivery itself, might be more relevant for whether healthcare is properly practiced (Gilson et al., 1995, Donabedian, 2005). Lastly, structure assessments refer to the setting in which healthcare takes place (Donabedian, 2005). However, also here a direct link between increased structural quality and better health outcomes is weak (Donabedian, 1988, Donabedian, 2005, Lindelöw and Wagstaff, 2003). Hence, this suggests that quality of care is more effectively improved when targeting process elements (Peabody et al., 2006). Concretely, this means that for quality assessment tools, which primarily aim to routinely steer improvement measures, it might be most effective to focus on processes as well as some structural key indicators, which are

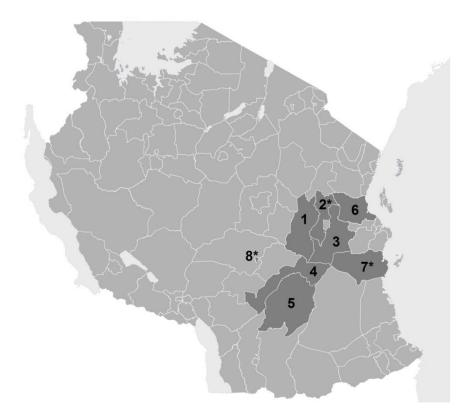
relevant to assess if structures are of sufficient quality (adequacy). Focusing on healthcare processes would also be in-line with what was proposed as an approach for measuring effective coverage (Ng et al., 2014). This also implies that such assessment tools would not need to be fully comprehensive to accurately fulfil their purpose, making it more feasible for routine measures in resource constraint settings. However, so far monitoring overall quality of care mainly focused on the structural part of quality by examining the existence of structures (availability) and leaving adequacy under-explored (Hozumi et al., 2006, Edward et al., 2009, Nickerson et al., 2014, Sprockett, 2016, Akachi and Kruk, 2017). Assessment tools monitoring specific services usually use an approach combining structural and process elements (Hozumi et al., 2006, Edward et al., 2009, Nickerson et al., 2014, Sprockett, 2016). Yet, it is important to look beyond a single service area to assess primary healthcare more generally in a harmonized holistic way (Edward et al., 2009).

Apart from assessment tools developed for specific services, there is, to the best of our knowledge, hardly any documentation about quality assessment tools in LMICs that focus on processes and structural adequacy of healthcare for the purpose of routinely steering improvement measures. To fill this gap, we systematically evaluated an approach developed in Tanzania as part of the "Initiative to Strengthen Affordability and Quality of Healthcare". The aim of the approach was to improve quality of primary healthcare through strengthening routine supportive supervision of healthcare providers, as conducted by Council Health Management Teams (CHMTs). In a first step a systematic assessment of quality of primary care was carried out in all health facilities within a given council, using the "electronic Tool to Improve Quality of Healthcare (e-TIQH)". The assessment was always concluded with an immediate constructive feedback to the healthcare providers, and joint discussions about how to address the identified quality gaps. In a second step, the findings were discussed at council level with all relevant stakeholders, providing important inputs for the third step, the annual council health planning and budgeting process. The supportive supervision approach and in particular the e-TIQH assessment tool itself have been described by Mboya et al. (Mboya et al., 2016). This paper now aims to examine how well the e-TIQH assessment tool measures and monitors quality of care. We tried to address the lack of a gold standard regarding how to best measure quality of care and therewith the issue of verifying validity of the assessment tool by using a range of methods. Companion and subsequent papers will further investigate if the e-TIQH approach contributed to improvements in quality of care and how the approach was able to strengthen routine CHMT supportive supervision (Renggli et al., 2017b, Renggli et al., 2017a).

### 5.3 Methods

### Measurement of quality of care

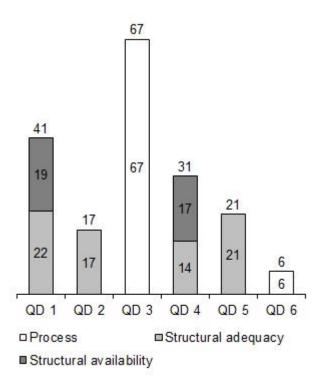
Quality of primary healthcare was measured between 2008 and 2014 in health facilities in up to eight Tanzanian district and municipal councils (DCs and MCs) (Figure 15).



**Figure 15** Map of Tanzania with councils where the e-TIQH supportive supervision approach was implemented (status 2008). Morogoro Region: (1) Kilosa DC (later split into Kilosa and Gairo DC), (2) Mvomero DC, (3) Morogoro DC, (4) Kilombero DC, (5) Ulanga DC; Pwani Region: (6) Bagamoyo DC, (7) Rufiji DC; Iringa Region: (8) Iringa MC. Asterisks mark councils selected for qualitative data collection.

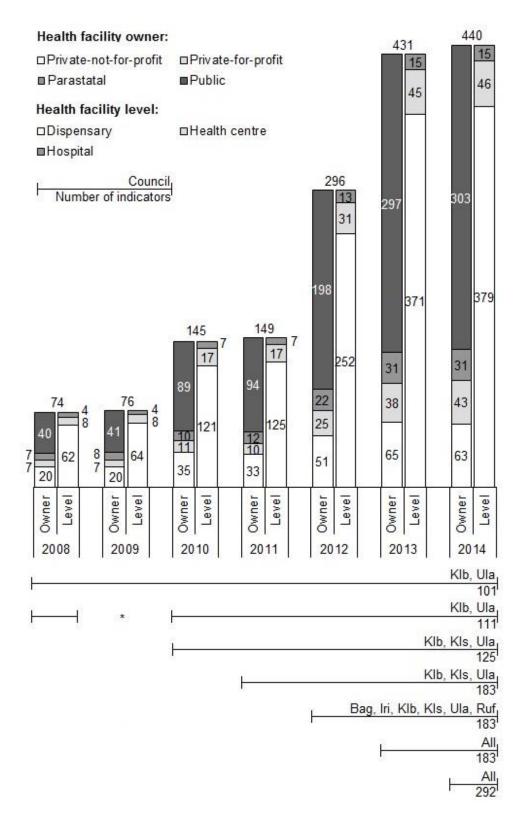
In total, six quality dimensions (QD) were assessed: (1) Physical environment and equipment; (2) Job expectations; (3) Professional knowledge, skills and ethics; (4) Management and administration; (5) Staff motivation; (6) Client satisfaction. Points were given for each indicator met, and percentage scores of total possible points were calculated per QD. The score of each QD equally contributed to the overall health facility score. The assessment methods included checklists, structured interviews and clinical observations to assess processes and some structural key indicators primarily focusing on adequacy (Mboya

et al., 2016). Figure 16 illustrates the number of indicators assessed in each QD, according to indicator type based on Donabedian's categories (Donabedian, 2005).



**Figure 16** Number of indicators assessed in each quality dimension (QD) by indicator type for the 183 indicators used. QD 1 = Physical environment and equipment; QD 2 = Job expectations; QD 3 = Professional knowledge, skills and ethics; QD 4 = Management and administration; QD 5 = Staff motivation; QD 6 = Client satisfaction

Data collection between 2008 and 2010 was paper-based, whereas from 2011 onwards this was done electronically using the e-TIQH (Mboya et al., 2016). Due to a phased introduction of the e-TIQH approach and the quality of manually entered data, the number of assessed councils, health facilities and indicators varied between years. Further, health facilities were differentiated based on their level and owner category in 2014 (Mboya et al., 2016) (Figure 17). At health centres and hospitals only out-patient departments were assessed.



**Figure 17** Number of health facilities assessed in each year across selected councils, by health facility owner and level category (bars); number of indicators assessed across years and councils (horizontal lines at bottom). Bag = Bagamoyo DC, Iri = Iringa MC, Klb = Kilombero DC, Kls = Kilosa DC (later split into Kilosa and Gairo DC), Mor = Morogoro DC, Mvo = Mvomero DC, Ula = Ulanga DC, Ruf = Rufiji DC (status 2008); All = Bag, Iri, Klb, Kls, Mor, Mvo, Ula, Ruf; \* Missing indicators due to data entry problems

### Consistency of quantitative and qualitative data

Consistency of quantitative data obtained from the e-TIQH assessments and qualitatively collected perceptions of quality of healthcare was explored across level and owner categories. Therefore, linear regression models and data from in-depth interviews complemented by observational data and informal personal communication were used. The qualitative data was also utilized to supplement the quantitative data by providing possible explanations for the results seen and assign a qualitative rank to health facilities visited.

### Linear regression model

Mixed linear regression models were developed to look at differences between QDs according to health facility level and owner categories. Health facility scores were calculated using only the electronically gathered data of 2011-2014 with 183 indicators, because of several inconsistencies in the manually entered data. Models were derived for the overall score and the six QD scores. Year, health facility level and owner were categorical variables, while the variable council was set as a random effect. Third and second order interaction terms were included and then stepwise excluded using Wald tests, whereby the variable with the highest order and p-value was excluded first. To confirm model selection the Akaike Information Criterion (AIC), which is an alternative to significance testing for model comparison, was calculated as well. Also, a sensitivity analysis was done comparing the random effect model with a fixed effect model using the robust variance estimator.

### In-depth interviews

Collection and analysis of this data was described elsewhere (Renggli et al., 2017b). In total 24 interviews at council and health facility level were conducted in three councils (Figure 15). However, to look at differences between level and owner categories only the 12 interviews done with CHMT and Council Health Service Board (CHSB) members were included into the present analysis. Interviews were conducted by a Swahili speaking female Swiss (SR) and a male native Tanzanian of middle age (IM) in the first quarter of 2016. Data were analysed using the framework method as described by Gale *et al.*, (Gale et al., 2013).

### Qualitative ranking

For qualitative data collection a total of six public dispensaries across three councils were visited (Figure 15) (Renggli et al., 2017b). Based on the information collected, the researchers (SR, IM) ranked the public dispensaries according to their personal subjective impression about overall quality of care, taking into account the six e-TIQH QDs. This purely

qualitative ranking was then compared with the rank dispensaries had achieved based on the quantitative e-TIQH assessment.

### Robustness of the e-TIQH assessment tool

Originally, the list of e-TIQH assessment indicators was developed in an iterative process and in consultation with key stakeholders. Additionally, indicator weights were assigned ranging from 1 (least important) to 5 (most important) according to their importance for quality care, relative to the other indicators. During the same process indicators were grouped in six QDs, whereas QD 3 was further divided into four sub-dimensions, making the total number of sections nine (Mboya et al., 2016). To assess robustness of the e-TIQH assessment tool the impact of changing the number and weights of indicators on health facility score and rank were investigated. We also assessed the usefulness of grouping the indicators into the nine QDs and sub-QDs through conducting a confirmatory factor analysis to test whether the factors identified were the same as those determined during the development process.

### Number and weights of indicators

To compare indicator sets consisting of different numbers of indicators, 2014 overall health facility scores based on unweighted indicators were calculated and ranked. For each health facility the positive difference in score and rank between the biggest indicator set (292) and each of the smaller in Figure 17 described sets was calculated. The differences were then averaged across all health facilities to get the average difference in health facility score and rank. The same calculations were done to compare 2014 overall health facility scores and ranks originating from weighted and unweighted indicators, using the 183 indicator set.

### Factor analysis

A factor analysis was performed with the 2014 score of 183 unweighted indicators of each health facility. The distribution of the indicators across the nine factors explaining the biggest variance was examined, in-line with the nine sections of the e-TIQH assessment tool. Each indicator was allocated to the factor to which it showed the strongest association (highest factor loading). Factor loadings range between -1 and 1 with a strong positive or negative association indicated by loadings close to 1 or -1, and a weak association with loadings close to 0. Thus, indicators with weak association to the factor they were assigned to (factor loadings between -0.4 and 0.4) were marked as they might not be relevant for predicting quality of care (Tabachnick and Fidell, 2001). Additionally, indicators were defined to be cross loaded if any of the other factor loadings was within a range of 0.2, meaning that these

indicator had no clear association to one specific factor (Bourke and Australian Council for Educational Research, 1984).

### **Ethical considerations**

Permission to publish the findings was obtained from the National Institute for Medical Research (NIMR) in Tanzania. Animal/human ethics guidelines were complied with. Ethical clearance was granted by the same institution (original: NIMR/HQ/R.8a/Vol.IX/1839, extension: NIMR/HQ/R.8c/Vol.II/521) and the Institutional Review Board of the Ifakara Health Institute (IHI/IRB/No:37-2014) in October 2014 as well as the Ethic Commission of Northeast and Central Switzerland (EKNZ 2014-347) in November 2014.

### 5.4 Results

### Linear regression model

There was a clear improvement in scores from 2011 until 2014 (Table 12). Time trends will be examined in more detail in a forthcoming paper (Renggli et al., 2017b). Differences between the six QDs were discussed in a previous paper (Mboya et al., 2016). Health centres and hospitals had a significantly better score compared to dispensaries, except for QD 5 and 6. Apart from QD 6, scores varied amongst owners. Public health facilities had a better overall score than private-not-for-profit, and private-for-profit entities had a significantly worse. For illustrative purposes, performance of health facility levels and owners for the year 2014 is shown graphically in Figure 18.

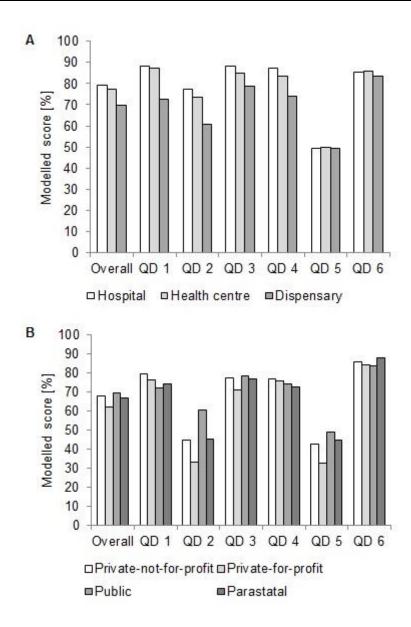
**Table 12** Differences in average overall and quality dimension (QD) scores, expressed as percentages of maximum achievable scores, according to year, health facility level and owner category, while the variable council was set as a random effect.

Variable	Overall score	QD 1	QD 2	QD 3	QD 4	QD 5	QD 6
Year (Reference category = 2011)							
2012	3.1 **	-2.7 *	1.2	-1.2	6.1 ***	10.5 ***	2.0
2013	6.5 ***	-0.4	5.8 **	2.7	7.0 ***	15.9 ***	5.4 ***
2014	8.4 ***	4.3 **	4.2 *	6.5 ***	10.2 ***	14.8 ***	7.4 ***
Health facility level (Reference category = Health centre)							
Hospital	1.8	1.1	3.7	3.3	3.7	-0.4	-0.5
Dispensary	-7.7 ***	-14.8 ***	-13.2 ***	-6.2 ***	-9.3 ***	-0.5	-2.2
Health facility owner (Reference category = Private-not-for-profit)							
Private-for-profit	-5.5 ***	-3.1*	-11.8 ***	-6.3 ***	-1.2	-9.8 ***	-1.3
Public	1.8 *	-7.5 ***	15.4 ***	1.2	-2.8 **	6.6 ***	-2.1
Parastatal	-0.9	-5.7 **	0.5	-0.4	-4.3 **	2.0	2.5
Constant	67.3 ***	90.3 ***	54.1 ***	77.0 ***	76.1 ***	28.4 ***	80.5 ***

Asterisks refer to p-values indicating the significance of a coefficient \* <0.05, \*\* <0.01, \*\*\* <0.001

For all models a large fraction of unexplained variance was attributed to the random effect (data not shown), meaning that scores were strongly correlated within councils.

QD 1 = Physical environment and equipment; QD 2= Job expectations; QD 3= Professional knowledge, skills and ethics; QD 4= Management and administration; QD 5= Staff motivation; QD 6= Client satisfaction.



**Figure 18** Performance of health facility levels (A) and owners (B) for the year 2014. In A the performance scores for public health facilities and in B for dispensaries are shown.

Models without any interaction terms performed best both according to Wald tests and the AIC. This means trends were the same independent of health facility level and owner category. The sensitivity analysis also showed no major difference between the random effect model and a fixed effect model using the robust variance estimator.

### In-depth interviews

Interviews generally pointed out issues with guideline availability (captured in QD 2), staffing levels and medicine availability (QD 4), staff benefits and rewards (QD 5), as well as with health financing mechanisms not measured by the assessment tool. The following sections

will explore the consistency of the qualitative data with the findings of the regression model regarding health facility level and owner categories.

### Differences between health facility levels

When asking about reasons for differences in healthcare quality at various levels of care, most respondents (9/12) were able to provide information. They pointed out that at higher level of care, meaning at health centres and hospitals, more services were provided (6 of the 9 above mentioned) and there was more and better qualified staff (7/9). For example a CHMT member said:

"Most of the skilled personnel can be found at hospital [and] health centre level, [which is] different from the dispensary level. But the district [council] medical officer takes into account the different types of services provided at these facilities (...) This means it's necessary to have nurses and doctors who can provide these services (...) Therefore at dispensary level you cannot find a highly skilled nurse." (Mvomero DC, CHMT member)

It was further mentioned that at higher level of care infrastructure (4/9), equipment (4/9) and medicines (1/9) were superior in terms of quantity, quality and type. In the light of limited resources, councils tended to prioritize higher level of care (5/9) and non-governmental stakeholders were more likely to support higher-level health facilities (1/9). Some of the here raised issues could be seen as given by the health facility's mandate, which defines the type of care supposed to be delivered at each level. However, the different mandates had been accounted for when designing the e-TIQH assessment tool through making certain indicators not applicable for lower level of care. Thus, the fact that the findings stated here were still in line with what was seen in Table 12 suggested that dispensaries executed their mandate worse than institutions of higher level of care.

### Differences between health facility owners

Most of the respondents could elaborate reasons for differences in quality of care between the public and private-not-for-profit (11/12) or private-for-profit sector (10/12). They stated that the private sector performed better in terms of physical environment (private-not-for-profit: 5/11, private-for-profit: 2/10) and availability of equipment (3/11, 2/10), supporting the above findings in QD 1 (Table 12).

Chances to receive guidelines were lower for the private sector (3/11, 3/10), and the private sector was less likely to provide job descriptions and contracts (1/11, 1/10). These perceptions explained the weaker performance of the private sector in QD 2 in Table 12.

Respondents further pointed out that staff working in the private sector were more welcoming and polite than in the public sector (5/11, 2/10), which was captured in QD 3. This was brought up more often for the private-not-for-profit sector, where it was frequently stated in connection with the intrinsic motivation given by the staff's belief in God (4/11). The issue raised the most was that of the unqualified, not well-trained or retired staff from the public sector working in the private sector (7/11, 7/10). This was mainly affecting scores in QD 3, counteracting the mentioned advantages of the private sector in the same QD. The perceived cause for this was lack of financial resources to employ better qualified staff and the brain drain from the private to the public sector due to better staff benefits in the latter. This was illustrated by a CHSB member as follows:

"They [faith-based organizations] make the staff... to be tolerant, but in all matters, meaning even for benefits they end up getting paid little (...) this means that they [faith-based organizations] will be looking for a person whose... education level is very low (...) A person like this... you cannot send to a training (...). The council... will tell you what kind of person they need [when conducting trainings]... you [then] realize you don't have one, that's why you don't send him/her. If you don't send him/her you cannot get the guidelines because to get them you have to go and study" (Mvomero DC, CHSB member)

In addition, it was raised in some cases that facility in-charges in the private-for-profit sector were not following guidelines (2/10) and tended to over-prescribe medicines to make more profit (4/10). Adding all this together, these statements can well explain the differences in QD 3 between owner categories in Table 12.

Respondents also mentioned the issue of better medicine availability in the private sector (5/11, 3/10), which influenced performance in QD 4, where about half of the measured indicators concerned medicine availability. Thus, issues which were only reflected by one indicator in QD 4, like weaker data reporting by private sector providers (4/11, 4/10) and less frequent routine supportive supervision in private sector health facilities (2/11, 2/10), could not compensate for the substantial bigger problem of medicine availability in the public sector compared to the private sector (Table 12).

In addition, the private sector staff was less likely to receive trainings (3/11, 2/10), payment was lower and less timely (4/11, 2/10), and staff benefits and rewards were poorer (4/11, 3/10), which was relevant for the weaker score of private sector providers in QD 5 (Table 12).

Importantly, although respondents reported a lack of collaboration between private sector providers and council authorities, they also mentioned that private-not-for-profit facilities were

less affected (3/10). This was further supported by the fact that across all councils the public sector collaborated with the private-not-for-profit facilities through Private Public Partnerships (PPPs) (7/11), but not with private-for-profit facilities (1/10). PPPs included the allocation of public employees to the private-not-for-profit sector in exchange for subsidization of certain services or financial support for bigger non-profit facilities. In this regard a member of the CHMT said:

"I can say... we often work together with them [the faith-based health facilities] [...] to some of them we have given personnel... and they themselves... have been providing some of the services ... for example mother and child [health services for] free... But for those... fully private [private-for-profit] I haven't seen that we have worked with them. There is not something like entering into a contract with them [saying] that you do this area and we give you personnel for that area or we support you here [in this area]..." (Mvomero DC, CHMT member)

Finally, private-not-for-profit facilities often got external support from their home institution or faith-based organizations in terms of training, medical products or financial resources (4/11).

### Qualitative versus quantitative ranking

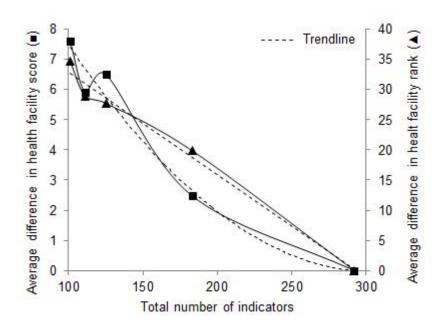
Table 13 showed that ranks assigned quantitatively and qualitatively did not completely overlap. This may be explained by the fact that the more services a health facility offered, the more indicators were applicable and thus the more difficult it was to get the full overall score. Secondly, answering an indicator more than once, which was possible for some QDs, made it less likely to obtain the full score for this indicator (Mboya et al., 2016). These observations suggested that a high number of indicators assessed and/or a high average of answers per indicator led to an underestimation of the health facility score. Thus, this could explain why health facility B and D have a better quantitative rank than A and C.

**Table 13** Comparison of qualitative and quantitative rank of six public dispensaries.

Council	Dispensary	Quali- tative rank	Quanti- tative rank	Quanti- tative score	Number of indicators assessed	Average answers per indicator assessed
1	Α	1	3	76%	147	1.79
1	В	2	1	83%	125	1.64
2	С	3	4	66%	163	1.85
3	D	4	2	79%	127	1.49
3	Е	5	5	57%	136	1.36
2	F	6	6	52%	152	1.51

### Number and weights of indicators

Results showed that scores of a given health facility were lower for bigger indicator sets, reflecting that it was more difficult to fulfil many indicators compared to fewer (data not shown). Looking at Figure 19, the average difference in score dropped at the beginning, whereas the line got flatter towards the end. This means that for every additional indicator the average difference in health facility score became smaller, indicating that adding an indicator to a larger number of previous indicators had less influence on the health facility score than adding an indicator to a smaller number of indicators. For difference in rank there was almost a linear decrease, meaning that for each additional indicator the difference in rank stayed the same.



**Figure 19** Average difference in health facility score and rank as a function of the total number of indicators (the score with the largest number of indicators serving as reference). Approximating trend line for average difference in health facility score as a function of total number of indicators is 2<sup>nd</sup> order polynomial, while for average difference in health facility rank it is linear.

Weighting led to a slightly higher average overall health facility score (69.1% vs. 68.4%). Thus, indicators with high weights were a little more likely to be answered with "yes" than those with low weights (although the respondents did not know the scores). With an average difference in health facility score of 0.87 and health facility rank of 8.13, the impact of

weighting on the overall score and rank was however small compared to the impact of changing the number of indicators.

### **Factor analysis**

Table 14 showed that 72% (132) of 183 indicators were independently assigned to the same QD. This means the factor a particular indicator was allocated to by factor analysis represented the QD to which the same indicator was assigned to during the development process of the e-TIQH assessment tool. Out of these 132 indicators 78% had a strong association to the factor they were assigned to (factor loading 0.4 or more) and only 24% had a similar strong association to another factor (cross-loading within a range of 0.2). This suggested a reliable allocation of these indicators to their respective factors. In contrast, the remaining 51 indicators were allocated differently by factor analysis and during the e-TIQH development process. However, of the 51, 73% showed a weak association to the factor they were assigned to (only 27% with factor loading of 0.4 or more) and 88% had a similarly strong association to another factor. In other words, for the e-TIQH assessment tool they seemed to be less relevant for measuring quality of care and were allocated with uncertainty to the corresponding factor. Apart from QD 4, each QD or sub-QD was clearly represented by one factor. QD 6 had the highest proportion of indicators with cross loading (83%) and a loading below 0.4 (67%) relative to the total number of indicators. For QD 4 most indicators measuring medicine availability (69%) were captured in factor 7, whereas the others were spread across several factors.

**Table 14** Comparison of indicator allocation between factor analysis and e-TIQH quality dimensions (QDs).

Factor	e-TIQH QDs <sup>1</sup>		f indicators the same QD <sup>2</sup>	Number of indicators not assigned to the same QD		
		with cross loading <sup>3</sup>	with factor loading above 0.4 <sup>3</sup>	with cross loading⁴	with factor loading above 0.4 <sup>4</sup>	
1	QD 3B (19)	19 (100%)		8		
		0 (0%)	19 (100%)	8 (100%)	1 (13%)	
2	QD 3A (17)	17 (100%)			0	
		0 (0%)	17 (100%)	0	0	
3	QD 3D (12)	12 (	100%)	4		
		0 (0%)	12 (100%)	2 (50%)	2 (50%)	
4	QD 1 (41)	30 (	(73%)	6		
		9 (30%)	20 (67%)	5 (83%)	2 (33%)	
5	QD 2 (17)	13 (	(76%)	20		
		8 (62%)	6 (46%)	18 (90%)	8 (40%)	
6	QD 3C (10)	9 (90%)			2	
		1 (11%)	8 (89%)	2 (100%)	0 (0%)	
7	QD 4 (16)	11 (69%)		0		
		1 (9%)	10 (91%)	0	0	
8	QD 5 (21)	16 (	(76%)	1		
		9 (56%)	9 (56%)	1 (100%)	0 (0%)	
9	QD 6 (6)	5 (83%)		10		
		4 (80%)	2 (40%)	9 (90%)	1 (10%)	
Total		132	(72%)		51	
- Otal		32 (24%)	103 (78%)	45 (88%)	14 (27%)	

<sup>&</sup>lt;sup>1</sup>In brackets is the number of indicators within a quality dimension,

QD 1 = Physical environment and equipment; QD 2= Job expectations; QD 3A= Professional knowledge, skills and ethics (Integrated Management of Childhood Illnesses, IMCI); QD 3B= Professional knowledge, skills and ethics (Maternal health); QD 3C= Professional knowledge, skills and ethics (Fever); QD 3D= Professional knowledge, skills and ethics (HIV/AIDS and TB); QD 4= Management and administration; QD 5= Staff motivation; QD 6= Client satisfaction

<sup>&</sup>lt;sup>2</sup>For percentage figures the denominator is the number of indicators within a quality dimension

<sup>&</sup>lt;sup>3</sup>For percentage figures the denominator is the number of indicators assigned to the same quality dimension

<sup>&</sup>lt;sup>4</sup>For percentage figures the denominator is the number of indicators not assigned to the same quality dimension

### 5.5 Discussion

### Consistency of quantitative and qualitative data

Regression models versus in-depth interviews

Results from the regression models confirm previously reported preliminary findings (Mboya et al., 2016). Based on triangulation of data from regression models and in-depth interviews it could be concluded that quantitative and qualitative findings were overlapping and consistent. The only inconsistencies observed were the perceived gaps in health financing mechanisms, and a lack of medicines found in the qualitative approach. The first concern was not captured by the e-TIQH assessment, since it is an issue beyond individual health facilities. The latter stood in contrast with the rather high scores in medicine availability in QD 4. This could partly be explained by the fact that only 16 essential medicines were tracked, and that medicine availability indicators were assessed using a more differentiated answer scale compared to all other indicators, where simple "yes/no/not applicable" answers were applied. Findings regarding differences in health facility level and owner categories were inline with what had been reported by other service assessments done in Tanzania (Ministry of Health and Social Welfare, 2013f, Ministry of Health and Social Welfare, 2016). The fact that dispensaries were more likely to have insufficient and underqualified staff, and experienced more equipment and medicine stock outs, explained well why they were executing their mandate less well than health centres and hospitals. The importance of provider cadre for quality of care was also reported by others (Edward et al., 2016). The problem of medicine and equipment availability at dispensary level was in-line with previous findings (Penfold et al., 2013, Choi and Ametepi, 2013, Ministry of Health and Social Welfare, 2013f). Importantly, the finding that dispensaries are given less priority by the council and other stakeholders may increase inequity in health since remote populations tend to be poorer and only have access to primary care. For the private-not-for-profit sector, politeness of staff, external support as well as collaborations with the public sector was likely to have compensated certain deficits of the private sector and led to better overall performance compared to the private-for-profit sector. For the public and the private-not-for-profit sector the overall difference was small, and performance strongly varied between QDs. This was inline with findings from other studies, which pointed out strengths and weaknesses of each sector (Berendes et al., 2011, Haazen, 2012, Basu et al., 2012, Shayo et al., 2016). Additionally, it has to be acknowledged that the assessments were mainly done by public employees and only by some representatives from the non-public sector (Mboya et al., 2016). Thus, there was a potential measurement bias, whereby public employees might have given better scores to health facilities of their own sector.

### Quantitatively versus qualitatively ranking

Although our results showed good consistency, a comparison between the quantitatively and qualitatively generated health facility quality rankings revealed some limitations of quantitative measures. The results made clear that factors not directly related to quality of care (number of indicators assessed and average of answers given per indicator) could influence the assessment results. Addressing these factors would make the assessment technically more demanding, time-consuming and expensive, leading to decreased efficiency and feasibility during routine supportive supervision exercises. All of which can ultimately affect effectiveness. Thus, this illustrated the constant trade-off between implementation feasibility, efficiency, effectiveness, validity, precision and acceptance of quality assessment measures.

### Robustness of the e-TIQH assessment tool

### Number and weights of indicators

By investigating the effect of changing the number and weights of indicators, we tried to assess how robust the e-TIQH assessment tool is in its ability to assign scores to health facilities and rank them accordingly. In terms of number of indicators, there is clearly a threshold above which neither score nor rank changes much anymore. The results showed that this number might have already been reached if the primary interest lies in the score and not the rank (e.g. if used for benchmarking purposes). Also, given their limited resources, providers and district authorities may find it easier to prioritize and address a smaller number of non-fulfilled indicators. Therefore, a set of few indicators, which are seen as most relevant for quality improvement, might lead to better results than a more comprehensive set of indicators.

The fact that indicators with high weights were a little more likely to be answered with "yes" than those with low weights showed that weights given to indicators during the e-TIQH development process reflected the priorities of the healthcare providers. However, results also revealed that weighting indicators only fine-tuned the scoring system and did not change scores or ranks drastically. Based on these findings, and considering the additional issues of design and analysis, it seems appropriate to recommend dropping the weighting. This would be in-line with a comparative analysis of selected health facility assessment tools which found that none of them used a weighting system (Edward et al., 2009).

### Grouping of indicators

Based on a factor analysis we assessed the usefulness of grouping the indicators into the nine QD and sub-QDs. The analysis confirmed that the nine factors reflected to a large extent the grouping done during the e-TIQH development process and therefore the grouping may be considered justifiable. Nevertheless, factor analysis also highlighted a couple of potential areas for improvement. Firstly, it suggested the subdivision of QD 4, whereby availability of medicines would be measured as a separate QD, while more general management and administration issues could be merged with other QDs. Secondly, factor analysis revealed that for the case of the e-TIQH assessment tool some indicators did not seem to be relevant for predicting quality of care due to similar strong association to another factor and weak association to the factor the indicators were assigned to. Therefore they could potentially be excluded. In particular client satisfaction appeared to have rather low relevance in predicting quality of primary healthcare. This finding was confirmed by the regression model, showing no significant difference in client satisfaction between health facility level and owner categories, despite the fact that the other scores showed clear differences. One reason why client satisfaction as it was captured in QD 6 did not reflect well the quality of health facilities, could be that the exit interview design had a courtesy bias (i.e. the patient not wanting to say anything negative about the facility). Courtesy bias has often been shown to be strong when interpreting perceived quality (Edward et al., 2009, Glick, 2009, MEASURE Evaluation, 2016). We tried to minimize the risk through rather objective indicators but it was certainly still influencing the respondent's answers. Another reason could be that the patients simply could not judge the quality of care. A fair conclusion would be that client satisfaction is not a very good measure of quality of care, despite its apparent attractiveness. This is in-line with other findings (Farley et al., 2014, Shirley and Sanders, 2016, Tancred et al., 2016). However, qualitative data showed that assessing client satisfaction increased provider accountability and acceptance of the assessment within the community, and thus is still recommended to be considered when developing quality improvement initiatives (Akachi and Kruk, 2017).

### Application of the e-TIQH assessment tool

Overall, the results presented here taken together with previously reported findings (Mboya et al., 2016) strongly suggested that the e-TIQH assessment tool, which focused on processes and structural adequacy of healthcare, is accurate enough to assess and monitor quality of primary healthcare for the purpose of routinely steering improvement measures. In practice, its ability to measure quality of care over time reflected a feasible approach to be used during supportive supervision and received great support from the CHMTs and health facilities staff (Renggli et al., 2017a). However, the value of the e-TIQH assessment tool

would need to be carefully reassessed if it were to be used outside its intended purpose. Potentially, it could be utilized for balanced score cards or benchmarking systems, as well as non-financial performance-based recognition initiatives (Peabody et al., 2006, Hansen et al., 2008, Edward et al., 2009, Blake et al., 2016). Obviously, the accuracy of the assessment is crucially dependent on both the assessor and the health facility staff understanding the value of an objective evaluation, with the intent of improving the situation. Yet, there is a conflict of interest if this assessment tool would be used for some kind of performance-based payments as this might lead to adverse effects (Suthar et al., 2017). Our results showed that health facilities offering fewer services or having less staff could potentially be favoured. Also, there could be an incentive to foster indicator driven improvements, although this would be less likely due the holistic nature of the e-TIQH assessment tool (Campbell et al., 2009, Basinga et al., 2011, Chimhutu et al., 2014, Binyaruka et al., 2015). Additionally, since the outcome of the assessment would have a financial value, there are legitimate concerns that providers could try to manipulate the assessment, whereas on the assessor's side it's likely to augment corruption problems. Finally, due to its design and purpose the e-TIQH assessment tool in its current format is unlikely to be accurate enough for higher level of care, licensing or accreditation as well as providing evidence for national policy, planning or management decisions.

### Limitations of the study

It is recognized that well-trained assessors familiar with the context are key for the accuracy of the assessment and to reduce measurement errors, especially when observing clinical consultations. For direct observations, it could also not be excluded that there was a Hawthorne effect as suggested by others, although for this study the qualitative data could not confirm that (Campbell et al., 1995, Leonard and Masatu, 2006, McCambridge et al., 2014). Additionally, 21 health facilities could not be reached in at least one of the years due to their remote location. It has to be suspected that quality of care in such areas was below average. Thus, the missing data from these health facilities could have led to an overestimation of the average scores presented.

The present analysis did not compare absolute values, time trends or differences between QDs with other quality of care measures. This paper did also not address the issue of how much the changes in quality of care could be attributed to the e-TIQH approach and how the approach was able to increase more generally the feasibility of routine supportive supervision. These two points will be further investigated in subsequent papers (Renggli et al., 2017b, Renggli et al., 2017a). Finally, none of the studies examined the effects of the e-TIQH assessment tool or improvements in quality of care on changes in health outcomes. Hence, the proof that improved processes lead to improved health outcomes is still

outstanding. This could be subject of further research, for example through linking community health data with health facility data.

### 5.6 Conclusions

Despite the lack of standards regarding how to best measure quality of care, the results presented here, coming from a range of different methods, suggested that for the purpose of routinely steering improvement measures at local level the e-TIQH assessment tool was able to accurately assess and monitor quality of primary healthcare. Focusing the quality assessment on processes and structural adequacy of healthcare was an appropriate approach for the assessment's intended purpose, and a unique key feature of the e-TIQH assessment tool. Thus, the e-TIQH assessment tool demonstrated a feasible option for routine quality measures of primary healthcare of different health facility level and owner categories in Tanzania. The results presented, combined with the more operational results of the companion papers (Renggli et al., 2017b, Renggli et al., 2017a) created a solid foundation for an approach that could lastingly improve services for patients in primary healthcare facilities. Finally, the expanded use of the e-TIQH assessment tool, for example for performance-based payment schemes, accreditation and other systematic evaluations of healthcare quality, should be considered carefully because of the risk of bias and adverse effects.

## 5.7 Acknowledgement

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# 6.Towards improved health service quality in Tanzania: Contribution of a supportive supervision approach to increased quality of primary healthcare

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Short title: An approach to increase quality of primary healthcare

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### 6.1 Abstract

Universal Health Coverage only leads to the desired health outcomes if quality of health services is ensured. In Tanzania, quality has been a major concern for many years, including the problem of ineffective and inadequate routine supportive supervision of healthcare providers by council health management teams. To address this we developed and assessed an approach to improve quality of primary healthcare through enhanced routine supportive supervision. Mixed methods were used, combining trends of quantitative quality of care measurements with qualitative data mainly collected through in-depth interviews. The former allowed for identification of drivers of quality improvements and the latter investigated the perceived contribution of the new supportive supervision approach to these improvements. The results showed that the new approach managed to address several major quality issues. It led to improvements that could be solved at local level, either solely by the healthcare provider, or in collaboration with the health management team of the council. Together with other findings reported in companion papers, we could show that the new supportive supervision approach was not only suitable for assessing quality of primary healthcare, but could also improve and maintain crucial primary healthcare quality standards across different health facility level and owner categories in various contexts in Tanzania. Thus, the new approach presents a powerful tool to support, guide and drive quality improvement measures within council and can be considered a suitable option to make routine supportive supervision more effective and adequate.

Key Words: Quality of care, quality improvement tool, Tanzania, electronic tool, supportive supervision, universal health coverage

### 6.2 Introduction

Since the publication of the World Health Report in 2010 there is growing ambition in many countries for progress towards Universal Health Coverage (UHC) (World Health Organization, 2010). This was further stimulated through the formulation of UHC as one of the prominent targets of the health-related Sustainable Development Goal 3 (Sustainable Development Solution Network, 2015). However, there is no benefit to UHC if poor quality of care leads to unwillingness of people to use services (Akachi et al., 2016). And even if services are accessed and used, studies suggest that poor quality is undermining health outcomes (Souza et al., 2013, Chari and Okeke, 2014, Powell-Jackson et al., 2015, Godlonton and Okeke, 2016). Consequently, health services need to be of sufficient quality to achieve the desired outcomes and thus improving quality must be of highest priority (Boerma et al., 2014, Akachi et al., 2016).

One of the main challenges resulting in weak quality in low- and middle-income countries is the lack of sufficient, well-trained and motivated staff with adequate financial and physical resources to provide basic health services (The Lancet, 2012, Ruelas et al., 2012). Another problem is insufficient resources and/or ineffective and inefficient allocation of limited resources at local and national level (Ruelas et al., 2012, Johnson et al., 2016). Additionally, when quality assessments are conducted, district managers and healthcare providers seldom receive feedback on performance of their facilities. As a result, assessment results are rarely translated into appropriate quality improvement measures (Edward et al., 2009). Moreover, it was reported that many assessments seemed to measure donor funded programs rather than country owned initiatives, leading to parallel monitoring structures that burden the system (Edward et al., 2009, Nickerson et al., 2014).

In Tanzania, given the expansion of health services, quality of care has become a major concern for many years (Ministry of Health and Social Welfare, 2011b). Some of the issues are low hygiene and sanitation standards, insufficient health infrastructure, poor healthcare waste disposal, low motivation of health workers, inadequate adherence to professional and ethical conduct, as well as a know-do gap amongst health workers (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). The last point refers to the gap between what health workers know and what they actually do (Leonard and Masatu, 2010). Furthermore, missing ownership of quality improvement measures at facility level, poor feedback on quality developments at council level, as well as inadequate and ineffective routine supportive supervision of healthcare providers by Council Health Management

Teams (CHMTs) are quality issues found in Tanzania (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e).

Already in the Tanzanian Health Sector Strategic Plan III (HSSP) (2009-2015) the need to put quality improvement systems in place was stipulated (Ministry of Health and Social Welfare, 2009a). The topic received even greater attention in the subsequent HSSP IV (2015-2020) (Ministry of Health and Social Welfare, 2015b). According to the this plan, operationalization of quality improvement ought to be done through the introduction of a performance-based certification system, clients' charters, pay-for-performance (P4P) schemes and an integrated quality improvement program. The latter is supposed to include a national quality improvement toolkit and monitoring system, facility self-assessments and comprehensive supportive supervision, mentoring and coaching (Ministry of Health and Social Welfare, 2015b). The HSSP IV also specifies the need for harmonizing, coordinating and integrating the improvement initiatives of the disease specific national control programs (Ministry of Health and Social Welfare, 2015b). However, apart from these initiatives, there are also rather uncoordinated and sometimes duplicative quality improvement approaches from other stakeholders (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e, Mwidunda and Eliakimu, 2015). These approaches rely usually on external assessments conducted in the frame of certification or accreditation procedures, on trainings with subsequent follow-up visits to health facilities or on self-assessments done at health facilities (Dohlie et al., 2000, Bradley and Igras, 2005, Ministry of Health and Social Welfare, 2011b, Tanzania Spread Study Team, 2011, Nangawe, 2012, Ministry of Health and Social Welfare, 2012b, Hanson et al., 2014, Ministry of Health and Social Welfare, 2015a, Necochea et al., 2015, Johnson et al., 2016, Kanamori et al., 2016, Jaribu et al., 2016). To the best of our knowledge, none of the documented approaches looked at routine CHMT supportive supervision.

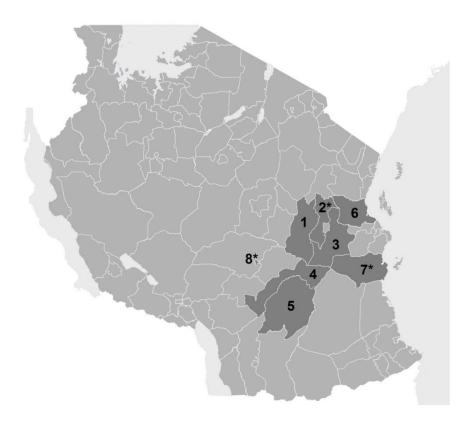
Thus, given the need to improve quality of care and strengthen routine supportive supervision of healthcare providers through their CHMT, we systematically evaluated a three-stage approach developed in Tanzania as part of the "Initiative to Strengthen Affordability and Quality of Healthcare" that aimed to serve this purpose. In a first step a systematic assessment of quality of primary care was carried out in all health facilities within a given council, using the "electronic Tool to Improve Quality of Healthcare" – in short e-TIQH. The assessment methods included checklists, structured interviews and direct clinical observations. Importantly, the assessment concluded with an immediate constructive feedback to the healthcare providers, and joint discussions about how to address the identified quality gaps. In a second step, the findings were discussed at council level with all relevant stakeholders, providing important inputs for the third step, the annual council health

planning and budgeting process. The supportive supervision approach and in particular the e-TIQH assessment tool itself have already been described in detail by Mboya *et al.* (Mboya et al., 2016). The e-TIQH assessment tool's appropriateness to measure quality of primary healthcare has been shown in a companion paper (Renggli et al., 2017c). Using a mixed methods approach, this paper now aims to identify drivers of quality improvements and examine whether the e-TIQH supportive supervision approach was able to contribute to these improvements. A fourth and final paper will then further investigate how this approach was able to strengthen routine supportive supervision conducted by CHMTs (Renggli et al., 2017a).

### 6.3 Methods

### **Quantitative approaches**

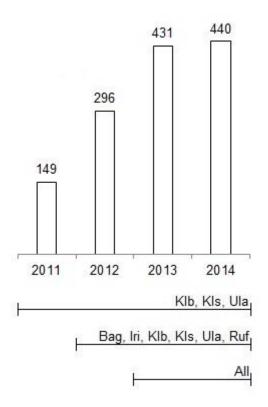
Data on quality of primary healthcare was electronically gathered between 2011 and 2014 in health facilities in up to eight Tanzanian district and municipal councils (DCs and MCs) (Figure 20) using the e-TIQH supportive supervision approach described above and in more detail by Mboya *et al.* (Mboya et al., 2016).



**Figure 20** Map of Tanzania with councils where the e-TIQH supportive supervision approach was implemented (status 2008). Morogoro Region: (1) Kilosa DC (later split into Kilosa and Gairo DC), (2) Mvomero DC, (3) Morogoro DC, (4) Kilombero DC, (5) Ulanga DC; Pwani Region: (6) Bagamoyo DC, (7) Rufiji DC; Iringa Region: (8) Iringa MC. Asterisks mark councils selected for qualitative data collection.

In total, six quality dimensions containing 183 indicators were assessed consistently over all four years: [1] Physical environment and equipment; [2] Job expectations; [3] Professional knowledge, skills and ethics; [4] Management and administration; [5] Staff motivation; [6] Client satisfaction. Points were given for each indicator met within a dimension, and percentage scores (of total possible points) were calculated per quality dimension. The score

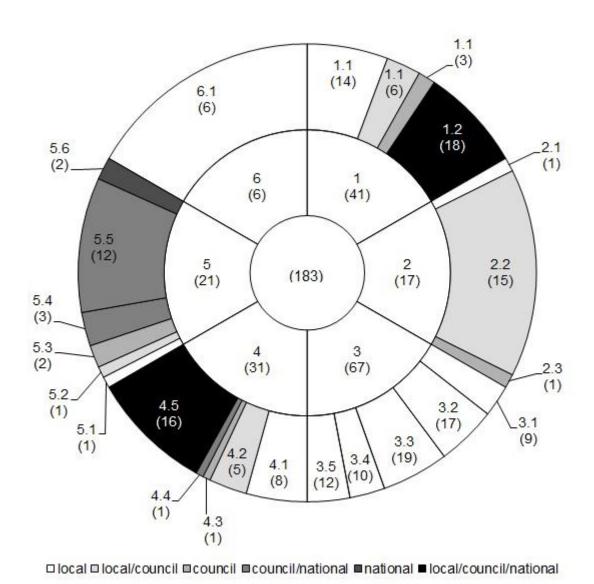
of each quality dimension then equally contributed to the overall health facility score. Due to a phased introduction of the e-TIQH approach, the number of assessed councils and health facilities varied from one year to the other (Figure 21).



**Figure 21** Number of health facilities assessed in each year (bars) across selected councils (horizontal lines at bottom). Bag = Bagamoyo DC, Iri = Iringa MC, Klb = Kilombero DC, Kls = Kilosa DC (later split into Kilosa and Gairo DC), Mor = Morogoro DC, Mvo = Mvomero DC, Ula = Ulanga DC, Ruf = Rufiji DC (status 2008); All = Bag, Iri, Klb, Kls, Mor, Mvo, Ula, Ruf

To better identify the drivers of quality improvements, indicators within the six quality dimensions were further grouped into thematic categories. To also understand where these improvements occur, we identified for each of these thematic categories the part of the health system, whose primary responsibility it was to address them (Figure 22). Responsibilities could also be sometimes shared between more than one level, leading to six groups: indicators that primarily ought to be addressed at local (I), council (c) or national (n) level, or in collaboration at local and council (I/c), council and national (c/n), or all (I/c/n) levels. For private providers, the local level was defined as the staff directly in contact with the client, the council level as the local management level, and the national level as the management at the highest level, e.g. an umbrella institution or owner, which could potentially even be based outside the country. The decision at which level a particular

indicator should be addressed was taken in consultation with a local medical expert familiar with the assessment procedures. In order to assess trends over time mixed linear regression models were derived for the six quality dimension scores and the thematic category scores. Year was included as a categorical variable and council as a random effect.



**Figure 22** Number of indicators per quality dimension (1-6; inner circle) and thematic category (1.1-6.1; outer circle) by responsible health system level.

Number of indicator are given in brackets

The e-TIQH assessment tool consisted of six quality dimensions (QDs) contributing equally to the overall score, which is illustrated in the inner circle through equivalent areas of each quality dimension. For further details see (Mboya et al., 2016).

QD 1 = Physical environment and equipment: QD 1.1 = Physical environment, QD 1.2 = Equipment availability;

QD 2= Job expectations: QD 2.1 = Provider knowledge of services to be provided, QD 2.2 = Guideline and algorithm availability, QD 2.3 = Availability of job description;

QD 3= Professional knowledge, skills and ethics: QD 3.1 = Ethics and Infection Prevention and Control (IPC), QD 3.2 = Integrated Management of Childhood Illnesses (IMCI), QD 3.3 = Maternal health, QD 3.4 = Fever, QD 3.5 = HIV/AIDS and TB;

QD 4= Management and administration: QD 4.1 = Display of public information, suggestion box, meeting conduction, duty roster, referral plans, QD 4.2 = Information, Education and Communication (IEC) material availability and Health Management Information System (HMIS) implantation, QD 4.3 = Routine CHMT supportive supervision visits, QD 4.4 = Staffing level, QD 4.5 = Medicines availability;

QD 5= Staff motivation: QD 5.1 = In-house education, QD 5.2 = Appointment as best worker, QD 5.3 = Letter of appreciation and training follow up, QD 5.4 = Reward payment, house allocation, promotion, QD 5.5 = Training, QD 5.6 = Salary and promotion payment; QD 6= Client satisfaction

#### **Qualitative approach**

We used qualitative data to support and supplement quantitative findings and to analyses if and how the e-TIQH supportive supervision approach contributed to changes in quality of care. It was attempted to identify with qualitative data areas in which quantitatively captured quality trends could at least to some extent be attributed to the e-TIQH approach. Causality was aimed to be shown through triangulation of methods and consistency across councils. Alternative methods to assess attribution of quality improvements to the e-TIQH approach were not feasible given the fact that this research was analysing an implementation project. The main part of the qualitative data consisted of in-depth interviews, whereas observational data and informal personal communication recorded in a field notebook as well as materials collected during the field work complemented the data set. In the light of the limited resources available for this study, a total of 24 in depth-interviews were conducted in three out of eight intervention councils (Figure 20). As we aimed to understand reasons for changes in quality of care, the councils with the biggest yearly changes in overall quality (as measured by the e-TIQH assessments) were selected. Coincidentally, sampling resulted in the selection of three councils, which were very different in terms of their characteristics (Table 15). This facilitated drawing conclusions for a wide range of contexts within Tanzania.

**Table 15** Description of councils selected for the qualitative study.

Characteristics	Rufiji DC	Mvomero DC	Iringa MC
Region	Pwani	Morogoro	Iringa
Classification	Rural	Rural	urban
Population size <sup>1</sup>	217'274	312'109	151'345
Area (km²)²	13'339	7'325	162
Number of operating health facilities <sup>3</sup>	78	69	33
Accessibility	Several hard- to-reach areas, including the Rufiji river delta	Some hard-to- reach areas	No hard-to- reach areas

<sup>&</sup>lt;sup>1</sup>(National Bureau of Statistics, 2013a)

Sampling of interview partners was done purposefully. At council level two CHMT members (including co-opted members) responsible for issues related to quality improvements were interviewed as representatives of the public sector. Additionally, two members of the Council Health Service Board (CHSB), which is the governance body responsible for adequate service delivery and CHMT oversight at council level, were selected to represent the non-public sector (Kessy et al., 2008). Within the rural councils two public dispensaries, one well and one less well performing in terms of quality of care (as measured by the e-TIQH assessments), as well as one public health centre were selected. For the urban council two dispensaries, one well and one less well performing (as measured by the e-TIQH assessments) each from the public and the private sector, were chosen. Interviews were done with the facility in-charge, and in health centres also with the person responsible for quality improvements (Table 16).

<sup>&</sup>lt;sup>2</sup>Source: Comprehensive Council Health Plans of participating councils collected by SR and IM

<sup>&</sup>lt;sup>3</sup>(Ministry of Health Community Development Gender Elderly and Children, 2016a), status October 2016

**Table 16** Number of in-depth interviews done in the three study councils (Mvomero DC/ Rufiji DC/ Iringa MC).

		9	Sector
Position	Administrative level	Public	Non-public
CHMT (co-opted) member	Council	2/2/2	_
CHSB member	Council		2/2/2
Health centre in-charge	Health centre	1/1/0	
Quality improvement person	Health centre	1/1/0	
Dispensary in-charge	Dispensary	2/2/2	0/0/2
Total		16	8

For confidentiality reasons, no further information about the respondents could be given here. In order to be considered as a respondent, the respondents had to be in their respective position at least for part of the time period in which the e-TIQH approach had been implemented or have comparable experience, based on the interviewers' judgement. Written informed consent was obtained from all respondents. Interviews were conducted in Swahili and led by a Swahili speaking female Swiss (SR), who was backed up by a male native Tanzanian of middle age (IM) in the first quarter of 2016. Interviews were guided by the main question relating to whether and how quality of care changed over time and why. During the interviews, it was ensured that respondents clearly refer to a time period in order to assign events to the timespan before, after or in which the e-TIQH approach had been implemented. Additionally, it was probed for specific areas of potential improvements. These areas were based on the health system building blocks, as defined by the World Health Organisation's health system framework (World Health Organization, 2007). The health system building blocks were chosen in order to allow capturing improvements across the whole system, not necessarily only areas included in the e-TIQH assessment tool. However, the e-TIQH quality dimensions and their thematic categories presented above in Figure 22 were used as sub-areas within the corresponding building block (World Health Organization, 2007). At council level we also probed for possible differences in quality of care amongst different health facility level and owner categories. Importantly, it was never directly asked if the e-TIQH supportive supervision approach led to certain changes. All interviews were taperecorded and transcribed by two native Tanzanian research assistants but not translated into English. The transcripts were managed and coded using MAXQDA software. Data were analysed using the framework method as described by Gale et al. (Gale et al., 2013). Coding was primarily done deductively. The six health system building blocks were used as themes, whereas categories were developed in-line with the e-TIQH thematic categories with space

for induction, which allowed creating categories not covered by the e-TIQH assessment tool. Findings were compared for similarities and differences within and between respondent groups, taking into account their gender, age, position as well as their working environment (council, level and ownership of health facility). Finally, citations used in the text were translated by SR into English and proofread by IM.

#### **Ethical considerations**

Permission to publish the findings was obtained from the National Institute for Medical Research (NIMR) in Tanzania. Animal/human ethics guidelines were complied with. Ethical clearance was granted by the same institution (original: NIMR/HQ/R.8a/Vol.IX/1839, extension: NIMR/HQ/R.8c/Vol.II/521) and the Institutional Review Board of the Ifakara Health Institute (IHI/IRB/No:37-2014) in October 2014 as well as the Ethic Commission of Northeast and Central Switzerland (EKNZ 2014-347) in November 2014.

# 6.4 Results

# Trends in quality of care based on the e-TIQH assessment tool

The linear regression coefficients for the years 2012-2014 in Table 17 indicate how quality dimension and thematic category scores changed compared to the year 2011, whose percentage score is given by the constant. For illustrative purposes, time trends are also shown graphically in Figure 23 for performance of each quality dimension and thematic category of quality dimension 1.

For quality dimension 1, which summarized performance in physical environment and equipment, the indicator groups that drove the overall improvement the most belonged to the category physical environment and could be addressed either at local level or in collaboration at local and council level. In quality dimension 2, which assessed job expectation, availability of guidelines and algorithms significantly increased, while trends in availability of job descriptions went in the opposite direction, resulting in an insignificant overall improvement. Results of quality dimension 3 revealed that improvements in performance of clinical consultations varied across categories, but were significant for all types of consultations except when assessing fever cases in patients above five years of age. Quality dimension 4, which represented a broad spectrum of management and administration issues, showed significant positive trends for the categories that captured things that could be addressed at local level or in collaboration at local and council level (QD 4.1 and 4.2), as well as for medicine availability. In quality dimension 5, which incorporated different types of incentives to boost staff motivation, all categories changed significantly (positively) over time and thus contributed to the overall improvement seen. Lastly, client satisfaction as measured in quality dimension 6 also indicated a positive trend.

**Table 17** Differences in average quality dimension (QD) and thematic category scores, expressed as percentages of maximum achievable scores, according to year, while the variable council was set as a random effect.

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	Overall	QD 1	QD 2	QD 3	QD 4	QD 5	QD 6
2012	3.0**	-2.9*	1.3	-1.2	5.9***	10.6***	1.9
2013	6.2***	-0.9	5.4*	2.4	6.7***	15.8***	5.2***
2014	8.0***	3.9**	3.7°	6.2***	9.9***	14.6***	7.3***
Constant	61.6***	72.5***	52.4***	72.3***	66.3***	31.5***	77.4***

QD1: Physical environment and equipment by thematic category

				,
	QD 1.1, (I)	QD 1.1, (I/c)	QD 1.1, (c)	QD 1.2, (l/c/n)
2012	-7.9**	-5.7*	-2.2	-0.2
2013	0.7	-0.2	-1.3	-2.1
2014	6.0**	5.7*	4.4	1.9
Constant	67.4***	70.0***	50.3***	79.3***

QD 2: Job expectations by thematic category

	QD2.1, (I)	QD 2.2, (I/c)	QD2.3, (c)
2012	-2.3	0.2	15.7***
2013	1.1	5.4*	7.1
2014	0.4	4.9*	-11.3**
Constant	97.8***	49.1***	54.6***

QD 3: Professional knowledge, skills and ethics by thematic category

-	QD 3.1,	QD 3.2,	QD 3.3,	QD 3.4,	QD 3.5,
	(I)	(I)	(I)	(I)	(I)
2012	-7.0***	-4.3	4.3*	-4.8	15.6***
2013	-3.5*	4.4	2.2	2.4	16.0***
2014	4.4**	7.3**	4.1*	2.2	20.1***
Constant	78.2***	67.0***	81.7***	66.2***	76.3***

QD 4: Management and administration by thematic category

					<del></del>
	QD 4.1,	QD 4.2, (I/c)	QD 4.3, (c)	QD 4.4, (c/n)	QD 4.5, (I/c/n)
	(1)	(1/6)	(6)	(6/11)	(1/6/11)
2012	-0.6	14.1***	-9.4*	-1.6	8.2***
2013	3.5	15.1***	2.8	-3.6	7.1***
2014	11.7***	16.9***	5.5	6.1	8.1***
Constant	53.8***	55.2***	84.7***	27.9***	75.7***

QD 5: Staff motivation by thematic category

	QD 5.1, (I)	QD 5.2, (I/c)	QD 5.3, (c)	QD 5.4, (c/n)	QD 5.5, (c/n)	QD 5.6, (n)
2012	7.2	2.4	8.7**	13.1***	10.0***	12.3***
2013	10.9**	4.2	18.6***	12.6***	16.9***	14.4***
2014	15.7***	7.5**	18.9***	9.2**	15.1***	21.1***
Constant	59.8***	7.4**	38.2***	35.3***	23.5***	67.1***

Asterisks refer to p-values indicating the significance of a coefficient \* <0.05, \*\* <0.01, \*\*\* <0.001

°Coefficient that would have been significant in a model including all variables, but was not in the model presented here. For additional comparisons see also Renggli *et al.* (Renggli et al., 2017c).

For all models there was a large fraction of unexplained variance attributed to the random effect, meaning that scores were strongly correlated within councils (data not shown).

Responsible health system levels are given in brackets for easier reference: I = local, c = council; n = national

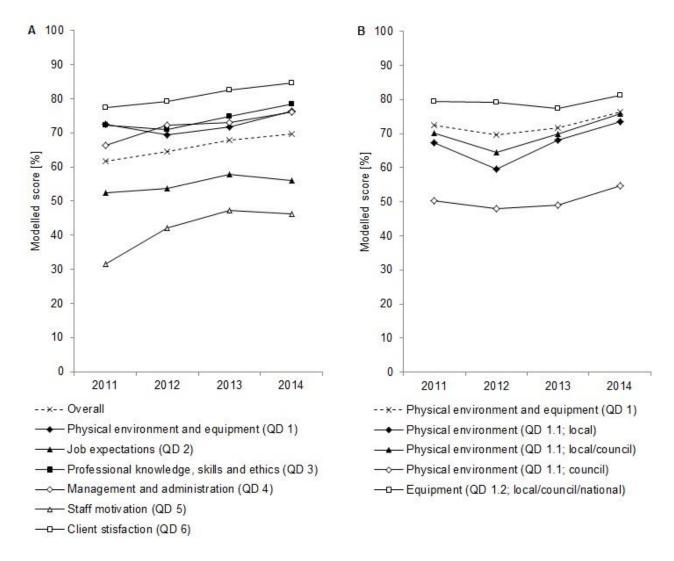
QD 1 = Physical environment and equipment: QD 1.1 = Physical environment, QD 1.2 = Equipment availability;

QD 2= Job expectations: QD 2.1 = Provider knowledge of services to be provided, QD 2.2 = Guideline and algorithm availability, QD 2.3 = Availability of job description;

QD 3= Professional knowledge, skills and ethics: QD 3.1 = Ethics and Infection Prevention and Control (IPC), QD 3.2 = Integrated Management of Childhood Illnesses (IMCI), QD 3.3 = Maternal health, QD 3.4 = Fever, QD 3.5 = HIV/AIDS and TB;

QD 4= Management and administration: QD 4.1 = Display of public information, suggestion box, meeting conduction, duty roster, referral plans, QD 4.2 = Information, Education and Communication (IEC) material availability and Health Management Information System (HMIS) implantation, QD 4.3 = Routine CHMT supportive supervision visits, QD 4.4 = Staffing level, QD 4.5 = Medicines availability;

QD 5= Staff motivation: QD 5.1 = In-house education, QD 5.2 = Appointment as best worker, QD 5.3 = Letter of appreciation and training follow up, QD 5.4 = Reward payment, house allocation, promotion, QD 5.5 = Training, QD 5.6 = Salary and promotion payment; QD 6= Client satisfaction



**Figure 23** Time trends for performance by quality dimensions (A) and by thematic categories of quality dimension 1 (B).

# Contribution of the e-TIQH supportive supervision approach to improvements in quality of care

A total of 22 out of the 24 respondents directly experienced the e-TIQH approach, either as an assessor, as the person being assessed or during the council stakeholder meeting (Mboya et al., 2016). The subsequent analysis is therefore restricted to these 22 people, since only they could potentially attribute any changes in quality of care to the e-TIQH approach. The following section is structured according to the e-TIQH quality dimensions and focusing on thematic categories in which the supportive supervision approach contributed to improvements.

Physical environment and equipment – quality dimension 1

In regard to physical environment and equipment, almost everyone interviewed (21/22) noticed improvements in physical environment. The issues that had been addressed were mostly within the responsibility of the local level, either solely (21 of the 21 above mentioned) or in collaboration with the council (16/21), and rather less frequent in the hands of the councils (11/21). This was in-line with quantitative findings showing significant improvement at local level or in collaboration at local and council level, but non-significant improvement at council level (Table 17, QD 1.1). Importantly, a considerable amount of respondents attributed to a large extent improvements in physical environment to the e-TIQH approach's capability to induce improvement measures (19/21 at local, 11/16 at local/council and 6/11 at council level). A CHMT member summarized this as follows:

"...the issue of IPC [infection prevention and control]... was very low...we didn't even have dustbins to dump the waste and also... we didn't do the segregation of it. And when we passed by [at the health facilities] the first time they put it [the waste] without looking at the colour [of the bins]... If you pass by now waste segregation is done and waste is put according to the type of waste." (CHMT member, Rufiji DC)

Routine CHMT supportive supervision, which complements the e-TIQH approach, was also brought up for having contributed to positive changes (6/21 at local, 4/16 at local/council and 4/11 at council level). Other than the CHMTs, P4P schemes, other stakeholders and the CHSBs were stated for having influenced improvements in physical environment. For P4P schemes this was rather the case for gaps that had to be addressed at local level or in collaboration at local and council level, whereas other stakeholders were more involved in things that were partially or fully in the responsibility of the council. Lastly, observational data suggested that a self-assessment approach focusing on physical environment might have as well contributed to positive changes at local level (Kamiya et al., 2017). In contrast, but still in agreement with findings in Table 17 (QD 1.2), improvements in the availability of appropriate equipment were hardly brought up (6/22). If so, they were attributed to a mix of interventions, including the e-TIQH approach (4/6), the availability of Community Health Fund (CHF) money (2/6), non-governmental support (1/6) and P4P schemes (1/6).

Job expectations – quality dimension 2

For job expectations, a considerable amount of respondents (13/22) reported improvements in guideline and algorithm availability, which was concurrent with the quantitative trend (Table 17, QD 2.2). It was explained that the e-TIQH approach (10/13) and/or routine CHMT supportive supervision (4/13) identified the lack of latest guidelines and algorithms, upon

which healthcare providers and CHMTs started initiatives to increase their availability. This was illustrated by a former facility in-charge as follows:

"...we practiced [the procedure] assuming we understand... often we didn't see the importance of having these guidelines, but these guidelines are good. Sometimes you realize... new ones have arrived with new changes. It's easy to open and read them. Thus, its [the e-TIQH approach's] job was to remind us that... it's important to have these guidelines. ...and because we were with the CHMT it was easy... he/she [e-TIQH assessor] told you this guideline is there [in the office of the CHMT]... this guideline we don't have, after some days come and look, you will find them. Thus, it was easy for us to do follow up." (Former facility in-charge, public dispensary, Iringa MC)

Moreover, few respondents elaborated that during the e-TIQH supportive supervision approach (3/13) and/or trainings (2/13) it was emphasized that guidelines provided need to be at work and not at home. Lack of guidelines at council level was seen as the main obstacle for further improvements in this area. In contrary, improvements in the availability of job descriptions were barely reported (2/22), which was consistent with the negative trend seen in Table 17 (QD 2.3).

Professional knowledge, skills and ethics – quality dimension 3

Changes in performance during clinical consultations as measured by direct observation could have been influenced by several factors (Table 17, QD 3). Amongst these were guideline and algorithm availability, but also trainings carried out by various stakeholders, as well as supervision visits and in-house education sessions, all of which significantly improved during the time period under investigation (Table 17, QD 2 and QD 5). Thus, there was a correlation between trainings attended and performance during clinical consultations, which has to be accounted for when looking into reasons for improvements of performance. Half of the respondents (11/22) said that behaviour during consultation, in particular friendliness, provider attitude and language used, improved. A majority of the respondents (8/11) elaborated that it was the e-TIQH approach's particular emphasis on consultation ethics, which triggered these improvements. Together with the e-TIQH approach, routine CHMT supportive supervision on its own (2/8) or in combination with increased availability of guidelines and in-house training (1/8) were raised. There were also some (3/11), who mainly attributed changes in ethics to stronger community oversight (2/3) and/or trainings conducted (2/3). Apart from consultation ethics, several respondents (8/22) reported improvements in compliance with IPC procedures during consultation. All of them (8/8) said that the direct observations and subsequent feedback of the e-TIQH approach, which was seen as on-job

training, contributed to a great extent to these changes. Lastly, a substantial number of respondents (15/22) asserted that treatment guidelines were more closely followed than previously. For example a facility in-charge said:

"... the feedback helped to change us regarding performance because sometimes we forget these steps [of the guidelines], we skip them...we work as we got used to, but... when they [e-TIQH assessors] did this supervision or the way they did it...it changed us a lot." (Facility in-charge, public dispensary, Rufiji DC)

All of them (15/15) acknowledged that the e-TIQH on-job training approach contributed to these changes. Some also added in-house training (1/15), trainings conducted by other stakeholders (2/15) and routine CHMT supportive supervision (1/15) were leading to improvements. Interestingly, in one council, routine CHMT supportive supervision was subsequently improved by using the same observational approach (3/15).

Management and administration – quality dimension 4

With respect to management and administration those respondents who reported positive changes in the category capturing things that could be addressed at local level (QD 4.1), uniquely said that these were triggered by the e-TIQH intervention (7/22). However, all other significant improvements in Table 17 were barely due to e-TIQH, but rather because of other interventions.

Staff motivation – quality dimension 5

With regard to benefits and rewards given to health workers, which were part of staff motivation, a considerable number of respondents stated that due to the e-TIQH approach discussions around required measures to improve staff motivation of any kind were stimulated or reinitiated (8/22). In this regard a member of the CHSB said:

"It's not that [the] e-TIQH [approach] only showed [us the problems of staff motivation], it stimulated us further, made it clearer. However, the problem was there since long and people knew it. But... it wasn't an area about which people were complaining... They [CHMT] may go to facilities and start talking about other things, but staff benefits is not spoken about... but [the] e-TIQH [approach] it goes as far as asking about staff benefits, you see? The problem was there, but it was not spoken about because it wasn't seen as [their] responsibility to ask, but [the] e-TIQH [approach] sees it as its responsibility to ask the personnel. Is he/she satisfied with the work he/she is doing? Is he/she feeling appreciated? Does he/she get the salary in time?" (CHSB member, Rufiji DC)

Some improvements were subsequently implemented, whereas the respondents in particular highlighted non-financial benefits. Thus, this suggested that the e-TIQH supportive supervision approach potentially contributed to some of the improvements presented in Table 17 (QD 5.2 and 5.3). In two councils P4P schemes were mentioned (10/22) in the context of reward payments. Despite the positive changes shown in Table 17 (QD 5.4) complains in this regard remained high, especially regarding financial employment benefits. According to the respondents the main problems were insufficient and delayed allocation of money from the national level to the councils, and lack of knowledge about administrative procedures at local and council level. For the category "training", some respondents confirmed the positive trends seen in Table 17 (3/22) while others stated the opposite (3/22), but the e-TIQH approach was hardly brought up in this context. Finally, improvements in timeliness of wage and promotion payments could be almost solely attributed to a revised payment process implemented by the national government as unanimously reported by respondents (Table 17, QD 5.6).

# 6.5 Discussion

## Contribution of the e-TIQH supportive supervision approach to quality improvements

The results presented here showed that the qualitative and quantitative findings were overlapping and strongly consistent, which supported identified trends and drivers of quality improvements. It also confirmed further what was demonstrated previously by Mboya et al. (Mboya et al., 2016) and regarding the tool's appropriateness to accurately assess quality of primary healthcare (Renggli et al., 2017c). Importantly, qualitative data also identified areas in which the e-TIQH supportive supervision approach contributed to improvements. Advances in physical environment that could be implemented at local level with or without the help of the council could largely be attributed to the e-TIQH approach. The e-TIQH approach also helped to address issues in physical environment, whose responsibility lied with the council. Thus, the approach could reduce some of the problems around insufficient health infrastructure, poor healthcare waste disposal and low hygiene and sanitation standards (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). Apart from physical environment, availability of guidelines and algorithms was another category in which improvements were seen in connection with the e-TIQH intervention. Additionally, although acknowledging the likely contribution of trainings conducted by other stakeholders, direct clinical observations and subsequent feedback of the approach made an important contribution to improved performance during clinical consultations as hypothesized previously (Mboya et al., 2016). This suggested that the e-TIQH supportive supervision approach not only led to structural changes, but also improved processes. This also demonstrated that measuring process quality by means of observations followed by appropriate immediate feedback positively affected provider practice. Thus, it was highly beneficial for healthcare providers and seen as on-job training, despite the criticism of observations as a process measure (Peabody et al., 2006). This was in line with what was found and recommended by others in particular in respect to onsite training followup visits (Suh et al., 2007, Prytherch et al., 2012, Manzi et al., 2014, Heiby, 2014, Kiplagat et al., 2014, Edward et al., 2016, Jaribu et al., 2016, Leonard and Masatu, 2017). Consequently, problems with inadequate provider adherence to professional and ethical conduct and the know-do gap could be decreased (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). Regarding management and administration issues, the e-TIQH approach considerably contributed to the improvements in areas that ought to be addressed at local level. An additional area, which was likely to be positively affected by the e-TIQH approach, was the improved provision of non-financial staff benefits. The approach had a crucial role in providing solid evidence about the sensitive topic of staff benefits, and thus made it possible to officially discuss it. This may have reduced the

issue of low health worker motivation (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e).

Overall it could be concluded that the e-TIQH supportive supervision approach led to improvements that could be solved at local level, either solely by the healthcare provider or in collaboration with the council. Especially the immediate, supportive feedback followed by solution-oriented discussions with those who were in a position to address the identified problems was found to be key to the approach. It therewith managed to address the lack of feedback on performance upon health facility assessments, as raised previously (Edward et al., 2009). This also meant that the e-TIQH approach fostered ownership of quality improvement measures at facility level (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). The results also showed that if the collected data was used appropriately, the e-TIQH approach could as well inform improvement measures that needed to be taken at council level. It therefore considerably reduced the problem of poor feedback on quality developments at council level (Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e). Thus, although the e-TIQH approach mainly contributed to improvements that required no or little financial means, it also facilitated the process of priority setting at local and council level in the light of limited resources.

## Contribution of other interventions to quality improvements

In all these improvement processes, healthcare providers and CHMTs were crucial in the implementation of improvement measures. This was owing to the participatory e-TIQH approach, with strong involvement of local and council stakeholders. Also, adoption of the routine CHMT supportive supervision procedures upon exposure to the e-TIQH approach played a key role. However, this also meant that contributions made by CHMT supportive supervision could not be clearly distinguished from the direct contributions of the e-TIQH supportive supervision approach as they were complementary. Additionally, revenue collection at health facility level, e.g. through health financing mechanisms and P4P schemes, enabled providers to take and finance actions. This was important for compensating the lack of sufficient financial means from council and national level to implement the improvement measures at health facility level. This is in-line with previous findings regarding the use of such kind of revenues (Mtei and Mulligan, 2007, Maluka and Bukagile, 2014, Binyaruka et al., 2015, Binyaruka and Borghi, 2017). For improvements that ought to be addressed at council level and therewith often also required substantial financial resources other stakeholders might have assisted as well. In particular non-governmental organizations seemed to have contributed to healthcare improvements. As a result of lack of money and cash flow uncertainties at council level, coupled with cumbersome administration processes, non-governmental stakeholders might have filled the gap.

### Quality trends with no contribution of the e-TIQH supportive supervision approach

Improvements in equipment and medicine availability were hardly influenced by the e-TIQH approach. However, complains about the inadequate national supply chain mechanism remained abundant, reflecting what has been extensively discussed by others (Euro Health Group, 2007, Penfold et al., 2013, Mkoka et al., 2014, Mikkelsen-Lopez et al., 2014). Also, no clear contributions of the e-TIQH approach to increased numbers of trainings or improvements in management and administration above the local level were identified. Neither was there a positive contribution with regard to improved timeliness of salary and promotion payments, or positive changes in staff motivation, that needed a substantial amount of money from national level for its implementation.

Although identified by the e-TIQH supportive supervision approach, some quality issues subsequently showed a stagnant or negative trend (Table 17). Hence, these quality gaps were presumably not addressed. The main reasons for this were on one hand non-awareness of availability of assessment data or non-usage of data due to lack of knowledge and skills. On the other hand it was not always clear whose responsibility it was to address the problem. Furthermore, inappropriate allocation of limited resources and lack of stakeholder harmonization, which caused a considerable burden for local governments, were other key issues for not addressing gaps. Both of which had been shown previously by others (Nyamhanga et al., 2013, Mwidunda and Eliakimu, 2015, Mwisongo et al., 2016). Clearly, for further improvements it is vital to [1] use the assessment results more systematically, [2] allocate sufficient resources in an effective and efficient way, and [3] clearly assigning roles and responsibilities of all stakeholders in the improvement process.

#### Limitations of the study

The limitations of the results with regard to validity and precision of the assessments were the same as stated in Renggli *et al.* (Renggli et al., 2017c). Moreover, well-trained assessors familiar with the context were crucial for constructive feedback, an important base for subsequent improvements. As the focus of this paper was to better understand time trends independently of health facility level and owner categories, it is acknowledged that the presented models could have been improved by including additional variables and potentially significant interaction terms. However, when comparing the models in Table 17 and models including all additional variables, there was no difference in significance of coefficients (Renggli et al., 2017c). Further, although this paper aimed to identify the underlying causes for improvements in quality of primary healthcare (i.e. the e-TIQH approach or other

measures), it is recognized that causality cannot conclusively be claimed. Unknown factors might have also contributed to the observed results. Nevertheless, conclusions presented here were supported by the triangulation of methods. It also could not be fully excluded that the improvements seen were driven by the choice of the indicators included in e-TIQH and thus might have led to overestimation of real changes. Moreover, the respondents were aware that the interviewers knew the team who facilitated the implementation of the e-TIQH supportive supervision approach, which could have potentially led to statements overstating the contribution of the e-TIQH approach. In addition it was not part of the analysis presented here to look into improvements in quality of care which were not quantitatively captured through e-TIQH assessments. This included contributions of other stakeholders, as well as additional benefits of the overall e-TIQH supportive supervision approach, like increased staff motivation owing to appropriate feedback given at health facility. The latter will be discussed in a forthcoming paper, which aims to compare the e-TIQH approach with routine CHMT supportive supervision as it is currently implemented (Renggli et al., 2017a). Also, it was beyond the scope of this analysis to examine the effects of the e-TIQH- linked quality improvements on changes in health outcomes. Hence, the proof that improved processes lead to improved outcomes could be subject of further research, for example through linking community health data with health facility data.

# 6.6 Conclusion

The results clearly demonstrated that the e-TIQH supportive supervision approach not only served the purpose of assessing quality of primary healthcare, but also facilitated that quality issues, lying in the responsibility of the council or local level, were being addressed. Thus, the e-TIQH approach was able to improve and maintain crucial primary healthcare quality standards across different health facility level and owner categories in various contexts. It also managed to address several major quality issues outlined in the National Health and Social Welfare Quality Improvement Strategic Plan (Ministry of Health and Social Welfare, 2013e). In this respect, the principles under which this approach was implemented were crucial: the involvement of the CHMT members in the assessments, the on-site constructive feedback and joint discussions on the basis of the findings, and the use of the results for the annual council health planning and budgeting. To the best of our knowledge this is currently the only approach to directly strengthen routine CHMT supportive supervision in Tanzania that has demonstrated this direct impact on general quality of primary care. By being a quality assessment and improvement intervention at the same time, the e-TIQH approach can be considered a suitable option to make routine supportive supervision more effective and adequate. Thus, it presents a powerful tool to support, guide and drive quality improvement measures within councils.

# 6.7 Acknowledgement

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# 7.Towards improved health service quality in Tanzania: An approach to increase costeffectiveness of routine supportive supervision

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# 7.1 Abstract

Effective supportive supervision of healthcare services is crucial for improving and maintaining quality of care. However, this process can be challenging in an environment with chronic shortage of qualified human resources, overburdened healthcare providers, multiple roles of district managers, weak supply chains, high donor fragmentation and inefficient allocation of limited financial resources. Operating in this environment, we systematically evaluated an approach developed in Tanzania to strengthen routine supportive supervision of primary healthcare providers. The approach included a systematic quality assessment at health facilities using an electronic tool and subsequent result dissemination at council level. Mixed methods were used to compare the new supportive supervision approach with routine supportive supervision. Qualitative data was collected through in-depth interviews in three councils. Observational data and informal personal communication as well as secondary data complemented the data set. Additionally, an economic costing analysis was carried out in the same councils. Compared to routine supportive supervision the new approach increased healthcare providers' knowledge and skills, as well as quality of data collected and acceptance of supportive supervision amongst stakeholders involved. It also ensured better availability of evidence for follow-up actions, including budgeting and planning, and higher stakeholder motivation and ownership of subsequent quality improvement measures. The new approach reduced time and cost spent during supportive supervision. Consequently, the approach made supportive supervision more effective and efficient and therewith also more sustainable. This increased feasibility of supportive supervision and hence the likelihood of its implementation. Thus, the results presented together with previous findings suggested that if used as the standard approach for routine supportive supervision the new approach provides a suitable option to make supportive supervision more cost-effective. Moreover, the new approach also provides informed guidance to overcome several problems of supportive supervision and healthcare quality assessments in low- and middle income countries.

Key Words: Quality of care, quality assessment tool, quality improvement approach, Tanzania, electronic tool, supportive supervision, universal health coverage

# 7.2 Introduction

Improving health service quality is a prerequisite for moving towards Universal Health Coverage and therewith crucial for achieving the health-related Sustainable Development Goal 3 (World Health Organization, 2010, Sustainable Development Solution Network, 2015). Various quality improvement initiatives have been implemented in resource constraint environments (Peabody et al., 2006, Jaribu et al.), including supportive supervision. Supportive supervision can be understood as on-site supervision or mentorship usually provided by health authorities under a supportive or facilitated model, with immediate feedback to the healthcare provider to assist in improving the performance (Bosch-Capblanch and Garner, 2008, Bailey et al., 2016). Supportive supervision was shown to promote quality improvements for structural and process elements in a number of low resource settings (Rowe et al., 2005, Suh et al., 2007, Frimpong et al., 2011, Zinnen et al., 2012, Bello et al., 2013, Kiplagat et al., 2014, Hoque et al., 2014, Bailey et al., 2016, Lazzerini et al., 2017). However, systematic reviews on this topic found mixed evidence on its effect on quality of care (Bosch-Capblanch et al., 2011, Bailey et al., 2016). This suggests that effective supportive supervision of healthcare services strongly depends on the way it is conducted, as well as on contextual factors (Suh et al., 2007, Clements et al., 2007, Bailey et al., 2016). It is seen as particularly challenging in an environment with a chronic shortage of qualified human resources, overburdened healthcare providers, multiple roles of district managers, weak supply chains, high donor fragmentation and inefficient allocation of limited financial resources (Johnson et al., 2016, Bailey et al., 2016). These factors also describe well the challenges faced by the Tanzanian health system (Ministry of Health and Social Welfare, 2015b, Baker et al., 2017).

In Tanzania, Regional Health Management Teams (RHMTs) have the responsibility to supervise Council Health Management Teams (CHMTs) and ensure implementation of routine CHMT supportive supervision (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2010). CHMTs are supposed to conduct supportive supervision in all hospitals, health centres and dispensaries within their council on a quarterly basis (Ministry of Health and Social Welfare, 2010). They are also in charge of developing the annual Comprehensive Council Health Plan (CCHP), which includes operational plans and budgets and is based on routinely collected health information and supportive supervision findings (Kessy, 2014). According to the concept of Integrated Management Cascade (IMC), the health centres should carry out supportive supervision of dispensaries within their catchment area (Ministry of Health and Social Welfare, 2010). At facility level the Health Facility Governing Committees (HFGCs), composed of community representatives, oversee

the facility operations (Kessy et al., 2008, Kessy, 2014). Likewise, at council level the Council Health Service Board (CHSB), consisting of community and private health sector representatives, is the governance body responsible for CHMT oversight and CCHP approval before its submission to the full council assembly (Kessy et al., 2008, Kessy, 2014).

Routine CHMT supportive supervision has often been reported as infrequent, inefficient and ineffective in tackling performance gaps (Ministry of Health and Social Welfare, 2010, Ministry of Health and Social Welfare, 2011b, Manzi et al., 2012, McAuliffe et al., 2013, Bradley et al., 2013, Ministry of Health and Social Welfare, 2013e, Kiplagat et al., 2014). Although national supportive supervision guidelines exist, they are not followed in practice (Ministry of Health and Social Welfare, 2010). Also, councils have been using a general supportive supervision checklist to develop their own list, which makes comparison between councils impossible (Ministry of Health and Social Welfare, 2010). Routine CHMT supportive supervision concentrates on quantity (reviewing record books) with insufficient focus on quality elements (delivery processes) (Ministry of Health and Social Welfare, 2010, Ministry of Health and Social Welfare, 2011b, Manzi et al., 2012, Olafsdottir et al., 2014, Mayumana et al., 2017). It is often more an inspection, whereas the supportive element is hardly practiced (Manzi et al., 2012, Nangawe, 2012, Ministry of Health and Social Welfare, 2013e). Supportive supervision was also reported as fragmented, incomplete and inconsistent with no or solely negative feedback (Manongi et al., 2006, Ministry of Health and Social Welfare, 2010, Ministry of Health and Social Welfare, 2011b, Mubyazi et al., 2012, Manzi et al., 2012, Nangawe, 2012, Prytherch et al., 2012, McAuliffe et al., 2013, Olafsdottir et al., 2014). CHMTs struggle to systematically follow-up and report back about issues identified during supportive supervision (Manongi et al., 2006, Mubyazi et al., 2012). Additionally, there is a lack of accountability of CHMTs to RHMTs and supervision of CHMTs by RHMTs is weak (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2010).

Overall, poor routine CHMT supportive supervision has been reported to slow down progress in quality improvement, negatively affecting job satisfaction, staff presence, performance, motivation and retention as well as impairing other quality improvement interventions (Nangawe, 2012, Zinnen et al., 2012, Mubyazi et al., 2012, Manzi et al., 2012, McAuliffe et al., 2013, Bradley et al., 2013, Olafsdottir et al., 2014, Mbaruku et al., 2014, Mkoka et al., 2015). There are several strategic documents in Tanzania emphasising the need for enhanced supportive supervision in order to improve quality of healthcare services (Ministry of Health and Social Welfare, 2019, Ministry of Health and Social Welfare, 2011b, Ministry of Health and Social Welfare, 2013e).

To inform council implementation of supportive supervision, we systematically evaluated a three-stage approach developed in Tanzania as part of the "Initiative to Strengthen

Affordability and Quality of Healthcare (ISAQH)". The aim of the approach was to improve quality of primary healthcare in the context of routine CHMT supportive supervision of healthcare providers. In a first step regular systematic assessments of quality of primary care were carried out in all health facilities within a given council, using the "electronic Tool to Improve Quality of Healthcare" - in short e-TIQH. CHMT core and co-opted members formed the core of the assessment team, but to increase objectivity and reduce bias community representatives and healthcare providers from the public and private sector were involved as well. Assessment supervision was done by ISAQH staff. The assessment methods included checklists, structured interviews and direct clinical observations, focusing on processes and structural adequacy of healthcare (Renggli et al., 2017c). In total, six quality dimensions were assessed: [1] Physical environment and equipment, [2] Job expectations, [3] Professional knowledge, skills and ethics, [4] Management and administration, [5] Staff motivation, and [6] Client satisfaction. Points were given for each indicator met within a dimension, and percentage scores (of total possible points) were calculated per quality dimension. Importantly, the assessment concluded with an immediate constructive feedback to the healthcare providers, and joint discussions about how to address the identified quality gaps. In a second step, the findings were discussed at council level during a dissemination meeting with all relevant stakeholders. This provided important inputs for the third step, the annual CCHP development process of the CHMT.

The supportive supervision approach and in particular the e-TIQH assessment tool as an integral part have already been described in detail by Mboya *et al.* (Mboya et al., 2016). Figure 24 summarizes its key features.

# Key features of the e-TIQH supportive supervision approach:

- For the purpose of monitoring and improving quality of primary healthcare
- Assessment type focusing on processes and structural adequacy of healthcare
- Multi-dimensional quality concept
- Clearly defined and concise set of indicators
- Electronic data entry (increased data quality)
- Diverse assessment team (incl. CHMT members and community, private, and public sector representatives)
- Constructive and supportive feedback with joint solution-orientated discussions
- Short written feedback summary form for health facilities
- Involvement of Health Facility Governing Committee chair during the feedback
- Automated data analysis
- Immediate access to aggregated and comparable data
- System for recognition and rewarding good health facility performance (dissemination meeting)
- Forum for mutual learning and understanding (dissemination meeting)
- Alignment with other assessments indicators of vertical programs and national accreditation initiatives

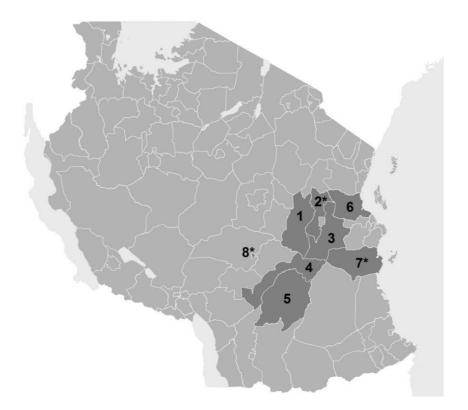
**Figure 24** Key features of the e-TIQH supportive supervision approach (Mboya et al., 2016, Renggli et al., 2017b, Renggli et al., 2017c).

The appropriateness of the e-TIQH approach to measure and improve quality of primary healthcare was shown previously (Renggli et al., 2017c, Renggli et al., 2017b). This paper now aims to assess the suitability of the e-TIQH supportive supervision approach to improve the currently implemented routine CHMT supportive supervision approach. Therefore, using a mixed method approach, a comparison of the implementation of the two approaches will be done.

# 7.3 Methods

### Study area

For purpose of the comparison study described here, three out of eight intervention district and municipal councils (DC and MC) were purposefully selected (Figure 25).



**Figure 25** Map of Tanzania with councils where the e-TIQH supportive supervision approach was implemented (status 2008). Morogoro Region: (1) Kilosa DC (later split into Kilosa DC and Gairo DC), (2) Mvomero DC, (3) Morogoro DC, (4) Kilombero DC, (5) Ulanga DC; Pwani Region: (6) Bagamoyo DC, (7) Rufiji DC; Iringa Region: (8) Iringa MC. Asterisks mark the three study councils.

Originally, these three councils were chosen due to their most pronounced yearly increases in overall quality (as measured by the e-TIQH assessments) compared to the other councils. This was in-line with the purpose of another study described elsewhere (Renggli et al., 2017b), which aimed to understand reasons for changes in quality of care. Coincidentally, sampling resulted in the selection of three councils, which were very different in terms of their characteristics (Table 18). As this facilitated drawing conclusions for a wide range of contexts within Tanzania, we decided that the three councils also perfectly suited the purpose of this study.

**Table 18** Description of councils selected for the study.

Characteristics	Rufiji DC	Mvomero DC	Iringa MC
Region	Pwani	Morogoro	Iringa
Classification	Rural	rural	urban
Population size <sup>1</sup>	217'274	312'109	151'345
Area (km²)²	13'339	7'325	162
Road (km) <sup>3</sup>	467	289	178
Accessibility	Several hard-to-reach areas, including the Rufiji river delta	Some hard-to-reach areas	No hard-to-reach areas
Number of operating health facilities (hospital/ health centres/ dispensaries) <sup>4</sup>	78 (2/6/70)	69 (3/8/58)	33 (3/4/26)
Existence of pay for performance (P4P) schemes	Pilot council for donor funded P4P scheme since 2011	Partially implemented locally funded P4P scheme between 2009 and 2011	No P4P experience
National star rating system in place since 2016	Yes	No	No

<sup>&</sup>lt;sup>1</sup>(National Bureau of Statistics, 2013a)

#### **Qualitative data**

To identify advantages and disadvantages of the routine CHMT and e-TIQH supportive supervision, a qualitative methodological approach was taken. The main part of the qualitative data consisted of in-depth interviews. Observational data and informal personal communication recorded in a field notebook together with secondary data collected during the field work complemented the data set. Secondary data included copies of health facility guest books as well as CCHPs, quarterly combined Technical and Financial Performance Implementation Reports (TFPIRs), council routine supportive supervision checklists and reports. In total, 24 in depth-interviews were conducted in the three study councils in the first quarter of 2016 (Figure 25). Sampling of interview partners was done purposefully as described elsewhere (Renggli et al., 2017b) and was summarized here in Table 19. In order to be considered as a respondent, the respondents had to be in their respective position at

<sup>&</sup>lt;sup>2</sup>Source: Comprehensive Council Health Plans of participating councils collected by SR and IM

<sup>&</sup>lt;sup>3</sup>gravel, tarmac, earth (Prime Minister's Office Regional Administration and Local Government, 2007)

<sup>&</sup>lt;sup>4</sup>(Ministry of Health Community Development Gender Elderly and Children, 2016a), status October 2016

least for part of the time period in which the e-TIQH approach had been implemented or have comparable experience, based on the interviewers' judgement. For confidentiality reasons, no further information about the respondents could be given.

**Table 19** Number of in-depth interviews done in the three study councils (Mvomero DC/ Rufiji DC/ Iringa MC).

		Sector	
Position	Administrative level	Public	Non-public
CHMT (co-opted) member	Council	2/2/2	
CHSB member	Council		2/2/2
Health centre in-charge	Health centre	1/1/0	
Quality improvement person	Health centre	1/1/0	
Dispensary in-charge	Dispensary	2/2/2	0/0/2
Total		16	8

Interviews were conducted in Swahili and led by a Swahili speaking female Swiss (SR), backed up by a male native Tanzanian of middle age (IM). In order to identify advantages and disadvantages of either approach, respondents were asked to describe routine CHMT supportive supervision and then compare it with e-TIQH supportive supervision. Additionally, we probed for specific activities conducted during preparation, implementation, reporting and dissemination as well as for data usage upon completion of supervision visits. All interviews were tape-recorded and transcribed by two native Tanzanian research assistants but not translated into English. The Swahili transcripts were managed and coded using MAXQDA software. Data were analysed according to Gale's framework analysis (Gale et al., 2013). Codes were primarily developed inductively. After repeated reading of transcripts and initial coding, emerging themes were structured to obtain a coding framework. The theme 'Quality of data collected' was split deductively into the categories proposed by the WHO guide to improve data quality (accuracy, reliability, completeness, legibility, timeliness, accessibility, meaningfulness and security) (World Health Organization, 2003). Within a category codes were assigned to the supportive supervision type (routine CHMT or e-TIQH) and the activity (Preparation, implementation, reporting, dissemination) they described. Findings were compared for similarities and differences within and between respondents attributes such as gender, age, position as well as their working environment (council, level and ownership of health facility). Finally, citations quotes used in this publication were translated by SR into English and proofread by IM.

#### **Cost assessment**

In order to complement and strengthen the qualitative data collected, we compare the cost of routine CHMT and e-TIQH supportive supervision by calculating quarterly recurrent council level cost for each of them. To do so an economic costing was carried out, identifying the value of all resources required to conduct supportive supervision. We defined opportunity cost as the "benefit forgone by particular use of resources" (Palmer and Raftery, 1999). Thus, opportunity cost of staff was estimated based on their salary and time spent. Cost spanning multiple quarters were equally divided over the relevant time period. One time start-up cost to develop the e-TIQH online platform of 113'680 USD was not included. The estimation of regional and national level cost was outside the scope of this study. All costs were calculated in Tanzanian Shillings (TSh) and converted to USD using the annual average exchange rate for 2016 (2'188TSh = 1 USD) (Bank of Tanzania, 2017).

An ingredient approach was employed, whereby quantities of each resource were identified, measured, and valued with the appropriate unit cost (Drummond et al., 2005). Costs were classified by type of resource (salary, per diem/allowance, transport, other expenses) and activity. To identify the activities done, time spent and resources used, three to four CHMT members in each of the three study councils were interviewed. In order for their statement to be valid, they had to be participating in the corresponding activity of both approaches. For the e-TIQH approach, time estimates were cross verified with observations done by ISAQH staff during implementation. Unit costs for personnel were based on the national salary scales (Prime Minister's Office Regional Administration and Local Government, 2013). Other unit costs were derived from information given by respondents, CCHPs, quarterly combined TFPIRs as well as ISAQH documents, other official documents collected and personal communication. Market prices were taken to value supplies (Table S1, supplementary data). Council routine supportive supervision checklists and reports were collected as a reference.

The overall activity of doing supervision was broken down in activities prior (preparation), during (implementation) and after (reporting, dissemination) supportive supervision visits (Table S2, supplementary data). To estimate the required number of assessment days, time needed at each health facility level (dispensary, health centre, hospital) was calculated. Travel time between health facilities and their typical distribution in a council were also taken into account. Assessment days were integrated into the cost calculations as a full working day (eight hours), even if adding up the time spent at health facilities was less. Due to the fact that at council level no activity equivalent to the result dissemination meeting could be identified, this cost was calculated separately. The same was done for start-up costs to introduce the e-TIQH approach in a council. Time estimations for these two activities were

taken from the ISAQH records. All costs were calculated for an average rural and urban council (Table 20).

Table 20 Relevant characteristics of an average rural and urban council in Tanzania.

	Rural (N=136) <sup>1</sup>	Urban (N=40) <sup>2</sup>
Total number of health facilities <sup>3</sup>	40	30
Hospital	1	2
Health centre	4	5
Dispensary	35	23
Distance to be covered (km) <sup>4</sup>	3'500	1'400

<sup>&</sup>lt;sup>1</sup>Includes all District Councils (Ministry of Health Community Development Gender Elderly and Children, 2016a)

For the e-TIQH supportive supervision approach two options were calculated: recommended and reduced assessor option. The recommended option consisted of two more assessors (two teams of six) than the routine CHMT approach (two teams of five), whereas the two additional assessors were non-CHMT members (e.g. CHSB members, private sector representatives). In order to facilitate the comparison to routine the conventional supportive supervision, the reduced assessor option involved the same number of assessors as the routine conventional approach (two teams of five). Reducing the assessment team by one assessor, would not affect the total time spent at a health facility due to the fact that e-TIQH quality dimension 1 was assessed as a team and subsequently quality dimensions 2 to 6 were evaluated concurrently by one assessor each.

### **Ethical considerations**

Permission to publish the findings was obtained from the National Institute for Medical Research (NIMR) in Tanzania. Ethical clearance was granted by the same institution (original: NIMR/HQ/R.8a/Vol.IX/1839, extension: NIMR/HQ/R.8c/Vol.II/521), the Institutional Review Board of the Ifakara Health Institute (IHI/IRB/No:37-2014) and the Ethic Commission of Northeast and Central Switzerland (EKNZ 2014-347). For the in-depth interviews written

<sup>&</sup>lt;sup>2</sup>Includes all Town, Municipal and City council, except the three Town Councils of Dar es Salaam (Ministry of Health Community Development Gender Elderly and Children, 2016a) <sup>3</sup>(Ministry of Health Community Development Gender Elderly and Children, 2016a)

<sup>&</sup>lt;sup>4</sup>Estimation based on the fuel consumption during the implementation of the e-TIQH supportive supervision approach

informed consent and for the costing oral informed consent was obtained from all respondents.

# 7.4 Results

Figure 26 summarizes activities reported to be conducted during routine CHMT and e-TIQH supportive supervision. Preparation, reporting and dissemination were done at council level and actual implementation at health facility level. An important finding was that data collected during routine CHMT supportive supervision was hardly entered upon return due to shortage of human resources, time limitation and competing priorities.

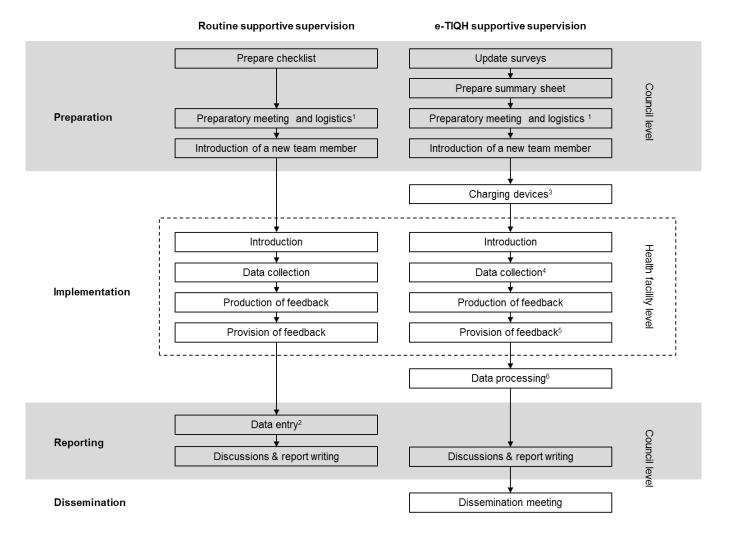


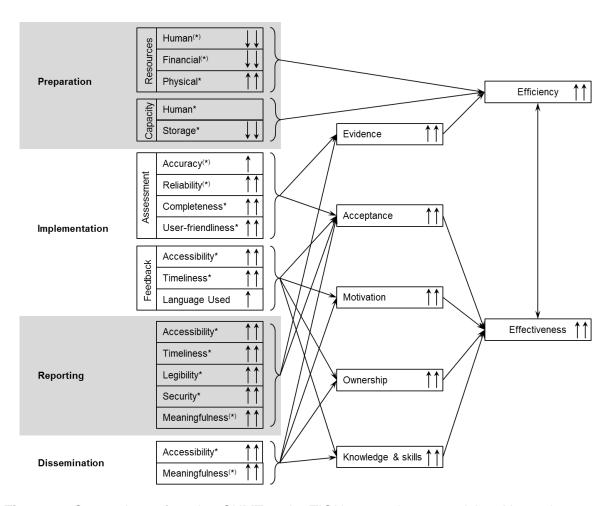
Figure 26 Activities conducted during routine CHMT and e-TIQH supportive supervision.

¹The preparatory meeting included setting up the teams and their routes; logistics included informing health facilities and request transport and per diems; ²Data entry after routine CHMT supportive supervision was hardly ever done; ³Charging devices was reported to take seven minutes for six tablets per team and day; ⁴Quality dimension 1 was evaluated as a team and subsequently quality dimensions 2 to 6 were assessed concurrently by one assessor each; ⁵Provision of feedback included the completion of five page feedback

summary form; <sup>6</sup>Estimated time for data processing (quality check and uploading survey forms) was one hour 30 minutes per team and day.

#### **Qualitative data**

A total of 23 out of 24 respondents directly experienced routine CHMT (21 of 23), e-TIQH (22/23) or both (20/23) supportive supervision as an assessor or as the person being assessed. The following analysis will be restricted to these 23 people, since only they could state advantages and disadvantages of either approach. In order to link the qualitative data with the cost assessment, the subsequent section was structured according to the activities reported to be conducted during supportive supervision (Figure 26) and findings are summarized in Figure 27.



**Figure 27** Comparison of routine CHMT and e-TIQH supportive supervision. Upwards arrows show a perceived improvement and downwards arrows a perceived decline when switching from routine CHMT to e-TIQH supportive supervision. Perceived change based on the qualitative data (statements given frequently and/or across administrative levels and sectors) is given by simple (likely change) and double (clear change) arrows. Asterisks

indicate that the particular change could primarily\* or partially<sup>(\*)</sup> be attributed to the usage of an electronic tool per se. For items without an asterisk or where changes could only partially (\*) be attributed to the electronic tool the overall e-TIQH supportive supervision approach was relevant as well. For physical resources it was assumed that tablets need be bought.

#### Preparation – Resources and capacity needed for implementation

For the routine CHMT supportive supervision infrequent implementation was reported and observed several times (13/23, observational data). Main reasons for this were lack of time (human resources) due to competing tasks (11/23, observational data) as well as insufficient and untimely financial resources because of cumbersome administration processes at council level and delayed or inadequate disbursement of money from the central government (10/23, observational data). This was illustrated by a CHMT member as follows:

"Doing it [supportive supervision] has its challenges. We have... competing tasks. You do a schedule that the whole week we dedicate to go to the health facilities for supportive supervision but in between some CHMT members are called for a certain seminar... Or we get visitors from the ministry, different organisations, NGOs that we work with. Thus, some of us need to go there, join them to do some work. Hence, you come to realize this week is lost and... maybe you managed to just visit one facility... these have been our big challenges..." (CHMT member, Iringa MC)

In contrast, for the e-TIQH supportive supervision approach financial resources were readily accessible through project funds. Also, several respondents stated that e-TIQH supportive supervision required less time at the health facility (10/23) and for reporting (4/23), supporting findings of the cost assessment below (Table 22). This was clearly attributed to the electronic nature of the assessment (8 of the 10 above mentioned; 4/4) and the more concise list of indicators compared to routine CHMT supportive supervision (3/10).

Additionally, some respondents (3/23) elaborated from a provider perspective how the e-TIQH assessment not only reduced time required, but also the time burden of supportive supervision as explained by a CHMT member:

"The e-TIQH assessment often doesn't involve all the staff... Sometimes it's not necessary [to take] the facility in-charge... an experienced person can show us all the places... Therefore, the rest of the work continues as normal. Also, because you use the tablets it doesn't take a lot of time... But for the one [supportive supervision] of CHMT... it means the service stands still (...) But for e-TIQH you go and people go

on with the work. (...) Then, to interview someone it doesn't take a lot of time because once s/he answered, you just enter it [into the tablet]." (CHMT member, Rufiji DC)

If the e-TIQH approach was to be implemented by the CHMT alone, the main additional human and financial resource concerns were the availability and affordability of non-CHMT assessors (2/23, observational data) as well as the affordability of tablets (8/23), the dissemination meeting (4/23) and the platform running cost (observational data). However, as presented in Table 23 and Table 24, these concerns could not be confirmed by the qualitative data apart from the cost of the dissemination meeting.

In terms of human capacity, for both approaches respondents emphasized the importance of well-trained assessors with the required contextual knowledge and professional skills to conduct the assessment (7/23), but also the organisational skills to ensure smooth implementation of the approach (11/23, observational data). Both issues were seen to be lacking to some extent during routine CHMT supervision, but not during e-TIQH supportive supervision. In addition, for the e-TIQH approach basic IT skills for managing the electronic devices were perceived as necessary (5/23), but less analytical skills were reported to be required due to automated data analysis (4/23). However, interviews and observations also revealed some inability to fully use the results generated at aggregated level by those in a position to do so (3/23).

#### **Implementation**

Respondents said that a main advantage of the e-TIQH assessment tool was its design with the emphasis on key issues of primary healthcare (8/23), the wider range of topics assessed (e.g. staff motivation, patient satisfaction) (18/23) and the assessment type, which focused on adequacy and processes of care (clinical observations) (16/23) (Renggli et al., 2017c). A facility in-charge summarized this as follows:

"There are a lot of supervisions being done, but they [e-TIQH assessors] want to observe [service delivered]. It's not like we sit and you ask [if] a certain thing [process] is being done. He [the e-TIQH assessor] wants to see if you are really doing it. If you say the guidelines are there, 'Where are they?' It's not [possible] to say they are there, but they aren't. He looks exactly where they are. (...) However, when they [CHMT] come, they look how you fill [the register book]. Thus, they don't look how you did the diagnosis of this patient... but they look how you filled [the record books]. (...) But he [e-TIQH assessors] wanted to see how the clients are being attended, together with [the request to] fill in all this data. (...) But they [CHMT] do supervision by asking question independent from whether or not there is a patient." (Facility in-

charge, Iringa MC)

Moreover, it was seen as less biased (12/23) due to a more diverse and skilled assessment team (8/12) and the usage of an electronic tool (8/12). This was illustrated by a CHSB member:

"The nice thing about the [e-TIQH] approach was [that] it mixed us [the assessor], it took people form the private [sector] to go and do supervision even at public [facilities]. So, this takes away biases." (CHSB member, Rufiji DC)

As a result of improved assessment design and reduced bias, most people perceived the overall e-TIQH assessment as more accurate than routine CHMT supportive supervision (15/23). Observations and interviews with CHMT members revealed that checklists of routine CHMT supportive supervision were often more extensive and covered more types of medical services (8/23, observational data). However, mainly health facility record books and availability of care were investigated, whereas adequacy was only assessed to some extent and processes hardly ever (11/23; observational data). Thus, the increased perceived accuracy of the e-TIQH assessment tool was not necessarily due to a higher number of indicators. However, the perception of increased accuracy led to higher acceptance of the assessments and their results amongst stakeholders involved (18/23).

Reliability and completeness of routine CHMT supportive supervision data was reported to be strongly affected by inconsistent data collection (14/23, observational data). This was seen to be due to insufficient human resources, which resulted in a constantly changing composition of the assessment team (4/14) and lack of time to go through an extensive supervision checklist (13/14).

In contrast, owing to a clearly defined, fixed and more concise set of indicators as well as the electronic nature of the tool, e-TIQH assessment reliability was perceived higher and data completeness was not an issue (9/23, observational data). The electronic tool was also seen as more user-friendly compared to the paper-based assessment (9/23). In term of feedback given, at health facilities interviewees stated that it was more adequate and constructive (20/23). This was said to be due to the more supportive attitude and language of the assessors (15/20) as well as the immediate availability of initial analyses thanks to the electronic format of the assessment (timeliness and accessibility of data) (11/20).

Thus, according to the respondents, acceptance of the feedback (16/23), ownership of the actions to be taken at facility level (12/23) and staff motivation (10/23) increased. This was elaborated by a CHMT member as follows:

"In the past you really only [pointed out] the problems... only problems. There were no congratulations to them [the healthcare provider]. There was no [thing like] telling them at least there are some percentages [reached]. But with e-TIQH... it shows you 'Here you did well, here there's a problem'. ...you can see there's an area, which you have improved, and an area [where] you still have a lot of work. But the old one [routine CHMT supportive supervision], it only showed problems. It didn't show an area where you put efforts in. [...] The one [e-TIQH supportive supervision]... it doesn't discourage you... it shows you the weaknesses and where you did well. So you know it's possible. At least you are activated [motivated] to continue working." (CHMT member, Mvomero DC)

Ownership was further increased by the feedback summary form left at the health facility (6/23, observational data). Lastly, although it was intended in the e-TIQH approach to involve the HFGC chair during the feedback at the health facility, we could not find respondents confirming this. However, most interviewees generally supported this idea and saw it as an additional option to further increase feedback acceptance and ownership at health facility level.

## Reporting

Automated data entry with instant and continuous access to more detailed reports after uploading the surveys ensured timeliness and accessibility of data (18/23). According to respondents this was unlike routine CHMT supportive supervision where data was hardly ever systematically analysed (2/23, observational data), feedbacks delayed (8/23) and reports difficult to access (8/23, observational data). Further benefits of the electronic tool were increased legibility (3/23) and security (3/23) of the data compared to routine CHMT supportive supervision. Importantly, due to the overall improved data quality, the e-TIQH approach also led to more meaningful and actionable data, which could be aggregated and compared at health facility and council level (19/23) as illustrated by a CHSB member:

"We use those [the results of the e-TIQH assessment] because they were being compiled and they show that our facilities had the issues 1, 2, 3. Now, for the routine I actually haven't seen its results [showing that] we visited all facilities [and] we saw that the main problem is this... They produce [results] for individual facilities. But if they were to do it like e-TIQH to compile results [showing] that in all our health facilities it appears as this is the problem... Then this obtains weight during the planning [and] if it's common [to all facilities], it is necessary to plan for this. (...) Thus, during implementation it gets priority. (...) Thus, it [e-TIQH] gives you an overview of the whole district [council] showing the problem is this, but the other one of the CHMT

it was like individual [data]" (CHSB member, Rufiji DC)

In contrast, lower data quality of routine CHMT supportive supervision reduced its usefulness (15/23). Consequently, respondents reported that it was difficult to keep track of what needed to be addressed (8/15), do follow-ups (12/15) and monitor changes (10/15), which led to untimely and/or inadequate actions (8/15) and ultimately to no or only slow improvements. A CHMT and a facility in-charge stated their point of view as follows:

"When coming back [to the facility] for another supervision you may or may not find the report. Thus, you might not know again where the problem was. This is different from now... once uploaded, even at the office you have the file... Thus, it's easy, even when going another time you exactly know 'There I left with this particular problem at that time. Now let me follow up and see how far they've come." (CHMT member, Mvomero DC)

## Dissemination

Having access to comparable health facility results (as it was the case during the annual dissemination meeting) contributed to increased result acceptance (18/23), ownership of quality improvement initiatives (16/23) and motivation (20/23) amongst all stakeholders. This was summarized by a facility in-charge:

"In the past this [dissemination meeting] was not done... They [CHMT] came, did supervision and left to do their [work] (...) Completely different from e-TIQH, because when they came [for the dissemination meeting] they transparently displayed for the whole district [council] how we deliver our services and where the weaknesses are [...] I used to believe that maybe I was the only one with challenges, but when I arrived there, [I saw] there are colleagues of mine, whose conditions were very bad... So, at least I got motivated [that]... I had to work hard in order to reach another level... I was very pleased because I realized that I already reached a certain position. Thus, [I asked myself] what should I do in order to move further?" (Facility incharge, Myomero DC)

The annual dissemination meeting with all relevant stakeholders was seen as a crucial forum for mutual learning and understanding, where best practices, lessons learned, success and failures of quality improvement initiatives could be shared (8/23).

## **Cost assessment**

Table 21 shows opportunity costs (time spent based on salary) and financial costs (per diems/allowances, transport, and other expenses) of introducing e-TIQH supportive supervision in a new council. The first three activities in Table 21 were part of the e-TIQH supportive supervision approach in the past. The one-day platform usage training was added based on findings from the qualitative study, which pointed out a lack of capacity within the CHMT to fully use the results generated by the e-TIQH assessments. Overall and financial cost was lower than one round of routine supervision in a rural council (Table 23). In an urban council financial cost was around 1.7 times the financial cost of one round of routine CHMT supervision, leading also to higher overall cost.

Table 21 Cost of introducing e-TIQH supportive supervision in a new council in 2016 USD by type of council, resource and activity.

		Rural			Urban				
	Opportunity cost <sup>4</sup>	Financial cost⁵	Total	Opportunity cost <sup>4</sup>	Financial cost⁵	Total			
1 day sensitization meeting <sup>1</sup> 2 days start-up training <sup>2</sup>	1'361 1'439	1'070 1'234	2'431 2'673	1'190 1'439	740 1'006	1'930 2'445			
Implementation supervision by 2 trainers 1 day platform usage training <sup>3</sup>	976 552	448 503	1'424 1'055	767 552	503 471	1'270 1'022			
Total	4'327	3'256	7'583	3'948	2'720	6'667			

Figures are rounded and thus might not exactly add up to the total

<sup>&</sup>lt;sup>1</sup>Participant composition: 5 Council officials, 12 CHMT members, 5 non-CHMT assessors and 2 trainers with one driver

<sup>&</sup>lt;sup>2</sup>Participant composition: 12 CHMT members, 5 non-CHMT assessors and 2 trainers

<sup>&</sup>lt;sup>3</sup>Participant composition: 8 CHMT members and 2 trainers

<sup>&</sup>lt;sup>4</sup>Opportunity cost includes the time spent by staff based on their salary

<sup>&</sup>lt;sup>5</sup>Financial cost includes per diems/allowances, transport for trainers (300km one way from regional headquarter) and other expenses, like supplies (e.g. print outs, notebook), rent, food and refreshment during meeting and trainings

Table 22 shows hours required by the assessment teams for one round of routine CHMT and e-TIQH supportive supervision by type of council and activity. The biggest task was visiting and assessing all health facilities, which was less during e-TIQH supportive supervision compared to the routine CHMT approach. Importantly, this not only decreased the time required by the assessors, but also the time and burden for the healthcare providers. The time valuation of the latter was not incorporated in the results presented in Table 22. Less time spent at the health facility also allowed assessing more health facilities within one day. This reduced the overall number of days required to visit all health facilities within an average rural and urban council as shown illustratively in Figure 28. Besides the time needed for conducting the assessment, e-TIQH supportive supervision also reduced time spent on reporting.

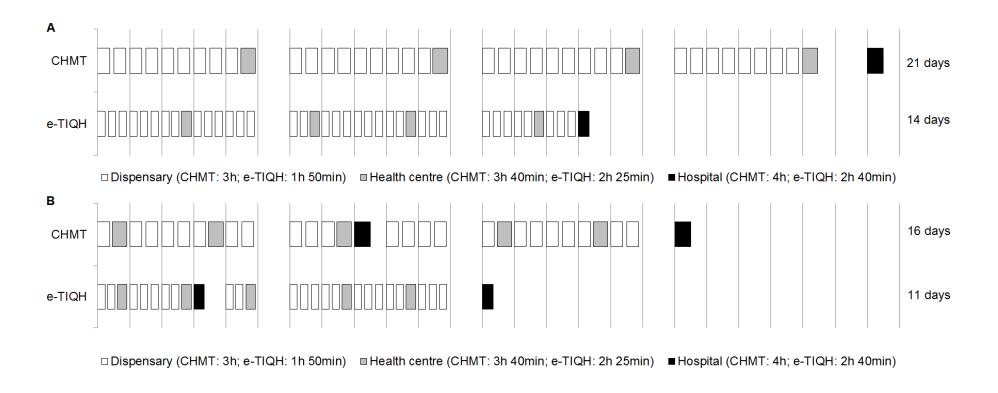
**Table 22** Estimated hours required by the assessment team for one round of routine CHMT and e-TIQH supportive supervision, by type of council and activity.

	Routine	CHMT	e-TQIH supportive supervision							
	supportive s	upervision	Recommend	ded option	Reduced asse	Reduced assessor option				
	Rural	Urban	Rural	Urban	Rural	Urban				
Preparation	34	34	41	41	34	34				
Implementaion <sup>1</sup>	1008	768	784	616	672	528				
Reporting	147°	134°	116	116	97	97				
Total	1189	936	941	773	803	659				

<sup>°</sup>Data entry after supportive supervision was assumed to take three minutes per page

Further information about time spent on more specific activities can be found in table S2 in supplementary data

<sup>&</sup>lt;sup>1</sup>Only includes time of the assessors and not time spent by the healthcare provider taking care of the assessment team



**Figure 28** Possible supportive supervision schedule showing assessment days required by the supportive supervision approach in an average rural (A) and urban (B) council. Vertical lines indicate a working day, consisting of eight hours (08:00 – 16:00). For simplicity schedule presented was developed for one team assessing the whole council.

The overall decrease in time used for supportive supervision by the e-TIQH approach also translated into lower opportunity (salary) and financial (per diems/allowances, transport, and other expenses) costs (Table 23). This was the case in all scenarios presented in Table 23, except for the recommended option in an average urban council, where financial cost was slightly higher despite clearly lower overall cost. The reason for this was the cost of other expenses, which included tablet (16USD/tablet) and platform running (92USD/council) costs. Time spent doing the assessment turned out to be the main cost driver, because of the amounts spent on per diems. Interestingly, overall cost and per diem cost were lower during e-TIQH supportive supervision despite the fact that the assessment team consisted of two more assessors than in the CHMT approach (Table 23A&B). If an equal amount of assessors was to be used, the decrease would be even more pronounced (Table 23C). Yet, this is likely to impact acceptance of the assessment amongst stakeholders involved as it would reduce the diversity of the assessment team's perspectives and therewith affect effectiveness in terms of implementing improvement measures.

Finally, the cost for conducting an annual dissemination meeting is given in Table 24. Financial cost and therewith overall cost in a rural council for this meeting exceeded the amount of one full round of routine CHMT supportive supervision due to per diem rates paid to participants. In an urban council financial and overall dissemination meeting costs remained lower than one round of supportive supervision. This was due to the proximity of the health facilities to the council headquarter resulting in less expenses for per diems and less time spent travelling to the meeting.

Table 23 Cost for one round of CHMT (A) and e-TIQH supportive supervision (B&C) in 2016 USD by type of council, resource and activity.

_		Routine CHMT supportive supervision												
Α			Ru	ral			Urban							
	Salary	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall	Salary	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall		
Preparation	145	0	0	55	55	199	143	0	0	43	43	187		
Implementation <sup>4</sup>	3'782	3'479	571	18	4'069	7'851	2'881	1'325	229	14	1'568	4'449		
Reporting	626	0	0	1	1	627	573	0	0	1	1	574		
Total	4'553	3'479	571	74	4'124	8'677	3'598	1'325	229	58	1'612	5'210		

_		e-TIQH supportive supervision - Recommended option												
В			Ru	ral					Urba	an				
	Salary <sup>3</sup>	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall	Salary <sup>3</sup>	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall		
Preparation	174	146	9	22	177	352	174	55	5	20	79	253		
Implementation <sup>5</sup>	2'999	2'687	571	215°	3'474	6'473	2'356	1'056	229	215°	1'500	3'856		
Reporting	496	146	9	2	157	653	496	55	5	2	61	557		
Total	3'669	2'980	590	240	3'809	7'478	3'026	1'165	238	237	1'640	4'666		

_		e-TIQH supportive supervision - Reduced assessor option												
C			Ru	ıral			Urban							
	Salary <sup>3</sup>	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall	Salary <sup>3</sup>	Per diem/ allowance	Transport <sup>1</sup>	Other expenses <sup>2</sup>	Total financial	Total overall		
Preparation	146	73	5	22	100	246	146	27	2	20	50	195		
Implementation <sup>6</sup>	2'521	2'303	571	199°	3'074	5'595	1'981	905	229	199°	1'333	3'314		
Reporting	413	73	5	2	80	493	413	27	2	2	31	444		
Total	3'080	2'450	580	223	3'254	6'334	2'540	960	233	221	1'414	3'954		

Figures are rounded and thus might not exactly add up to the total

°Included cost for tablets and the platform running cost assuming the latter would be shared across all 179 councils in Tanzania. Without tablets the figure would be 16USD/tablet lower and without platform running cost 92USD/council.

<sup>&</sup>lt;sup>1</sup>Included transport allowances

<sup>&</sup>lt;sup>2</sup>Others expenses included supplies (e.g. print outs, notebook, tablets) as well as communication, internet and platform running cost

<sup>&</sup>lt;sup>3</sup>Depending on which non-CHMT members will be selected, they might not be on government payroll. However, it was assumed that there opportunity cost would be the same as in the case of a CHMT member assessor

<sup>&</sup>lt;sup>4</sup>Assessment team consists of twice five CHMT members (in total 10 assessor) with one driver each

<sup>&</sup>lt;sup>5</sup>Assessment team consists of twice four CHMT members and two non-CHMT members (in total 12 assessor) with one driver each

<sup>&</sup>lt;sup>6</sup>Assessment team consists of twice four CHMT members and one non-CHMT member (in total 10 assessor) with one driver each Further information about the cost of more specific resources can be found in table S1 in supplementary data

Table 24 Annual dissemination meeting cost in 2016 USD by type of council, resource and activity.

	_	Rural		Urban				
	Opportunity cost <sup>3</sup>	Financial cost⁴	Total	Opportunity cost <sup>3</sup>	Financial cost⁴	Total		
Preparation <sup>1</sup>	136	9	146	136	9	146		
1 day dissemination meeting <sup>2</sup>	3'622	6'120	9'743	1'743	1'407	3'149		
Total	3'759	6'130	9'888	1'879	1'416	3'295		

Figures are rounded and thus might not exactly add up to the total

<sup>&</sup>lt;sup>1</sup>Preperation done by 2 CHMT members during two days

<sup>&</sup>lt;sup>2</sup>Participant composition: 5 Council officials, 12 CHMT members, 7 CHSB members, 40 (rural) / 30 (urban) health facility in-charge, 32 (rural) / 14 (urban) HFGC chair (Ministry of Health Community Development Gender Elderly and Children, 2016a)

<sup>&</sup>lt;sup>3</sup>Opportunity cost includes the time spent by staff based on their salary

<sup>&</sup>lt;sup>4</sup>Finacial cost includes per diems/allowances, transport and other expenses like supplies (e.g. print outs, notebook), communication cost as well as rent, food and refreshment during meeting and trainings

## 7.5 Discussion

Findings with regard to routine CHMT supportive supervision were well in-line with what has been reported previously for Tanzania or similar settings (Rowe et al., 2005, Manongi et al., 2006, Bosch-Capblanch and Garner, 2008, Ministry of Health and Social Welfare, 2010, Bosch-Capblanch et al., 2011, Ministry of Health and Social Welfare, 2011b, Manzi et al., 2012, Mubyazi et al., 2012, Nangawe, 2012, Ministry of Health and Social Welfare, 2013e, Bradley et al., 2013, McAuliffe et al., 2013, Kiplagat et al., 2014, Olafsdottir et al., 2014, Bailey et al., 2016). Our results also revealed the advantages and challenges of e-TIQH supportive supervision, as well as issues of routine CHMT supportive supervision that still remain with the e-TIQH approach.

## Advantages of e-TIQH supportive supervision

The e-TIQH supportive supervision approach addressed several frequently mentioned challenges of routine CHMT supportive supervision and thus received substantial support at council and health facility level (Manongi et al., 2006, Ministry of Health and Social Welfare, 2010, Ministry of Health and Social Welfare, 2011b, Mubyazi et al., 2012, Nangawe, 2012, Manzi et al., 2012, Bradley et al., 2013, Ministry of Health and Social Welfare, 2013e, McAuliffe et al., 2013, Kiplagat et al., 2014, Olafsdottir et al., 2014).

## Financial and human resources

Both qualitative findings and costing results demonstrated that e-TIQH supportive supervision reduced time and cost spent, despite a higher number of assessors needed per team. This allowed saving precious time of overburdened council and health facility staff as well as reducing the need for financial resources. Additionally, owing to the mixed assessment team in the e-TIQH approach only four and not five CHMT members per team were required, thereby further reducing the staff demands on the CHMT's side. Thus, the more efficient use of human and financial resources could make supportive supervision implementation more feasible and therewith more likely to happen.

## Data quality

Importantly, our findings showed that e-TIQH supportive supervision also improved availability of evidence through the better quality of collected data. The electronic format of the tool in particular increased completeness, legibility, timeliness, accessibility, security and meaningfulness of the data, as well as the user-friendliness of the assessment. Automated data entry and analysis facilitated simple and immediate access to aggregated and comparable data and eliminated the problem of manual data entry errors. This was found to

be a major improvement compared to routine CHMT supportive supervision, where data entry and systematic analysis was hardly ever done.

Other features of the e-TIQH approach also contributed to improved data quality. For example the different assessment design, in particular the multi-dimensional quality concept and the assessment type focusing on processes and structural adequacy, increase perceived accuracy and acceptance of the assessment (Renggli et al., 2017b). This was the case although the e-TIQH assessment tool did not have a higher number of indicators. In fact, the clearly defined and more concise indicator set improved reliability of the assessment. Thus, fewer, but more accurate indicators that are consistently followed up might lead to more substantial improvements than a more comprehensive indicator set, which is not consistently followed-up (Renggli et al., 2017c).

Also, a more diverse assessment team, involving CHMT core and co-opted members as well as community and private sector representatives, reduced bias and further increase perceived accuracy and acceptance of the assessment. Interestingly, the national supportive supervision guidelines already stipulate the need of such mixed teams, but it has not been implemented so far (Ministry of Health and Social Welfare, 2010, Mubyazi et al., 2012, Nangawe, 2012).

## Feedback at health facility

The way comprehensive and action-oriented feedback was given to all stakeholders at health facility level was another key feature of the e-TIQH approach. Instead of primarily focusing on negative aspects, the language used was supportive and advices given were constructive and summarized in writing. Also, joint discussions were solution-oriented and clear, achievable tasks were assigned to all stakeholders involved. Thus, as hypothesised by Mboya *et al.* (Mboya et al., 2016), the feedback led to increased knowledge and skills, was more accepted and improved motivation and ownership of subsequent quality improvement measures at facility level (Renggli et al., 2017b). The need for constructive and supportive feedback is supported by other literature showing its importance for effective supportive supervision (Marquez and Kean, 2002, Bosch-Capblanch and Garner, 2008, Manafa et al., 2009, Bradley et al., 2013, McAuliffe et al., 2013, Bailey et al., 2016).

### Data usage

Overall, the improved data quality of the e-TIQH approach allowed for more systematic follow ups, better monitoring of changes as well as more timely and adequate actions. Additionally, as speculated by Mboya *et al.* (Mboya et al., 2016), the approach increased usage of collected data during planning and budgeting, leading to more evidence-based resource

allocation. If used at national scale the e-TIQH supportive supervision approach would also allow for comparison between councils and regions, addressing another major gap of current routine CHMT supportive supervision (Ministry of Health and Social Welfare, 2010). This further opens up the opportunity to strengthen and facilitate the role of RHMTs in supervising CHMTs, which in turn would be likely to stimulate motivation and ownership of CHMTs to conduct proper supportive supervision. At the same time the e-TIQH approach would offer a great possibility to overcome the lack of national indicators for monitoring quality of healthcare and ensure improved alignment with indicators of vertical programs, development partners and national accreditation initiatives (Ministry of Health and Social Welfare, 2010, Ministry of Health and Social Welfare, 2011b, Nangawe, 2012, Ministry of Health and Social Welfare, 2013e, Ministry of Health and Social Welfare, 2015a, Ministry of Health and Social Welfare, 2015b). The later was for example the case in Rufiji DC, a council where a national star rating system was introduced in 2016 (Table 18) (Ministry of Health and Social Welfare, 2015a). Most importantly, by making the e-TIQH approach the standard approach for routine CHMT supportive supervision, it would ensure that required improvements are actually happening and therewith would accelerate the ministry's efforts to move towards accreditation of all health facilities (Nangawe, 2012).

## Challenges to the e-TIQH supportive supervision

## Financial resources

Financial concerns in terms of purchasing tablets and covering platform cost could not be confirmed, as they represented only a small part of the overall cost. Additionally, tablets could be substituted by personal smart phones and an open-source platform could be made available to reduce running cost in the medium to long term. One-time financial start-up cost for introducing e-TIQH supportive supervision in a council was within the range of one round of supervision, depending on the type of council. In contrast, the financial cost for conducting an annual dissemination meeting, which exceeded the amount of one round of supportive supervision in rural councils, would occur yearly. Thus, it may be difficult to implement and maintain dissemination meetings in resource constraint settings. However, qualitative data indicated that dissemination meetings contributed substantially to increased knowledge and skills through mutual learning and understanding. It thereby supported the aim of the government to promote peer learning and exchange of experiences (Ministry of Health and Social Welfare, 2015b). The dissemination meetings also strongly improved result acceptance, ownership of quality improvement measures and motivation amongst all stakeholders. Thus, it was effective in rewarding good health facility performance without financial incentives. Spotlighting quality of care set the bar for performance and managed to create a system for recognition, something which is well known to improve motivation and

retention of healthcare providers (Peabody et al., 2006, Mathauer and Imhoff, 2006, Willis-Shattuck et al., 2008, Mubyazi et al., 2012, Ministry of Health and Social Welfare, 2014a). This was the case despite the fact that two out of three study councils already had experiences with pay-for-performance (P4P) schemes.

## Remaining challenges for supportive supervision

The results presented here also revealed issues of routine CHMT supportive supervision that e-TIQH supportive supervision could not overcome. One of the main remaining challenges is the competing tasks and ad-hoc assignments among CHMT members, leading to the disruption of planned supportive supervision, which was similar to findings from previous studies (Manongi et al., 2006, Manzi et al., 2012, Nangawe, 2012, Bradley et al., 2013). Additionally, insufficient and delayed financial resources and availability of vehicles for supportive supervision would remain a major challenge and affect motivation of CHMT members, in-line with what has been raised by others (Manzi et al., 2012, Bradley et al., 2013, Olafsdottir et al., 2014, Mayumana et al., 2017). Neither will e-TIQH nor routine CHMT supportive supervision be effectively implemented with insufficient assessors or assessors lacking contextual knowledge or professional and organisational skills (Manzi et al., 2012).

## Limitations of the study

Although findings presented here were supported by triangulation of methods, causality between the e-TIQH approach and objectively measured improvements in supportive supervision cannot conclusively be claimed. Especially, it remains uncertain how much of the improvement was attributable to the usage of an electronic tool, and how much was due to the overall e-TIQH approach and spirit. Also, it could not be excluded that the ISAQH staff influenced the results presented here. In particular during the dissemination they played a major role as they were the ones presenting the results. For the health facility assessment and subsequent feedback the ISAQH staff only acted as facilitators, while the CHMT members were conducting the activities. Additionally, it is likely that the organisational capacity of the ISAQH staff was greater than the one of an average CHMT, which might have smoothened implementation of the supportive supervision exercise. Similar considerations apply for the financial resources for implementation that were readily accessible through project funds and might have influenced CHMT member motivation, especially because per diems were paid in time. Thus, it remains unclear to which extent implementation will be successful in the absence of some form of project support.

The economic costing relied on reported estimates of time used by a small sample of CHMT members. These estimates could not be validated to ensure reported time would reflect

actual time spent. Also, sense of time was likely to have varied between respondents. However, only CHMT members who participated in both approaches were considered in our study. It should be further recognized that there might have been some recall bias as the interviews took place one to two years after the last implementation of the e-TIQH approach.

It has also to be acknowledged that the respondents were aware of the link between interviewers and the team facilitating the implementation of the e-TIQH supportive supervision approach. This could have potentially led to statements overestimating the contribution of the e-TIQH approach.

Finally, none of the studies aimed to examine the effects of the e-TIQH-linked quality improvements on changes in health outcomes. Hence, the proof that improved processes lead to improved outcomes should be the subject of further research, for example through linking community health data with health facility data.

## 7.6 Conclusion

Compared to routine CHMT supportive supervision, the e-TIQH supportive supervision approach improved quality of data collected and acceptance of supportive supervision amongst stakeholders involved, while reducing required human and financial resources. It increased healthcare providers' knowledge and skills as well as generated better evidence for follow-up actions, including budgeting and planning. Also, stakeholders' motivation and ownership of subsequent quality improvement measures was higher. Consequently, the approach made supportive supervision more effective and efficient and therewith also more sustainable. This increased feasibility of supportive supervision and hence the likelihood of its implementation. It therefore facilitated achieving and maintaining crucial quality standards, which ultimately lead to improvements in quality of primary healthcare (Renggli et al., 2017c). Thus, the results presented together with previous findings suggested that if used as the standard approach for routine CHMT supportive supervision the e-TIQH approach provides a suitable option to make supportive supervision more cost-effective (Mboya et al., 2016, Renggli et al., 2017c, Renggli et al., 2017b). The e-TIQH approach not only addressed specific challenges frequently experienced with routine CHMT supportive supervision in Tanzania but also provides informed guidance to overcome several problems of supportive supervision and healthcare quality assessments in low- and middle income countries (Peabody et al., 2006, Edward et al., 2009, Bosch-Capblanch et al., 2011, Bailey et al., 2016, Sprockett, 2016, Akachi and Kruk, 2017). Therefore, it may prove useful for enhancing quality of care in such settings.

# 7.7 Acknowledgement

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# 7.8 Supplementary data

**Table S1** Unit cost of resources in Tanzanian Shillings (TSh). Exchange rate in 2016 was 2'188TSh per USD.

Itam	Unit post
Average colomy of train and	Unit cost
Average salary of trainers <sup>1</sup>	19'067/h°
Average salary of council officials <sup>1</sup>	18'115/h°
Average salary of CHMT/non-CHMT assessor/CHSB <sup>1</sup>	9'332/h°
Average salary of health facility in-charge (health centre) <sup>1</sup>	5'331/h°
Average salary of health facility in-charge (dispensary) <sup>1</sup>	5'122/h°
Average salary of HFGC chair <sup>1</sup>	3'842/h°
Average salary of driver <sup>2</sup>	2'596/h°
Per diem trainer (village level) <sup>3</sup>	70'000/day
Per diem trainer (council level) <sup>3</sup>	100'000/day
Per diem CHMT (village level) <sup>3</sup>	62'500/day
Per diem non-CHMT assessor (village level) <sup>3</sup>	60'000/day
Per diem non-CHMT assessor/CHSB (council level) 3	80'000/day
Per diem health facility in-charge (health centre) (council level) <sup>3</sup>	80'000/day
Per diem health facility in-charge (dispensary) (council level) <sup>3</sup>	73'333/day
Per diem HFGC chair (council level) <sup>3</sup>	60'000/day
Per diem driver (village level) <sup>3</sup>	50'000/day
Per diem driver (council level) <sup>3</sup>	60'000/day
Extra duty allowance for council officials <sup>4</sup>	35'000/day
Extra duty allowance CHMT <sup>4</sup>	31'250/day
Extra duty allowance non-CHMT assessor/CHSB <sup>4</sup>	30'000/day
Extra duty allowance health facility in-charge (health centre) <sup>4</sup>	30'000/day
Extra duty allowance health facility in-charge (dispensary) <sup>4</sup>	28'333/day
Extra duty allowance HFGC chair <sup>4</sup>	25'000/day
Extra duty allowance driver <sup>4</sup>	25'000/day
Transport allowance (Rural council) <sup>5</sup>	5'000/way
Transport allowance (Urban council) <sup>5</sup>	2'500/way
Diesel (1L per 7km) <sup>6</sup>	2'500/L
Rent for conference facility <sup>6</sup>	100'000/day
Food and refreshment per person <sup>6</sup>	10'000/day
Print out of page <sup>7</sup>	50/page
Communication voucher <sup>7</sup>	10'000/week
Notebook <sup>7</sup>	700 each
Pen <sup>7</sup>	300 each
Internet bundle <sup>7</sup>	8'333/week
Multi plug (durable for 3 years=12 rounds) <sup>7</sup>	25'000 each
Tablet (durable for 3 years=12 rounds) <sup>7</sup>	200'000 each
Training material <sup>8</sup>	3'000 each
Annual platform running cost (179 councils with 12 users each) <sup>8</sup>	808'124/council

<sup>°</sup>Yearly salary was assumed to be equal to 52 weeks of 40 hours of work

<sup>&</sup>lt;sup>1</sup>Source: Assumption based on information given by respondents and national salary scales (Prime Minister's Office Regional Administration and Local Government, 2013)

<sup>&</sup>lt;sup>2</sup>Source: Personal communication

<sup>&</sup>lt;sup>3</sup>Salary and location-dependent; source: Information given by respondents, cross verified by official documentation collected by SR and IM

<sup>&</sup>lt;sup>4</sup>Said to be half of the lowest per diem rate (village level); source: information and assumptions given by respondents, cross verified by personal communication

<sup>&</sup>lt;sup>5</sup>Source: Information given by respondent, cross verified by CCHP budgets and quarterly combined TFPIRs collected by SR and IM

<sup>&</sup>lt;sup>6</sup>Source: CCHP budgets collected by SR and IM

<sup>&</sup>lt;sup>7</sup>Source: Market price collected by SR and IM

<sup>&</sup>lt;sup>8</sup>Source: ISAQH documents collected by SR and IM

**Table S2** Estimated quantity and time required for CHMT and e-TIQH supportive supervision by activity – Average across all three study councils.

	Routine CHMT sup	portive supervision	e-TIQH support	e-TIQH supportive supervision				
_	Quantity	Time required	Quantity	Time required				
Preparation								
Prepare checklist	2x25pages per health facility	90sec/40pages						
Update surveys			12 devices	5min/device				
Prepare feedback summary form			2x5pages per health facility	90sec/40pages				
Preparatory meeting and logistics	10 CHMT members	3h13min/person	8 CHMT members and 4 non-CHMT members	3h13min/person				
Introduction of a new team member	2 CHMT members	15min/person	2 CHMT members	30min/person				
Implementation								
Charge devices			1 CHMT member per team and day	7min/6tablets				
Introduction at the health facility	5 CHMT members	11min/health facility	4 CHMT members and 2 non-CHMT member	9min/health facility				
Data collection at the health facility	5 CHMT members	1h48min/ dispensary; 2h30min/ health centre; 2h54min/ hospital	4 CHMT members and 2 non-CHMT member	1h/dispensary; 1h30min/health centre; 1h48min/hospital				
Production of feedback at the health facility	5 CHMT members	29min/health facility	4 CHMT members and 2 non-CHMT member	18min/health facility				
Provision of feedback at the health facility	5 CHMT members	29min/health facility	4 CHMT members and 2 non-CHMT member	24min/health facility				
Data processing			1 CHMT member per team	1h30min/day				
1 round of supportive supervision	2 teams of 5 CHMT members and 1 driver each	10.5 days/rural council; 8 days/ urban council	2 teams of 4 CHMT members, 2 non-CHMT member and 1 driver each	7 days/rural council; 5.5 days/ urban council				
Reporting								
Data entry	1 CHMT member for each team	3min/page						
Discussion and report writing (1 page per facility)	10 CHMT members	9h41min/person						
Discussion and report writing (2 pages/facility & 10 pages/council)			8 CHMT members and 4 non-CHMT members	9h41min/person				

# 8. Administrating the Tanzanian Community Health Fund within a complex system

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Working paper

## 8.1 Abstract

Introduction: In Tanzania the health financing system is extremely fragmented with cost sharing strategies in place to supplement funds provided from the central level. One of these strategies is the Community Health Fund (CHF), a voluntary health insurance scheme for the informal rural sector. Since its implementation has been challenging, we investigated CHF administration processes and their interactions with other health financing mechanisms and policies.

*Methods:* Two councils were purposively selected for this study. Administrative routine data were collected at council and public health facility level. Additionally, an economic costing approach was used to estimate CHF administration cost and the contribution of other health financing mechanisms to these costs.

Results: Bottlenecks in CHF administration and management led to serious implementation problems, which were likely to have affected CHF enrolment. Costing results clearly pointed out the lack of financial sustainability of the CHF. However, the financial analysis showed that thanks to significant contributions from other health financing mechanisms, the CHF could be left with more than 70% of its revenues for financing services assuming administration processes were working. Additionally, exemption policies and healthcare seeking behaviour influenced negatively the maximum potential enrolment rate of such a voluntary scheme. Higher revenues from user fees, user fee policies and fund pooling mechanisms might have furthermore set incentives for care providers to prioritize user fees over CHF revenues.

Conclusion: Given the context in which the CHF is implemented and its interaction with other health financing mechanisms and policies, it is questionable if improvements in CHF administration and management are feasible and scalable. The question also certainly remains if such efforts were value-for-money. Thus, our results call for a reconsideration of approaches taken to address the challenges in health financing and emphasises the importance of looking beyond a single health financing mechanism.

Key words: Community Health Fund, Tanzania, administration, health financing, universal health coverage

# 8.2 Introduction

Following the publication of the World Health Report 2010 and the formulation of the health-related Sustainable Development Goal 3, Universal Health Coverage (UHC) has gained high priority in many countries (World Health Organization, 2010, Sustainable Development Solution Network, 2015). UHC implies that everyone has access to needed health services of sufficient quality to be effective without incurring financial hardship (World Health Organization, 2010). However, many low- and middle-income countries have been struggling to implement sustainable health financing strategies. A major problem in these countries is the informal nature of their economies, which makes the collection of revenues to fund health systems more difficult. But also underlying strategies and mechanisms of health financing systems pose challenges (World Health Organization, 2013). The basis to address these challenges lies in the in-depth understanding of the context-specific and often complex designs and processes of existing health financing systems (World Health Organization, 2010, World Health Organization, 2013).

In Tanzania, the healthcare system primarily depends on funds from central level coming either from general tax revenues or from external donors (Dutta, 2015). In addition, there are several insurance schemes, and out-of-pocket payments account for around 23% of total health expenditure (World Health Organization, 2014). Overall, the health financing system is extremely fragmented, both in terms of insurance schemes as well as within the central level funding system (McIntyre et al., 2008, Haazen, 2012, Borghi et al., 2013, Dutta, 2015). User fees paid out-of-pocket are levied at the point of access, whereas the poor and other defined priority groups (children under five, pregnant women, elderly above 60, and people with certain disease conditions, including chronic illnesses, HIV/AIDS, TB and leprosy) are supposed to be exempted at public health facilities (Mubyazi, 2004). All public servants are compulsorily enrolled in the National Health Insurance Scheme (NHIF), covering both inpatient and out-patient care (McIntyre et al., 2008). Voluntary insurance schemes include the Community Health Funds (CHFs) for the informal rural population (Haazen, 2012). The CHF scheme covers a whole household and the flat rate premium per year as well as the benefit package is defined by the councils. CHF funds raised are doubled through matching grants from the central government via the NHIF (Chakupewa and Maluka, 2016). At council level, resources collected through cost sharing strategies are defined as "Cost Sharing and Insurance Funds (CSIFs)" and includes CHF revenues, matching grants, user fees and reimbursements from the NHIF (Ifakara Health Institute, 2013). Key stakeholders relevant for CSIF implementation at council level are described in box 1 and summarized in Figure 29.

# Box 1. Key stakeholders of cost sharing and insurance fund implementation within a council (Figure 29)

#### Council level

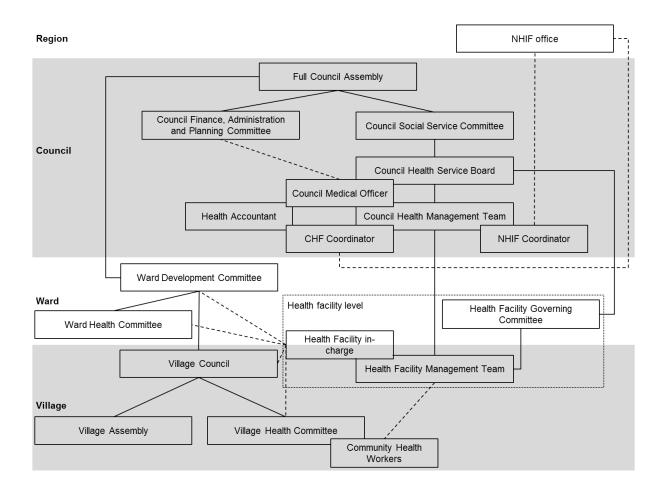
The Council Health Service Board (CHSB), consisting of community and private health sector representatives, is the governance body overseeing the Council Health Management Team (CHMT) (Kessy et al., 2008, Kessy, 2014). The CHSB is responsible for management and administration of the funds collected at health facility level (CHF revenues, matching grants, user fees) (Mtei and Mulligan, 2007). This includes mobilizing and allocating funds, issuing CHF membership cards to exempted households, and verifying the collection and expenditure of funds (United Republic of Tanzania, 2001). The CHSB receives technical input from the CHMT through the Council Medical Officer (CMO). The CHMT is in charge of monitoring and assuring the quality of services provided (United Republic of Tanzania, 2001). The CHF and NHIF coordinators are typically members or co-opted members of the CHMT (Borghi et al., 2015). The CHF coordinator, who is supported by a council health accountant, oversees the operation of the CHF and tracks membership, fund generation and use (Borghi et al., 2015). It is the duty of the council (often the CHF coordinator) to claim the matching funds from the NHIF. The NHIF coordinator compiles the NHIF claim forms and forwards them to the NHIF office. NHIF reimburses the council or directly the health facility for expenses based on the submitted claim forms.

## Ward and village level

The Ward Development Committee (WDC) at ward level and the Village Council (VC) at village level are in charge of sensitizing and mobilizing community members (e.g. during the Village Assembly), and identifying poor households eligible for exemptions (United Republic of Tanzania, 2001).

## Health facility level

At facility level the Health Facility Governing Committees (HFGCs), composed of community representatives, oversee the facility operations. They are responsible for the mobilization of financial resources to run the health facility and liaising with the CHSB (Kessy et al., 2008, Kessy, 2014). The Health Facility Management Team (HFMT) enrols community members into the CHF, collects contributions (CHF revenues, user fees) and completes NHIF claim forms (Kessy, 2014, Borghi et al., 2015).



**Figure 29** Key stakeholders of cost sharing and insurance fund implementation at council level. Solid lines indicate official reporting hierarchies, dashed lines indicate further relevant interactions, and stakeholders within the dotted box belong to the health facility level.

National CHF enrolment rate in 2015 was around 4.5% (Ministry of Health Community Development Gender Elderly and Children et al., 2016), indicating that the target of 30% enrolment by 2015 had not been reached (Ministry of Health and Social Welfare, 2009a, Ministry of Health and Social Welfare, 2015b). Numerous studies have investigated reasons for low enrolment. Amongst them are low quality of care, high premium rates, limited benefit packages, lack of trust in the scheme or the healthcare provider, as well as failure to see the rational of an insurance scheme (Kamuzora and Gilson, 2007, Mtei and Mulligan, 2007, Kessy et al., 2008, Stoermer et al., 2011, Stoermer et al., 2012, Ministry of Health and Social Welfare, 2012a, Borghi et al., 2013, Macha et al., 2014, Maluka and Bukagile, 2014, Kalolo et al., 2015, Kalolo et al., 2017, Kapologwe et al., 2017). Issues in governance were observed, in particular in terms of insufficiently capacitated or functioning CHSBs, HFGCs and WDCs at local level and the role of the NHIF in managing the CHF (Mtei and Mulligan, 2007, Kamuzora and Gilson, 2007, Kessy et al., 2008, Stoermer et al., 2011, Stoermer et al., 2012, Ministry of Health and Social Welfare, 2013c, Borghi et al., 2013, Mkumbo and

Masbayi, 2014, Kessy, 2014, Maluka and Bukagile, 2014, Kalolo et al., 2015, Borghi et al., 2015, Chakupewa and Maluka, 2016, Kalolo et al., 2017). Furthermore, various bottlenecks in CHF management have been described, including the lack of district management commitment, high administration cost, inadequate supportive supervision, a weak medical supply chain as well as the lack of systems for service purchasing, claim processing and risk equalisation or cross-subsidisation (Mtei and Mulligan, 2007, Kamuzora and Gilson, 2007, Kessy et al., 2008, Stoermer et al., 2011, Stoermer et al., 2012, Borghi et al., 2013, Macha et al., 2014, Maluka and Bukagile, 2014, Borghi et al., 2015, Chakupewa and Maluka, 2016). Some studies also touched upon problems regarding weak administration processes, inadequate fund pooling, and insufficient transparency and accountability together with poor data quality and management at all level leading to incomplete matching fund requests (Kamuzora and Gilson, 2007, Kessy et al., 2008, Stoermer et al., 2011, Ministry of Health and Social Welfare, 2012a, Stoermer et al., 2012, Borghi et al., 2013, Macha et al., 2014, Mkumbo and Masbayi, 2014, Maluka and Bukagile, 2014, Frumence et al., 2014b, Borghi et al., 2015, Chakupewa and Maluka, 2016, Kalolo et al., 2017). Lastly, interaction with other cost sharing mechanisms have been reported as leading to challenges, in particular exemption policies, which are inadequately implemented or potentially discouraging people from joining the CHF (Mtei and Mulligan, 2007, Kamuzora and Gilson, 2007, Kessy et al., 2008, Nangawe, 2012, Maluka, 2013, Idd et al., 2013, Ministry of Health and Social Welfare, 2013c, Macha et al., 2014).

However, apart from an administrative costing study and an analysis of the effect of a CHF management reform by Borghi *et al.* (Borghi et al., 2013, Borghi et al., 2015), little detailed evidence has been provided about the administration of the CHF or its interaction with other health financing mechanisms. This is most likely due to the difficulty of obtaining such kind of data (Laterveer et al., 2004, Ministry of Health and Social Welfare, 2013c). Hence, the aim of this paper was to investigate administrative factors and interactions with other health financing mechanisms and policies, which might explain differences in council performance and why reaching the envisioned target of 30% enrolment by 2015 has been so difficult (Ministry of Health and Social Welfare, 2009a).

# 8.3 Methods

## Study area

Two neighbouring rural district councils "A" and "B" from the same region were selected. Both councils benefited from the "Initiative to Strengthen Affordability and Quality of Healthcare (ISAQH)", which aimed to support and expand coverage of the CHF through: [1] training on CHF administration for all relevant stakeholders in 2012, [2] a CHF forum in 2013, [3] CHF radio spots aired between 2012 and 2014, [4] supportive supervision on CHF data management for the years 2012 to 2014, and [5] sensitization meetings (including the distribution of information, education and communication materials) in villages in 2012 (both councils) and 2013 (council A only). Councils were chosen for their difference in perceived administrative management capacity, as judged by ISAQH staff. Council A was perceived as better performing than council B. Further relevant characteristics of the councils are described in Table 25, but for confidentiality reasons no more information can be given.

Table 25 Description of study councils (status 2014).

Characteristics	Council A	Council B
Population size <sup>1</sup>	~250'000	~400'000
Average household size <sup>1</sup>	4.9	4.3
Number of health facilities <sup>2</sup>	38	59
Number of public health facilities (hospitals/health centres/dispensaries) <sup>2</sup>	27 (23/3/1)	25 (20/5/0°)
Year of CHF introduction <sup>3</sup>	2003	2008/9
CHF premium <sup>3</sup>	3.01/6.02USD <sup>5,6</sup>	6.02USD <sup>6</sup>
Number of beneficiaries per CHF card <sup>4</sup>	6	5
CHF benefit package <sup>3,4</sup>	Unlimited access to all services offered at any public health facility within the council, including the council hospital	Access limited all services offered at the health facility, where CHF registration took place
User fee <sup>4</sup>	0.90USD at public dispensaries or health centres including all services; 1.20USD at the public hospital for registration/ consultation and various prices for medical supplies, diagnostics or any other additional services	0.12-1.08USD for registration/ consultation and various prices for medical supplies, diagnostics or any other additional services at all public health facilities
Fund pooling <sup>4</sup>	Cost Sharing and Insurance Funds pooled at council level	Cost Sharing and Insurance Funds pooled at health facility level
Role of CHF coordinator	Dental Medical Officer at council hospital	Health facility in-charge (medical officer) at main council health centre

<sup>&</sup>lt;sup>1</sup>(National Bureau of Statistics, 2013a)

## Administrative data collection

In order to get in-depth information about the administration of the CHF and its interaction with other health financing mechanisms and policies, routine data was collected at public health facility and council level for the financial year (FY) 2013/14 or the calendar year 2013 and 2014, depending on the type of data.

<sup>&</sup>lt;sup>2</sup>Source: Comprehensive Council Health Plans of selected councils collected by SR and IM

<sup>&</sup>lt;sup>3</sup>Source: CHF reports of selected councils collected by SR and IM

<sup>&</sup>lt;sup>4</sup>Source: Informal personal communication and observational data from selected councils collected by SR and IM

<sup>&</sup>lt;sup>5</sup>CHF premium changed from 3.01USD to 6.02USD mid-October 2014

<sup>&</sup>lt;sup>6</sup>Annual average exchange rate for 2014 (1'662TSh = 1USD) (Bank of Tanzania, 2017)

<sup>°</sup>There is a designated non-public referral hospital in council B

## Data collected at public health facilities

Data on the number of households enrolled in the CHF, the number of out-patient visits by financing source (CHF, NHIF, exempted, user fee), as well as the amount of revenues by financing source (CHF, user fee, other) and expenditures were collected from all public health facility in the selected councils for each month in 2014. CHF enrolment data was also collected for the year 2013. In council B, one dispensary could not be reached due to its remote location. Data collection was done in February and March 2015.

Yearly averages for CHF enrolment, the number of out-patient visits, revenues and expenditures by health facility level (dispensary, health centre, hospital) were calculated for 2014 (if not specified otherwise). Total council figures were subsequently based on health facility level averages and the total number of public dispensaries, health centres and hospital in each council, except where indicated otherwise. Revenues and expenditure were converted from Tanzanian Shillings (TSh) to USD using the annual average exchange rate for 2014 (1'662TSh = 1USD) (Bank of Tanzania, 2017).

Data collection benefitted from the fact that the required routine data were often available owing to a data collection sheet designed by ISAQH and distributed to all health facilities. To cross verify the data and fill gaps other available documentation was used. This included CHF counter books, CHF register books designed by NHIF, CHF membership cards or receipt books, out-patient registers, monthly or yearly out-patient or financial health facility reports, as well as cash books. In the rare cases in council A where no other data source was available reports from the CHF coordinator or ISAQH were used to obtain CHF enrolment data. If data was completely missing the average of available monthly values was taken to compute the missing data. In case missing data could not reliably be estimated, the health facility was excluded from average calculations for that particular value, leading to different numbers of units considered (N) in Table 26.

#### Data collected at council level

At council level Comprehensive Council Health Plans (CCHPs) and annual combined Technical and Financial Performance Implementation Reports (TFPIRs) were used to analyse the contribution of various sources to overall health financing in the FY2013/14. Except for the central government's in-kind contributions through the Medical Store Department (MSD), funds outside council accounts (such as contributions from multi- and bilateral partners) were excluded as they strongly varied between councils and could not reliably be tracked within the council system (Ministry of Health and Social Welfare and Prime Minister's Office Regional Administration and Local Government, 2011). Yet, for

reference the contributions from multi- and bilateral partners in council A and B were budgeted to be 1'741'395USD and 2'338'951USD, respectively. In council A individual receipts of money submitted by health facility in-charges and monthly revenue reports from cash books were obtained from the health accountant. In the same council CHF membership data gathered by the CHF coordinator from health facility in-charges was used for analysis. In council B no such detailed documentation could be obtained. TSh were converted to USD using the annual average exchange rate for the FY2013/2014 (1'626TSh = 1USD) (Bank of Tanzania, 2017).

#### **Cost calculations**

To obtain information on the CHF administrative costs for 2014 and on the contribution of other health financing mechanisms to these costs, an approach similar to the methodology used previously on the CHF in Tanzania was adopted (Borghi et al., 2015). Yearly recurrent costs required for administrating the CHF at health facility and council level were estimated. To do so an ingredient approach was used, whereby quantities of each resource were identified, measured, and valued with the appropriate unit cost (Drummond et al., 2005). Details on cost calculations can be found in annex 1 (supplementary data). Overall council cost was computed by multiplying the health facility cost with the number of health facilities in each council and adding the council level cost. All costs were calculated in TSh and converted to USD using the annual exchange rate for 2014.

Costs were classified by type of resources (salary, per diem, transport, other expenses), type of financing sources (CHF, NHIF, user fee, other health financing, other public or non-public sources), cost type (variable, fixed) and type of activity (mobilization, pooling, stewardship, purchasing). For categorization of the activities the framework suggested by Mathauer and Nicolle (Mathauer and Nicolle, 2011) was used. We defined opportunity cost as the "benefit forgone by particular use of resources" (Palmer and Raftery, 1999). Thus, opportunity cost of staff was estimated based on their salary and time spent. When estimating the time spent on activities that were not solely conducted for the purpose of administrating the CHF (e.g. HFGC meetings), costs were apportioned accordingly based on information given by respondents (e.g. proportion of time spent on issues related to CHF) (Table S1, supplementary data).

To identify activities, time spent, resources required and source of financing, the study planned to interview the CHF coordinator, health accountant, Council Medical Officer and one responsible person for CHF administration at six dispensaries and two health centres in each council. However, in council B the study could only be conducted at one of the three selected health centres because in the other two no one was available or willing to provide

required information. This resulted in 11 informants in council A and 10 in council B. Oral informed consent was obtained from all respondents.

## **Ethical considerations**

Permission to publish the findings was obtained from the National Institute for Medical Research (NIMR) in Tanzania. Ethical clearance was granted by the same institution (original: NIMR/HQ/R.8a/Vol.IX/1839, extension: NIMR/HQ/R.8c/Vol.II/521), the Institutional Review Board of the Ifakara Health Institute (IHI/IRB/No:37-2014) and the Ethic Commission of Northeast and Central Switzerland (EKNZ 2014-347).

## 8.4 Results

## CHF related data collected at public health facilities

Table 26 displays CHF related data collected at public health facilities for each level of care and the total council. In council A, CHF population coverage in 2014 was 11.0%, which was a slightly less than in 2013 (11.4%). This was likely to be due to the increase in premium from 3 to 6 USD (Table 25). In council B, only 1.0% of total population was covered in 2014 (2013 population coverage was 0.6%). Strikingly, in council A most out-patients were exempted or CHF members and hence only few paid user fees. This was different in council B, where patients were either exempted or paid user fees. Consequently, a big share of revenues collected at public health facilities in council A came from CHF contributions, while in council B revenues largely came from user fees. The higher number of patients paying user fees and the council's specific user fee policies (Table 25) also led to more than seven times higher total revenues in council B compared to council A. This indicated that council A is losing out financially as a result of higher CHF coverage. Lastly, the percentage of revenues spent at public health facilities in council A reflected the council level pooling mechanisms in place (Table 25), with a council level account (council level fund pooling), where only little cash was transferred back to the health facilities for rehabilitation and renovation (Figure 30B). In contrast in council B, where each public health facility had an individual account (health facility level fund pooling), the proportion of money spent was much higher.

Table 26 CHF related data collected at public health facilities for the year 2014 by level of care and for the total council.

			C	oun	cil A					Council B		
_	Dispensary (N=23)	Dispensary Health Centre (N=23) (N=3)		Hospital (N=1)		Total council	Dispensary (N=20)		Health Centre (N=5)	9	Total council	
		Ν		Ν		Ν			Ν		Ν	
Yearly CHF enrolment												
Households	146	23	328	3	975	1	5'327	19	19	97	5	866
Yearly number of out-page	atient visits at	publi	c health facilities b	y fin	ancing source							
Total	5'946	16	19'458 <sup>#</sup>	1	12'821 <sup>#</sup>	1	207'951	4'127	19	15'115	4	158'108
CHF (% of total)	3'202 (54%)	16	6'908 (36%) <sup>#</sup>	1	3'398 (27%)#	1	97'760 (47%)	347 (8%)	2	NA	0	NA
NHIF (% of total)	87 (1%)	16	272 (1%) <sup>#</sup>	1	1'018 (8%)#	1	3'829 (2%)	64 (2%)	2	NA	0	NA
User fee (% of total)	151 (3%)	16	1'630 (8%)#	1	7'831 (61%) <sup>#</sup>	1	16'203 (8%)	1'325 (32%)	19	6'522 (43%)	4	59'103 (37%)
Exempted (% of total)	2'506 (42%)	16	10'648 (55%) <sup>#</sup>	1	574 (4%) <sup>#</sup>	1	90'158 (43%)	2'390 (58%)	2	NA	0	NA
Yearly revenues and ex	penditure at p	ublic	health facilities in	2014	USD by financing	sou	rce					
Total revenue	694	18	2'303	2	NA	0	22'881°	3'008	19	22'125	5	170'781
CHF (% of total)	546 (79%)	18	845 (37%)	2	NA	0	15'094 (66%)°	114 (4%)	19	589 (3%)	5	5'225 (3%)
User fee (% of total)	142 (20%)	18	1'458 (63%)	2	NA	0	7'633 (33%)°	2'865 (95%)	19	19'337 (87%) <sup>+</sup>	5	153'982 (90%)
Other (% of total)	7 (1%)	18	0 (0%)	1	NA	0	154 (1%)°	29 (1%)	19	2'199 (10%)	5	11'575 (7%)
Total expenditure	11	18	193	2	NA	0	834°	2'619	19	14'167	4	123'222
% spent	2%	18	8%	2	NA	0	4%°	87%	19	87%	4	87%

<sup>\*</sup>Estimations were based on average data from 2013 as no data for 2014 was available, but this was considered as realistic because CHF enrolment rate at the particular health centre only changed by 0.3% and at the hospital by 6%.

<sup>°</sup>Total council figures do not include the hospital due unavailability of data

<sup>+</sup>Includes also user fees collected for in-patient services as this amount could not be clearly separated from the total revenues documented in the health facility

#### CHF related data collected at council level

Table 27 shows the contribution of various funding sources to overall health financing in the two study councils for the FY 2013/14, divided into funds approved, brought forward, received, and spent. Funds brought forward are unspent funds from the previous year (FY 2012/13). In both councils there was less money received than approved upon budgeting (67% and 85%). Also, less money was spent than what was available (sum of received and brought forward) (87% and 81%). CHF revenues made up only around 2% of total funds available for health (sum of brought forward and received). The proportion of CHF money brought forward was high compared to its share in the funds approved, received and spent. This reflected the greater difficulty to actually spend this money relative to funds from the other sources. The better performing council A had less problems receiving (81% of approved budget) and spending (41% of brought forward and received) CHF money in comparison to council B (0.3% received of approved budget and 0% spent of brought forward and received). In contrast to the CHF revenues, those coming from the other CSIFs were spent easier in both councils. Additionally, the unrealistic approved CHF budget in council B indicated that the mechanism of pooling funds at health facility level was likely not being considered during planning and budgeting.

**Table 27** Contribution of various funding sources to overall health financing stratified by resources approved, brought forward, received and spent for each council in the FY2013/14.

		Cour	ncil A			Cour	ncil B	
	Approved	Brought			Approved	Brought		
[USD] (% of total)	budget	forward	Received	Spent	budget	forward	Received	Spent
Personal Emolument (LGBG <sup>1</sup> )	1'421'846	0	892'258	892'258	1'593'944	0	1'571'962	1'571'962
	(61%)		(57%)	(49%)	(49%)		(57%)	(59%)
Other charges (LGBG <sup>1</sup> )	119'741	18'132	130'044	103'012	221'997	0	188'932	148'005
	(5%)	(3%)	(8%)	(6%)	(7%)		(7%)	(6%)
Health Sector Basket Fund	318'478	137'892	318'478	369'029	492'600	263'348	492'600	474'540
	(14%)	(26%)	(20%)	(20%)	(15%)	(51%)	(18%)	(18%)
Health Sector Development Grant	74'124	105'677	23'067	90'023	113'809	173'893	0	164'399
	(3%)	(20%)	(1%)	(5%)	(4%)	(34%)		(6%)
Local Government Development Grant	116'875	241'604	12'303	203'936	0	14'749	0	0
	(5%)	(45%)	(1%)	(11%)		(3%)		
Central Government Other Source	0	0	0	0	246'052	0	246'052	37'587
					(8%)		(9%)	(1%)
Council Own Source	12'303	0	0	0	123'026	0		
	(1%)				(4%)		0	0
Receipt in kind (Medical Store	167'780	0	113'628	113'628	223'538	0	223'538	223'538
Department)	(7%)		(7%)	(6%)	(7%)		(8%)	(8%)
Cost Sharing and Insurance Funds								
National Health Insurance Fund	19'721	0	9'421	9'421	24'605	10'102	0	10'102
	(1%)		(1%)	(1%)	(1%)	(2%)		(0%)
Community Health Fund	44'412	21'986	36'131#	23'795	169'530	55'060	554	0
	(2%)	(4%)	(2%)	(1%)	(5%)	(11%)	(0%)	
User fee	23'873	0	19'242	13'274	14'563	0	14'563	14'563
	(1%)		(1%)	(1%)	(0%)		(1%)	(1%)
Drug Revolving Fund	7'382	12'841	12'215	19'944	0	0	0	0
	(0%)	(2%)	(1%)	(1%)				
Total	2'326'535	538'131	1'566'786	1'838'319	3'223'664	517'152	2'738'200	2'644'696

<sup>&</sup>lt;sup>1</sup>Local Government Block Grants (LGBGs) are divided into "Personal Emolument" (salaries) and "Other Charges" (statutory employment benefits)

\*Composition of CHF (45%) and matching fund (34%) contributions from all levels of care as well as NHIF (14%) and user fees (6%) from health centres and dispensaries. 2% are of unknown source.

Finally, the spending pattern of CHF revenues from council A (23'795USD) revealed that the revenues were spent as stipulated in the guidelines with at least 70% of expenditure on medicines and supplies (Figure 30).

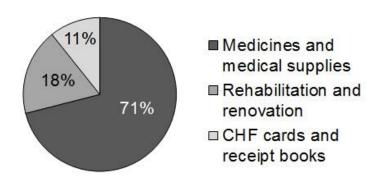


Figure 30 Spending pattern of CHF revenues in council A for the FY 2013/14.

#### Cost of CHF administration and its financing sources

Table 28 shows opportunity costs (personnel time spent) and financial costs (per diem, transport, and other expenses) for administrating the CHF in the councils A and B. In both council financial costs only made up about 15% of total cost. Mobilizing people to join the CHF (including enrolment) was the most resource-intense activity at health facility level, both in terms of total financial and overall cost. At council level, stewardship of the CHF scheme caused the biggest overall cost, but mobilization activities remained with the largest share for total financial cost. Fund pooling and purchasing only marginally contributed to the total cost because little time was spent on these activities (Figure 31). In both councils important drivers for total financial cost were CHF supplies (cards, receipt books), transport cost for fund pooling and per diem cost for mobilization, fund pooling and stewardship. Financial as well as overall cost for administrating the CHF was about double in council A compared to council B. This was caused by the substantially higher amount of hours reported to be spent on mobilization activities by HFGC members in council A (Figure 31).

## Community Health Fund administration within a complex system

Table 28 Average annual health facility level, council level and council overall cost in 2014 USD by input, council, type of resource and activity<sup>1</sup>.

	Council A			Council B								
				Other	Total	Total				Other	Total	Total
	Salary	Per diem	Transport	expenses <sup>2</sup>	financial <sup>3</sup>	overall <sup>4</sup>	Salary	Per diem	Transport	expenses <sup>2</sup>	financial <sup>3</sup>	overall <sup>4</sup>
Dispensary le	evel											
Mobilization	2'735	0	0	127	127 (4%)	2'861 (87%)	753	68	0	18	86 (10%)	839 (63%)
Pooling	103	0	68	0	68 (40%)	171 (5%)	197	0	68	0	68 (26%)	265 (20%)
Stewardship	134	86	30	0	116 (46%)	250 (8%)	160	11	65	0	75 (32%)	235 (18%)
Total	2'971	86	98	127	310 (9%)	3'282	1'110	<b>79</b>	133	18	229 (17%)	1'340
Health Centre	e level											
Mobilization	1'296	337	0	282	619 (32%)	1'915 (76%)	1'776	159	0	85	244 (12%)	2'019 (79%)
Pooling	107	0	68	0	68 (39%)	175 (7%)	6	0	0	0	0.4 (5%)	7 (0%)
Stewardship	301	55	60	0	115 (28%)	416 (17%)	399	12	108	0	120 (23%)	519 (20%)
Total	1'703	392	128	282	802 (32%)	2'505	2'181	171	108	85	364 (14%)	2'545
Hospital leve	I											
Mobilization	3'613	193	0	837	1'029 (22%)	4'642 (81%)						
Pooling	154	0	68	0	68 (31%)	222 (4%)						
Stewardship	496	245	67	39	351 (41%)	847 (15%)						
Total	4'263	438	135	875	1'448 (25%)	5'712						
Council level												
Mobilization	4'288	2'396	752	0	3'148 (42%)	7'435 (28%)	1'823	1'745	376	0	2'121 (54%)	3'944 (17%)
Pooling	1'100	1'092	215	7	1'314 (54%)	2'414 (9%)	2'215	0	0	2	2 (0%)	2'217 (9%)
Stewardship	10'238	2'396	44	581	3'022 (23%)	13'260 (49%)	9'913	892	78	52	1'021 (9%)	10'935 (47%)
Purchasing	3'723	0	0	2	2 (0%)	3'725 (14%)	6'367	0	0	2	2 (0%)	6'369 (27%)
Total	19'350	5'884	1'011	590	7'485 (28%)	26'835	20'318	2'637	454	56	3'147 (13%)	23'465
Overall coun	cil											
Mobilization	74'687	3'599	752	4'597	8'949 (11%)	83'635 (72%)	25'758	3'904	376	781	5'061 (16%)	30'819 (49%)
Pooling	3'945	1'092	2'043	7	3'142 (44%)	7'087 (6%)	6'192	0	1'364	4	1'368 (18%)	7'560 (12%)
Stewardship	14'710	4'783	984	620	6'387 (30%)	21'097 (18%)	15'107	1'163	1'911	52	3'126 (17%)	18'233 (29%)
Purchasing	3'723	0	0	2	2 (0%)	3'725 (3%)	6'367	0	0	2	2 (0%)	6'369 (10%)
Total	97'065	9'474	3'779	5'226	18'479 (16%)	115'545	53'424	5'067	3'651	839	9'557 (15%)	62'981

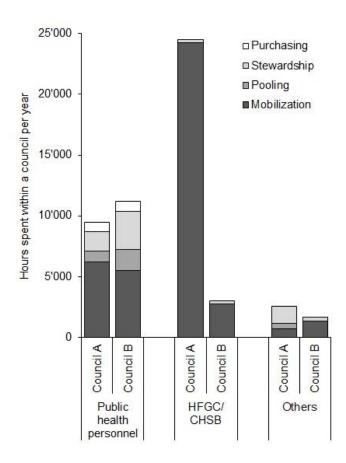
<sup>&</sup>lt;sup>1</sup>Activity were categorized according to Mathauer and Nicolle (Mathauer and Nicolle, 2011)

<sup>&</sup>lt;sup>2</sup>Others included supplies (e.g. CHF cards and receipts, registration books, print outs) as well as rent, food and refreshment during meetings if applicable

<sup>&</sup>lt;sup>3</sup>In brackets is indicated the percentage of total overall cost for the specific activity

<sup>&</sup>lt;sup>4</sup>In brackets is indicates the percentage of total overall cost for the specific health system level (dispensary, health centre, council or overall council)

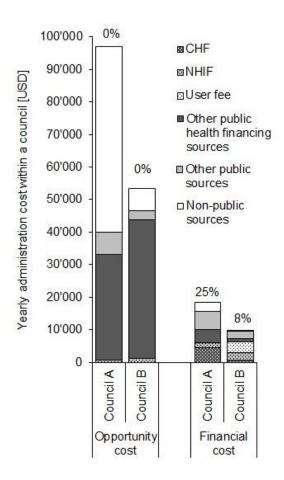
Similar to the overall cost, time spent on administrating CHF was more than twice as high in council A compared to council B (Figure 31). Figure S1 summarizes activities reported to be conducted to administer the CHF in each council. It was however interesting that the absolute amount of hours spent by public health personnel was less in council A than in council B. The primary reason for this was that in council A front-line workers at health facility level spent less time on CHF administration (particularly mobilization) than in council B (7% and 25% of a single full-time person at dispensary and health centre level in council A versus 12% and 33% in council B; data not shown). A large share of this work was taken over by HFGC members.



**Figure 31** Estimated annual amount of hours spent on CHF administration within a council by type of personnel and activity.

Consequently, because in council A responsibilities were better shared amongst different stakeholders (especially with those outside the public health sector), opportunity costs in council A were financed to a large extent by non-public money (Figure 32). In contrary, in council B most of the activities were carried out by personnel employed in the public health

sector. In both councils, opportunity costs were exclusively financed through non-CHF money.



**Figure 32** Contribution of different financing sources to the opportunity and financial cost incurred for CHF administration by council. Percentage figures indicate the proportion financed by CHF contributions.

Remarkably, only 25% and 8% of the total financial cost for administrating CHF were directly financed by CHF revenue in council A and B, respectively. Expenditures in council A were higher because these financial costs (CHF cards and receipt books) were pure variable cost and depended on the number of CHF member households. All additional financial costs were borne by other financing sources within the system, including contributions of NHIF and user fees (in case of council B).

In both councils overall costs mainly consisted out of fixed cost (data not shown). As a result, the administration cost per CHF member household was lower in council A than in council B (Table 29), although overall administration cost was bigger (Table 28). The cost-revenue

ratio was 0.5 and 0.92 in council A and B when only the financial costs were considered. This means the financial administration cost was below the premium paid by a CHF household. When the cost of personnel time was included, the ratio increased to around 3 in council A and 6 in council B, meaning administration cost was more than three or six times above the premium paid by a CHF household. If only considering the administrative cost directly financed through CHF revenues, the cost revenue ratio decreased to 0.12 in council A and 0.07 in council B. This ratio was smaller in council B because administration cost directly financed through CHF money was the same for each household in either council, but premiums were higher in council B. Most importantly, this meant that there was more than 70% of the CHF revenue left to purchase medicines and supplies and do minor facility renovations.

**Table 29** Summary table including cost revenue ratios and cost per CHF member household for the year 2014.

	Council A	Council B
Revenue		
Total number of households enrolled	5'327	866
Premium paid by each household	3.46	6.02
Total revenue (including matching fund) [USD]	18'408 (36'816)	5'212 (10'423)
Administration cost [USD]		
Cost paid by CHF revenues	4'565	742
Financial cost	18'479	9'557
Economic cost	115'545	62'981
Cost revenue ratio (including matching fund)		
Cost paid by CHF/revenue	0.25 (0.12)	0.14 (0.07)
Financial cost/revenue	1.00 (0.50)	1.83 (0.92)
Economic cost/revenue	6.28 (3.14)	12.08 (6.04)
Cost per CHF member household [USD]		
Cost paid by CHF/household	0.86	0.86
Financial cost/household	3.47	11.03
Economic cost/household	21.69	72.72

## 8.5 Discussion

#### **Bottlenecks in CHF administration**

In council B, the decision to pool and use the CSIFs at health facility level led to a lack of proper documentation at council level. Thus, it was impossible to know what CSIFs were received at health facility level and how they were spent. Neither did it allow applying for matching funds. Fund pooling at health facility level also made it more difficult to put a mechanism in place for the purpose of balancing the risk across the many smaller pools which emerged as a consequence. Documentation was about to be improved at the time the study was conducted, yet, without addressing the problem of matching fund application or risk pooling. The latter problems were also reported from other councils elsewhere in the country, whereby the fragmented risk pools were seen as a challenge to equity (Borghi et al., 2013). In contrast, pooling of CSIFs at council level in council A facilitated planning and budgeting as well as risk pooling and other CHF administration processes. This was observed based on the percentage of budgeted CHF revenue received and available revenues spent as well as due to the possibility to request for matching funds, track how available revenues were used and allow for risk sharing through need-based reallocation of funds.

Nevertheless, both councils were facing difficulties to spend CHF revenue, due to lengthy and cumbersome administration processes attached to it. For example, in council B over the years accumulated CHF money was stuck in the council account and could not be spent because of not clearly defined administration processes. In council A, use of funds was impeded by the closure of the CHF account and its consolidation with other council accounts, which changed fund access rights. Similar problems with fund usage have been reported by others (Mubyazi et al., 2006, Kessy et al., 2008, Mtei and Mulligan, 2007, Ministry of Health and Social Welfare, 2012a, Borghi et al., 2013, Ministry of Health and Social Welfare, 2013c, Macha et al., 2014). Consequently, these administrative hurdles made activities planned to be implemented through CHF revenue, more unlikely to happen. However, other health financing sources are facing similar difficulties, like Council Own Sources, Health Sector and Local Government Development Grants (Tidemand, 2013). Additionally, most of these sources suffer from insufficient and delayed disbursement from the central to the council level; a problem, which has been documented several times over the past two decades (Gilson et al., 1994, Manzi et al., 2012, Frumence et al., 2013, Ministry of Health and Social Welfare, 2013c, Mikkelsen-Lopez et al., 2014, Olafsdottir et al., 2014, Frumence et al., 2014a, Dutta, 2015).

The comparison between council and health facility level data suggested additional bottlenecks in CHF administration processes: [1] inadequate documentation of the type of CSIF submitted at council level, [2] incomplete or erroneous CHF record keeping at health facility and council level, [3] inadequate availability of CHF supplies (cards, receipt books), and [4] insufficient CHF cash flow monitoring and auditing. Also broader issues around the availability of CSIF data affected CHF administration. For example, reporting formats were inconsistent, recently re-designed patient registers did not capture the funding source of outpatients (CHF, NHIF, exempted, user fee) anymore and in places where more than one person consulted patients CSIF data was fragmented and not consolidated, leading to misreporting. These weaknesses of CHF and overall CSIF administration processes had an impact on the quality of data available for planning and budgeting, which had also been noted previously (Laterveer et al., 2004). In particular, not knowing the number of CHF patients treated at each health facility impeded the possibility of risk adjusted reallocation of the CHF money. The problems of CHF administration additionally led to a financial loss as matching funds could not be requested due to the lack of household registration details and/or proof of money submission. Thus, all these bottlenecks in administration and management led to CHF implementation failures and therewith diminished potential positive effects of a council level health insurance scheme. Subsequently, this was likely to have contributed to CHF member dissatisfaction and therewith influenced enrolment.

#### **Cost of CHF administration**

The selection of the same study approach as used previously by Borghi et al., (Borghi et al., 2015) allowed for comparison across studies. Importantly, several key findings could be confirmed: [1] lack of financial sustainability of the CHF as such, [2] substantial opportunity cost of personnel time with a share of around 85% of total cost, [3] workloads of front-line health workers in a very similar percentage range of a single full-time person, [4] mobilization as the most significant task at health facility level and CHF stewardship at council level, [5] similar relative cost of different administration activities at health facility, [6] comparable average annual health facility level cost for an average dispensary in council B, and [7] higher cost per CHF member household in area where enrolment was lower due to considerable fixed costs. However, in our study we found the total annual council-wide cost to be higher than what was published by Borghi et al., (Borghi et al., 2015). Yet, detailed comparison with Borghi et al. was difficult because council level cost only included stewardship activities and it was unclear how dispensary and health centre costs were calculated given the number of health facilities in a council and the average annual health facility level cost. Consequently, also cost to revenue ratios and cost per CHF member households were higher than reported previously (Borghi et al., 2015). Also, in contrast to

Borghi et al., we found in one council strong engagement of HFGC members in CHF mobilization activities, which reduced the burden of public health workers (Borghi et al., 2015). This suggested that contrary to other places in Tanzania HFGC were well informed about their roles and responsibilities (Kessy et al., 2008, Kessy, 2014). Additionally, in terms of financial cost we found that important cost drivers were CHF supplies, transport cost for pooling as well as per diem or allowances for mobilization, pooling and stewardship. Optimization of CHF card design, an electronic mobile payment system or a computerised system for processing membership information could potentially reduce some of these costs (Stoermer et al., 2011, Mtei and Enemark, 2013, Kalolo et al., 2015). Also, it could be argued that financial and opportunity cost resulting from mobilization activities could be reduced if all or most out-patients were covered by insurance. However, as seen in council A with only 8% of out-patients paying user fees and a population coverage of 11% substantial mobilization activities would still be needed to further increase overall enrolment. Another argument could be that moving to a mandatory insurance scheme would reduce cost and capacity spent on mobilization, but the enforcement of this strategy would definitely require resources as well (Hsiao and Shaw, 2007). Although, our results undoubtedly pointed out the lack of financial sustainability of the CHF as such, they also showed that owing to the fact that the CHF was built into existing structures, there was considerable cross subsidisation in terms of the financing sources paying for CHF administration (e.g. national tax-financed salaries, NHIF and user fee funds). Thus, this may to some extent increased perceived fairness of the financial contributions to CHF administration as there was a redistribution of wealth from rich to poor. It would also leave the CHF with more than 70% of its revenues to purchase medicines and supplies and implement quality improvement activities at health facility level assuming all other administration processes would be working.

#### Interaction of CHF administration with other health financing mechanisms and policies

Strikingly, although population coverage in council A was just above 10%, only few patients at dispensary and health centre level paid user fees. This clearly indicated that the people seeking public care the most where the exempted and insured. Whereas the others were either seeking care in the non-public sector, not at all or only at very late stages, when they had to attend hospital level services as indicated by a high proportion of user fee patients for the hospital. This suggested and confirmed previous findings that CHF enrolment was likely to be affected by healthcare seeking behaviour in connection with adverse selection and exemption policies, which stipulate free service provision to groups with a higher likelihood to be in need of care (Mtei and Mulligan, 2007, Macha et al., 2014). These factors also undoubtedly influence negatively the maximum potential enrolment rate which could possibly be reached with a voluntary scheme.

On the other hand the number of patients paying user fees and the user fee policies set by the council seemed to impact the total revenues collected from CSIFs as well as their individual contribution to these revenues. This led to a situation where council A was losing out financially as a result of higher CHF coverage. Furthermore, the pooling mechanism in place had an influence on the availability of money and the subsequent spending pattern at health facility level. This meant that higher revenues from user fees, decisions about user fee policies, and the pooling mechanism might have set incentives for the supply side to prioritize one income source over the other and therewith also pose a problem for equity. Thus, the situation in council B, where revenues from user fees were high and funds were pooled at health facility level (with weaker oversight of spending patterns and no possibility to get matching funds), might have provided little incentives for healthcare workers and HFGC member to conduct CHF mobilization activities. However, in contrary to expectations on the demand side high user fees did not lead to increased CHF enrolment (Kessy et al., 2008). This in turn would contribute to explain why enrolment rate was very low in council B.

#### Way forward

Our results made clear that in order to make the CHF work, major improvements in its administration and management processes in-line with what has been suggested by others would be indispensable (Stoermer et al., 2011, Stoermer et al., 2012, Mtei and Enemark, 2013, Ministry of Health and Social Welfare, 2015b, Kalolo et al., 2015, Kalolo et al., 2017). An attempt by the NHIF to partially address the problem of inadequate CHF documentation was shown to bring improvements. Also, an electronic data management system as implemented elsewhere in Tanzania in the frame of the "Redesigned CHF" could lead to further progress (Kalolo et al., 2017). Yet, this would need to be well aligned with existing systems, in particular the one of the NHIF. Use could further be made of the increased coverage of mobile payment systems, allowing depositing money in remote places (Mtei and Enemark, 2013). Most importantly, our findings showed that improvements would need to go hand in hand with adaptions in other CSIF policies (e.g. exemption, user fee, fund pooling policies) as the CHF cannot be looked at as a stand-alone system. Such improvements could increase efficiency and potentially also effectiveness of the CHF. Some might also decrease financial and opportunity cost of the personnel time, whereby other improvements, in particular introducing a system for service purchasing, claim processing, risk equalisation or enforcement in case of a mandatory scheme, are also likely to increase cost (Borghi et al., 2015).

Yet, it is highly questionable if process improvements were feasible and scalable given the context in which the CHF is implemented and its interaction with other health financing mechanisms and policies. The question also remains if such efforts were value-for-money

taking into account the already considerable contributions of other health financing mechanisms to CHF administration and the fact that the CHF only contributed around 2% of overall health financing available (excluding multi- and bilateral donors). Potentially, limited resources might be better invested if in a first place the focus were on improving processes of major health financing sources coming from central level (Block Grants, Health Sector Basket Fund, Development Grants and MSD supply chain) and therewith improve predictability of funding flows and resource utilization. This would lead more likely to a noticeable change in quality of care, because even little improvements in these processes could free up a substantial amount of money and human capacity. Improved quality might then in turn increase willingness of the community to contribute to health services as suggested by others (Bonu et al., 2003, World Health Organization, 2013, Adebayo et al., 2015). However, this would imply that in order to protect the informal sector from financial hardship, they would need to be at least temporarily exempted from user fees until certain level of healthcare quality could be guaranteed. This could obviously not be done without increasing the level of funding for healthcare from central level through existing or new innovative financing solutions (Gilson and McIntyre, 2005, Dutta, 2015). Such changes may also have implications on several parts of the system, including a potential increase in service utilisation followed by a possible drop of quality of care (Gilson and McIntyre, 2005, Borghi et al., 2012, World Health Organization, 2013, McIntyre et al., 2013). However, given the problems with CHF administration and management or CSIFs more generally, it could be worth considering conducting further research in this direction and opt for the most pro-poor and cost-effective approach. In particular a comprehensive study ought to be done, which compares the cost and other implications of abolishing user fees with the efforts required for effectively improving CSIF mechanisms and policies.

#### Limitations of the study

Some data presented here was collected from routine data and its documentation might have been erroneous. Yet, by verifying the numbers with additional sources available, it was assured to obtain data of reliable quality. Part of the analysis could only be done in council A, where detailed enough data was available. The lack of sufficient data in council B further supported the above discussed findings. For the cost calculations, also costs of activities that would need to be done in the absence of the CHF were included. Though, these costs were apportioned according to the share of time spent on CHF administration. Additionally, it could be argued that the sample of informants was too small to be representative for the council. However, most findings overlap well with what has been shown previously (Borghi et al., 2015). Finally, activities done by HFGCs were indirectly reported through the person responsible for CHF administration at the health facility. Thus, these estimates could be

overestimated. Yet, even if reported values were halved, apart from the absolute values for cost and time spent no statement reported in this study would change.

### 8.6 Conclusion

The results demonstrated that bottlenecks in CHF administration and management led to serious scheme implementation failures, which were likely to have affected CHF enrolment. Findings also clearly pointed out the complexity of the overall CSIF system and the interactions between them. Exemption policies and healthcare seeking behaviour negatively influenced the maximum potential enrolment rate. Higher revenues from user fees, user fee policies and fund pooling mechanisms might have set incentives for care provider to prioritize user fees over CHF revenues. Although our results clearly pointed out the lack of financial sustainability of the CHF, they also showed that owing to significant contributions from other financing mechanisms, the CHF could be left with more than 70% of its revenues for financing services. In practice, this would assume that substantial improvements in administration and management were made. This is however highly questionable in terms of feasibility and scalability given the context in which the CHF is implemented and its interaction with other health financing mechanisms and policies. The question also remains if such efforts to improve CHF administration and management were value-for-money, and if limited resources were not better invested through primarily focusing on improving processes of major health financing sources coming from central level. This publication calls for a realistic reconsideration of approaches taken to address the challenges in health financing, and emphasises the importance of looking beyond a single health financing mechanism.

## 8.7 Acknowledgment

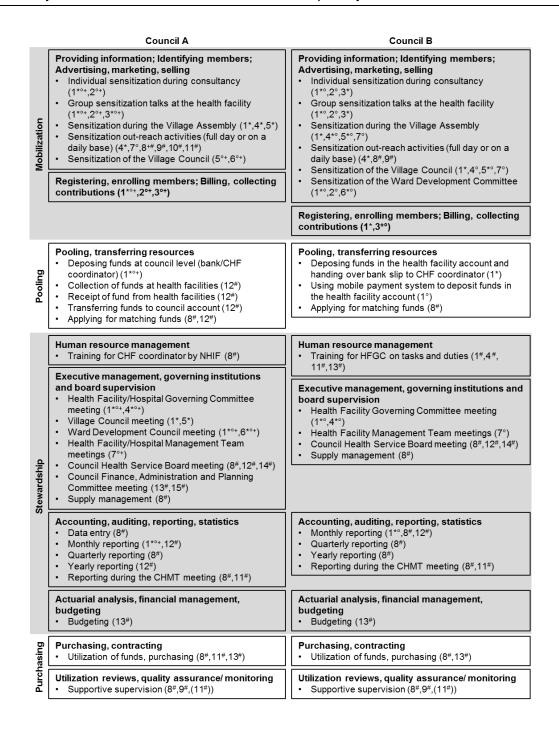
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## 8.8 Supplementary data

#### Annex 1

Unit costs and source of financing for personnel were based on the national salary scales (Prime Minister's Office Regional Administration and Local Government, 2013). Other unit costs and information about financing sources were derived from information given by respondents, CCHPs, annual combined TFPIRs, CHF specific documentation, other official documents collected and personal communication. Market prices were taken to value supplies (Table S2, supplementary data). Cost spanning multiple years were equally divided over the relevant time period. An exception was made for the CHF card, which was meant to last for five years but designed in a way that it could only be used for one year.

Costs for activities conducted by the ISAQH were excluded. Also, the cost for the overall process of formally exempting the poorest households from health service payments was not included. Furthermore, although routine CHMT supportive supervision was at least partially classified as a CHF administrative activity (Purchasing: Utilization reviews, quality assurance/monitoring) its cost was not taken into account here. Yet, this was discussed in detail elsewhere (Renggli et al., 2017a). Start-up cost to introduce the CHF in a council and estimations of regional, zonal and national level cost were also not included.



**Figure S1** CHF administration activities performed in each council by type of activity according to Mathauer and Nicolle (Mathauer and Nicolle, 2011). <sup>1</sup>Health facility in-charge; <sup>2</sup>Other medical personnel consulting patients; <sup>3</sup>Other medical personnel (e.g. nurse, medical attendants); <sup>4</sup>Health Facility/Hospital Governing Committee members; <sup>5</sup>Village Council members; <sup>6</sup>Ward Development Committee members; <sup>7</sup>Health Facility/Hospital Management Team members; <sup>8</sup>CHF coordinator; <sup>9</sup>NHIF personnel; <sup>10</sup>Community Health Worker; <sup>11</sup>Council Health Management Team members; <sup>12</sup>Health accountant; <sup>13</sup>Council Medical Officer; <sup>14</sup>Council Health Service Board members; <sup>15</sup>Council Finance, Administration and Planning Committee members; \*At dispensaries level; °At health centres level; \*At hospitals level; \*At council level

**Table S1** Personnel and time required for administrating the CHF in council A and B by type of activity.

		Council A	Council B		
	Person involved (Quantity)	Time required (Number of informants)	Person involved (Quantity)	Time required (Number of informants)	
Mobilization					
Individual sensitization during consultancy	D: HF i/c (1) HC&H: HF i/c (1/2) and other physicians (1/2)	D,HC&H: 0.9min/CHF member; 5.6min/user fee patient (N=8)	D: HF i/c (3/4) and other staff (1/4) HC: HF i/c (1/2) and other physicians (1/2)	D&HC: 0min/CHF member; 4.4min/user fee patient (N=7)	
Group sensitization talks at the health facility	D: HF i/c (2/3) and other staff (1/3) HC&H: HF i/c (1/3), other physicians (1/3), other staff (1/3)	D,HC&H: 24.4min/week (N=8)	D: HF i/c (3/4) and other staff (1/4) HC: HF i/c (1/2) and other physicians (1/2)	D&HC: 39.7min/week (N=7)	
Sensitization during the Village Assembly	D: Whole village attending, but VC (18), HF i/c (1), HFGC (5) included here	D: 5 out of 6 were invited 3.4 times a year: 8.5min on CHF out of 6.5h (N=6)	D: Whole village attending, but VC (28), HF i/c (1), HFGC (5) included here HC: Whole village attending, but VC (28), HFMT (1), HFGC (5) included here	D: 6 out of 6 were invited 3 times a year: 8.9min on CHF out of 3.75h (N=6) HC: 3 times a year: 8.9min on CHF out of 3.75h (N=7)	
Sensitization out- reach activities (full day or on a daily base)	D: HFGC (5.2) HC: HFMT (3) H: CHF Co (1) C: CHF Co (1), NHIF (3), driver (1); CHF Co (1), CHW (94); CHMT (3 teams, 2 cars) (13.5)	D: 204 hours per year (N=6) HC: 1day/quarter (N=1) H: 1 day/year (N=1) C: 1 week/year (N=1); 2x1 day/year (N=2); 1x3 days/year (N=1)	D: HFGC (7) C: CHF Co (1), NHIF (3), driver (1); CHF Co (1)	D: 4 out of 6: 28 hours per year (N=6) C: 2 week/year (N=1); 1x6 day/year (N=1)	
Sensitization of the Village Council	HC&H: VC (23), WDC (1)	HC&H: 15min on CHF out of 6h/quarter (N=4) for 4 village	D: HF i/c (1), VC (33) HC: VC (28), HFGC (5), HFMT (1)	D: 6 out of 6 were invited 2.9 times a year: 5.4min on CHF out of 4h (N=6) HC: 5.4min on CHF out of 4h/month (N=7)	

		Council A	Council B		
	Person involved (Quantity)	Time required (Number of informants)	Person involved (Quantity)	Time required (Number of informants)	
Sensitization of the Ward Development Committee			D: HF i/c (1), WDC (31.5) HC: HF i/c (1), other physicians (1), WDC (30.5)	D: 5 out of 6 were invited 3.8 times a year: 8 min on CHF out of 4h (N=6) HC: 3.8 times a year 8 min on CHF out of 4h/quarter (N=6)	
Registering, enrolling members; Billing, collecting contributions	D: HF i/c (1) HC&H: HF i/c (1/3), other physicians (1/3), other staff (1/3)	D,HC&H: 5.5min/new member (N=8)	D: HF i/c (2/3) and other staff (1/3) HC: Health staff	D&HC: 5.8min/new member (N=7)	
Pooling					
Deposing funds	D,HC&H:HF i/c (1)	D,HC&H: At council level (bank or CHF Co): 7.4h/month done with other activities (salary pick up> 50%) for 9 months (in 3 months the accountant passes by) (N=7)	D: HF i/c (1) HC: HF i/c (1)	D: Into HF account: 16h/month (done with deposing user fee> 33%) (N=6) HC: Using mobile payment system to deposit funds in the health facility account: 10min/month (N=1)	
Collection of funds at health facilities	C: Accountant (1), driver (1)	C: 3x5.5 days/year (N=1)			
Receipt of fund from health facilities	C: Accountant (1)	C: 5min/HF and month (9 months) (N=1)			
Transferring funds to council account	C: Accountant (1)	C: 2x30min/week (N=1)			
Applying for matching funds	C: CHF Co (1), accountant (2)	C: 39h/year (N=2)	C: CHF Co (1)	C: 1week/per month (N=1)	
Stewardship					
Training for CHF coordinator by NHIF	C: CHF Co (1)	C: 3-5 days/3 years (N=1)			
Training for HFGC on tasks and duties			C: HFGC (182), HF i/c (31), CMO (1), CHMT (3), driver (1)	C: 11days/3year; 3.5h/HFGC; 25% on CHF (N=1)	

		Council A	Council B		
	Person involved (Quantity)	Time required (Number of informants)	Person involved (Quantity)	Time required (Number of informants)	
Health Facility/Hospital Governing Committee meeting	D: HF i/c (1), HFGC (7) HC: HF i/c (2),HFGC (7) H: CHMT (5), HGC (6)	D&HC: 17.5min on CHF out of 3h/quarter (N=5) H: 36.25min on CHF out of 4.125h/quarter (N=2)	D: HF i/c (1), HFGC (7) HC: HF i/c (2),HFGC (7)	D&HC: 15.8 min on CHF out of 2.4h/quarter (N=7)	
Village Council meeting	D: VC (23), HF i/c (1)	D: 3 out of 5 were invited every second month: 15min on CHF out of 6h (N=4)			
Ward Development Council meeting	D,HC&H: HF i/c (1), WDC (24.4)	D: 3 out of 5 were invited HC&H: always invited 9.4 min on CHF out of 5.5h/quarter (N=4)			
Health Facility/Hospital Management Team meetings	HC: HFMT (16.7) H: HMT (16.7)	HC&H: 12.5min on CHF out of 3.5h/month (N=3)	HC: HFMT (27)	HC: 20min on CHF out of 2h/month (N=1)	
Council Health Service Board meeting	C: CHSB (7), CHMT or co- opted (4)	C: 3h on CHF out of 7.2h/quarter (N=3)	C: CHSB (7), CHMT or co- opted (4)	C: 3h total with about 22.5min on CHF/quarter (N=2)	
Council Finance, Administration and Planning Committee meeting	C: CMO (1), CFAPC (24)	C: 1 day with about 2h on CHF/month (N=1)			
Supply management	C: CHF Co (1)	C: 5h/month (N=1)	C: CHF Co (1)	C: 8h/week (N=1)	
Data entry	C: CHF Co (1)	C: 4h/week (N=1)			

		Council A	Council B		
	Person involved (Quantity)	Time required (Number of informants)	Person involved (Quantity)	Time required (Number of informants)	
Monthly reporting	D,HC&H: HF i/c (1) C: Accountant (1)	D: For 1/2 of dispensaries 7.4h/month for reports sent to council level together with other reports (> 33%) and for 1/2 dispensaries reports are being picked up with others (N=6) HC&H: Fill NHIF form (90min/month); 7.4h (33%)/month reports sent to council level together with other reports (N=1) C: 2h/month (N=1)	D: HF i/c (1) HC: HF i/c (1) C: CHF Co (1); accountant (1)	D: 11.3h/month reports sent to council level together with other reports and money (>33%) (N=6) HC: 8h/month reports sent to council level together with other reports (>50%) (N=1) C: 1d/week (N=1); 3.5d/month (N=1)	
Quarterly reporting	C: CHF Co (1)	C: 10h/quarter (N=1)	C: CHF Co (1)	C: 1d/quarter (N=1)	
Yearly reporting	C: Accountant (1)	C: 4day/year (N=1)	C: CHF Co (1)	C: 1d/year (N=1)	
Reporting during the CHMT meeting	C: CHF Co (1), CHMT (8 plus 3 co-opted)	C: 2x4h in total with 30min on CHF/year (N=1)	C: CHF Co (1), CHMT (8 plus 6 co-opted)	C: 2x1.75h total with 5min on CHF/month (N=1)	
Budgeting	C: CMO (1)	C: 8h/week (N=1)	C: CMO (1)	C: 8h/week (N=1)	
Purchasing					
Utilization of funds, purchasing	C: CHF Co (1), CHMT/CMO (1)	C: 7h/week (N=2)	C: CHF Co (1), CMO (1)	C: 8h/week (N=2)	
Supportive supervision	Done with NHIF advertising/marketing activities (see above); CHMT supportive supervision was excluded		Done with NHIF advertising/marketing activities (see above); CHMT supportive supervision was excluded		

Legend: C=Council; CFAPC=Council Finance, Administration and Planning Committee; CHF Co=CHF coordinator; CHMT=Council Health Management Team; CHSB=Council Health Service Board; CHW=Community Health Worker; CMO=Council Medical Officer; D=Dispensary; H=Hospital; HC=Health Centre; HF i/c = Health facility in-charge; HFGC=Health Facility Governing Committee; HFMT=Health Facility Management Team; VC= Village Council; WDC=Ward Development Committee

Table S2 Unit cost of resources in Tanzanian Shillings (TSh).

Item	Unit cost
Average salary of Council Medical Officer <sup>1</sup>	17'769/h°
Average salary of CHMT/CHSB/CFAPC <sup>1</sup>	9'332/h°
Average salary of CHF coordinator/NHIF personnel <sup>1</sup>	7'667/h°
Average salary of health facility in-charge (health centre) <sup>1</sup>	5'331/h°
Average salary of health facility in-charge (dispensary)/other physician (health centre) <sup>1</sup>	5'122/h°
Average salary of health accountant <sup>1</sup>	4'225/h
Average salary of HFGC member <sup>1</sup>	3'842/h°
Average salary of WDC/VC member <sup>1</sup>	3'338/h°
Average salary of medical personnel (e.g. nurse, medical attendant) <sup>1</sup>	3'012/h°
Average salary of community health worker <sup>1</sup>	1'761/h°
Average salary of driver <sup>2</sup>	2'596/h°
Per diem CHSB/HGC/CHF coordinator (council level) <sup>3</sup>	80'000/day
Per diem CHMT (village level) <sup>3</sup>	62'500/day
Per diem CHF coordinator/NHIF personnel/accountant (village level) <sup>3</sup>	60'000/day
Per diem driver (village level) <sup>3</sup>	50'000/day
Extra duty allowance for CHMT/HGC/CHSB/CHAPC <sup>4</sup>	31'250/day
Extra duty allowance for HFGC training (Council B) <sup>5</sup>	10'000/day&person
Extra duty allowance for out-reach activity of HFMT at health centre (Council A) <sup>6</sup>	20'000/day&person
Transport allowance CHF coordinator for NHIF training (Council A) <sup>6</sup>	20'000 return
Transport allowance for HGC/CHSB <sup>5</sup>	10'000 return
HFGC sitting allowance (Council A) <sup>5</sup>	10'000/meeting
HFGC sitting allowance (Council B) <sup>5</sup>	5'000/meeting
WDC/VC sitting allowance <sup>6</sup>	20'000/meeting
Transport to council (Council A) <sup>6</sup>	25'000 return
Transport to council for fund pooling (Council B) <sup>6</sup>	28'333 return
Transport to council for report submission from dispensary (Council B) <sup>6</sup>	26'833 return
Transport to council for report submission from health centre (Council B) <sup>6</sup>	30'000 return
Food and refreshment for HGC/NHIF training/CHSB/CFAPC5	10'000/day&person
CHF/accountant receipt book (50 pages) <sup>6</sup>	1'200/book
CHF card (lasts 1 year) <sup>7</sup>	1'400/card
NHIF register book (lasts for 5 years) <sup>6</sup>	10'000/book
Counter book for accounting at the health facility (lasts for 5 years) (Council B) <sup>8</sup>	3'000/book
Print out of page <sup>8</sup>	50/page
Diesel (1L per 7km) <sup>8</sup>	2'500/L
Training material for NHIF training <sup>6</sup>	2'000/person
Training material for HFGC training <sup>5</sup>	1'500/person
Rent for conference facility of NHIF training (for 50 people) <sup>5</sup>	100'000/day

<sup>°</sup>Yearly salary was assumed to be equal to 52 weeks of 40 hours of work

<sup>&</sup>lt;sup>1</sup>Source: Assumption based on information given by respondents and national salary scales (Prime Minister's Office Regional Administration and Local Government, 2013)

<sup>&</sup>lt;sup>2</sup>Source: Personal communication

<sup>&</sup>lt;sup>3</sup>Salary and location-dependent; source: Information given by respondents, cross verified by official documentation collected by SR and IM

<sup>&</sup>lt;sup>4</sup>Said to be half of the lowest per diem rate (village level); source: information and assumptions given by respondents, cross verified by personal communication

<sup>&</sup>lt;sup>5</sup>Source: Information given by respondent, cross verified by CCHP budgets and quarterly combined TFPIRs collected by SR and IM

<sup>&</sup>lt;sup>6</sup>Source: Information given by respondent

<sup>&</sup>lt;sup>7</sup>Source: Information given by respondent, cross verified by CHF specific documentation from CHF coordinator and/or accountant collected by SR and IM

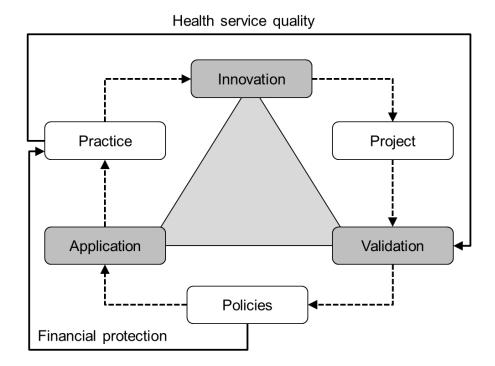
<sup>&</sup>lt;sup>8</sup>Source: Market price collected by SR and IM

## 9. Discussion

The present thesis intended to improve understanding of how to promote UHC in Tanzania. The findings provided actionable evidence and recommendations to help move towards improved health service quality and financial protection in an equitable manner. Figure 33 summarizes the research done in health service quality and financial protection along the value chain, from innovation to validation and application. In order for either of the research to have public health impact it will be crucial to bridge the gap between research and policymaking/management.

For health service quality we went from current practice in routine supportive supervision to a new innovative approach, the e-TIQH approach. This approach was implemented in a project setting and subsequently validated as good as possible given the lack of standards how to best measure quality of care (chapter 4-7). The next steps should now be the translation of the research findings into national policies and wide-scale implementation. The countrywide application of the e-TIQH approach would then have to be monitored and evaluated in order to do further adaptations, as required.

In terms of the research conducted in the area of financial protection we started off with the existing policies and analysed their application in real word settings through in-depth studies (chapter 8). The findings on financial protection now need to be discussed amongst stakeholders to come up with innovations to address the identified problems.



**Figure 33** Summary of research conducted in health service quality and financial protection along the value chain form innovation to validation and application.

The subsequent section will discuss the contribution of the research findings to increased UHC in Tanzania. This will be followed by a critical review of the methodological approaches used in this study. Lastly, building on the study findings the implications and recommendations for research as well as for policy and practice will be formulated.

## 9.1 Contribution to Universal Health Coverage

The WHO has recognized that quality of care has so far been a neglected driver of improved health and thus raised the need for new, validated and feasible assessment and improvement measures for quality of care (Chapter 1.1) (Akachi et al., 2016, Akachi and Kruk, 2017). The work presented here tried to address this need and therewith contribute to the discussion around how to measure and improve effective health service coverage. Focusing the multi-dimensional quality assessment (e-TIQH) on processes and structural adequacy of healthcare was found to be the key element for routinely assessing and monitoring quality of primary healthcare (Chapter 5). This feature had hardly been documented for other overall quality assessment tools used during routine monitoring in low-and middle-income countries (LMICs). For Tanzania, the e-TIQH assessment tool offers a unique opportunity to establish routine monitoring of healthcare quality countrywide and addresses effectively the lack of national indicators for such purposes (Table 4) (Ministry of Health and Social Welfare, 2013e).

At the same time we could demonstrate that the overall e-TIQH approach had a direct impact on general quality of primary healthcare within a council. It did so by making assessment results actionable and by facilitating the process of priority setting in the light of limited resources (Chapter 6). Compared to routine CHMT supportive supervision, the e-TIQH approach made supportive supervision more effective and efficient and therewith more sustainable (Chapter 7). Consequently, it increased feasibility of supportive supervision and hence the likelihood of its implementation. This is expected to also have had a positive impact on equity because smaller, more remote and non-public health facilities were shown to be more affected by infrequent implementation of routine supportive supervision (Chapter 1.4.3) (Mubyazi et al., 2012, Nangawe, 2012, Bradley et al., 2013).

To the best of our knowledge, the e-TIQH approach is unique in contributing directly to the strengthening of routine CHMT supportive supervision in Tanzania. It allowed supporting the existing structure and did not add an additional burden to the already strained system. Thus, through using the e-TIQH supportive supervision approach as the standard approach for routine CHMT supportive supervision, it could ensure that the envisioned quality improvements at primary healthcare level are actually happening. Additionally, due to the strong overlap of e-TIQH and BRN star rating assessment indicators the approach has the potential to accelerate the move towards accreditation under the BRN initiative (chapter 1.4.1). Therefore, the e-TIQH supportive supervision approach can be considered as a cost-effective and sustainable option to contribute to more effective and equitable health service coverage in Tanzania. The findings also managed to more generally address challenges of

ineffective supportive supervision in other LMIC (Peabody et al., 2006, Edward et al., 2009, Bosch-Capblanch et al., 2011, Sprockett, 2016, Bailey et al., 2016, Akachi and Kruk, 2017). Hence, the Tanzanian experience may prove useful to inform and guide attempts to strengthen supportive supervision in such settings and therewith enhance quality of care.

The analysis of the CHF administration and it's interaction with other health financing components clearly indicated that the path to universal financial protection is still long (Chapter 8). The analysis questioned whether fixing bottlenecks of CHF administration processes was feasible, scalable, and value-for-money. It also raised the question of whether limited resources were not better invested by improving processes of major central level health financing sources, to ensure their sufficient and timely disbursement. Therefore, chapter 8 called for a realistic reconsideration of approaches taken to address the challenges in the Tanzanian health financing system and suggested to opt for the most pro-poor and cost-effective approach.

A study from seven LMICs on factor facilitating universal financial protection confirmed the importance of increased central level funding in particular to improve informal sector coverage (McIntyre et al., 2013). This would also have positive implications for equity as central level funding tends to be progressive, meaning the richer segments of the population are paying more proportionally (Macha et al., 2012). The same study also raised the question about the value of health insurance schemes for the informal sector (McIntyre et al., 2013). It showed that countries with the greatest progress in UHC engaged in intervention for the entire population, whereas other countries adopted targeted reforms with more fragmentation in the funding pool with detrimental effects on equity (McIntyre et al., 2013, Borghi et al., 2013). There is, however, surely no blueprint solution for health financing, and a comprehensives understanding of all existing funding mechanisms within a country is crucial in order to move towards universal financial protection.

## 9.2 Methodological considerations

#### **Mixed methods**

The big advantage of the mixed methods approach was found to be its ability to compensate for the weaknesses of either qualitative or quantitative research alone (Steckler et al., 1992). The approach provided comprehensive knowledge about a complex setting, which would not have been possible otherwise (Moffatt et al., 2006). For example, the risk of bias and adverse effects of the e-TIQH assessment tool would not have been uncovered, had we not investigated why qualitatively and quantitatively assigned health facility ranks did not overlap. Also, the in-depth analysis of the CHF administration would not have been possible without the large body of observational and secondary data together with extensive personal exchanges. Still, there was always an attribution gap between the intervention's direct effect and results found. Causality could not conclusively be claimed as unknown factors might have also contributed to the observed results.

#### **Data quality**

A major challenge faced throughout our research was ensuring the quality of the data gathered. When collecting primary data, several and often time-consuming intermediate steps had to be introduced to guarantee data quality. For example the transcriptions of the interviews from Swahili into Swahili had to be tediously checked for acceptable quality and if insufficient, send back to the research assistants for revision. In terms of secondary data, data cleaning was a major task and without in-depth knowledge of the context it would have been almost impossible. The quality of routine council or health facility data was in particular poor, similar to what has been previously documented by others (Ministry of health and Social Welfare, 2009b, Humba, 2015, Ministry of Health Community Development Gender Elderly and Children, 2016b). For instance, the data collection around CHF administration (chapter 8) revealed that low quality of routine data has major implication for the degree to which the scheme was implemented as originally designed. Appendix 2 provides a detailed example of how incomplete and erroneous CHF record keeping impacted data available for planning and budgeting, and even led to a financial loss. Key to acceptable data quality for this research was the extensive amount of time spent in the field to understand the context and practices in place.

#### **Qualitative methods**

In qualitative research the quality of data largely depends on the person conducting the research, and thus the researcher's role has to be carefully reflected upon (Murphy et al., 1998, Mays and Pope, 2000, Malterud, 2001). During the course of this thesis SR, a Swahili speaking female Swiss, was in the leading role for implementing qualitative research. Owing to prior work experience in Tanzania, she was aware of the importance of rapport-building and language skills, which had previously been shown to ensure rigor and quality in qualitative research (Ryan and Dundon, 2008, Nakkeeran and Zodpey, 2012). Within the research setting she was treated as "part of the family" and also introduced as such to interview partners by the Tanzanian counterpart she worked with. This led to high familiarity and made it possible to gather information, which would have been very unlikely to obtain otherwise. Additionally, establishing empathy with the responded and being an engaged listener confirmed to be crucial during the interviews (Mack et al., 2005). Apart from that, the intimate understanding of the research setting, rigorous collection of materials (e.g. secondary data, pictures, etc.), note taking in the field notebook as well as continuous and iterative data analysis were other key components of our qualitative approach, which ensured data quality (Mays and Pope, 1995, Silverman, 2013).

On the other hand, the closeness of the main researcher to the data could potentially have led to a researcher bias. Yet, this was addressed through a systematic and reflective analysis of the data, extensive exchange with the research team, and triangulation of methods (Murphy et al., 1998, Mays and Pope, 2000). It further needs to be kept in mind that conducting research in a foreign language is prone to misunderstanding and misinterpretation. In part this was alleviated by the partnership with a native speaker as counterpart. Also, it could be seen as a conflict of interest that the implementation of and the research on the ISAQH project were funded by the same donor. However, we aimed to reduce this problem with through no involvement of the donor in the study design, the collection, analysis and interpretation of data or the writing of the manuscript. Additionally, there was always the possibility of responder bias. For example respondents could have provided answers which they believe the interviewer wanted to hear, or they omitted important information that might have been self-evident to them. Lastly, another challenge of qualitative research was the often questioned generalizability of the finding (Mays and Pope, 1995, Malterud, 2001). By choosing study council of different characteristics, working in a team with countrywide experience, and integrating the qualitative findings with quantitative data we however believe that we did all that was possible to address this issue.

#### **Quantitative methods**

Chapter 5 concluded that the e-TIQH assessment tool could accurately measure and monitor quality of primary healthcare in Tanzania for the purpose of routinely steering improvement measures at local level. It is obvious that this conclusion only holds true for the specified context and purpose. This is in particular the case when considering expanding the use of the assessment tool to higher level of care (secondary and tertiary), other purposes (e.g. P4P schemes, accreditation) or new contexts (e.g. outside Tanzania). If the e-TIQH assessment tool was to be used in other settings or for other purposes, it would need to be adapted accordingly and its appropriateness had to be critically reassessed.

For the quality of care measurements presented in chapter 5 and 6, it could be argued that the analysis did not compare values with reference quality of care measures. The reason for this was that for most indicators no alternative and more reliable assessment was available. For few indicators that were measured comparatively in other studies, results varied considerably amongst these studies (e.g. visual and auditory privacy SARA 2012 = 15%, SPA 2014/15 = 94%) (Ministry of Health and Social Welfare, 2013f, Ministry of Health and Social Welfare, 2016). Hence, this rose questions about the reliability and therewith suitability of such assessments for comparison.

The economic costing studies done in chapter 7 and 8 relied on a considerable number of assumptions, which were documented in as much detail as possible in the supplementary data of each study. Absolute values ought therefore to be understood as best estimates. Yet, given that results were clear-cut and backed up by other studies in the case of the CHF costing, findings can still be considered as conclusive (Borghi et al., 2015). Nevertheless, the analytical challenges faced, raised concerns in terms of overall reliability of such studies. Feasible alternative approaches to the one taken by Borghi *et al.* (Borghi et al., 2015) would be needed, but this might be difficult in practice.

## 9.3 Implications and recommendations for research

For system effectiveness studies, move away from randomized control trials as the gold standard for evaluations in health research

There is a strong need for better research to inform decisions about health policies, programmes, and practices (Peters et al., 2013b). Yet, this implies that we know the effectiveness of interventions for which efficacy has been shown. Randomized Control Trials (RCTs) are the gold standard for measuring the efficacy of an intervention (West et al., 2008). However, for studies measuring effectiveness of complex, system-level interventions, RCTs are in many circumstances inadequate and/or impossible to conduct (de Savigny and Adam, 2009, West et al., 2008). One major problem is that the generalizability of findings from RCTs to real world settings might be limited, and thus RCTs only provide incomplete information about the actual effectiveness of interventions (West et al., 2008). This research demonstrated that for effectiveness studies where probability designs (e.g. RCTs) are not feasible and no comparison areas or groups exist, the mixed method approach was a reasonable alternative. This is in-line with the conclusion by West et al. which states that if RCTs are not feasible, it is far better to use a strong alternative design, rather than to change the setting so that an RCT can be implemented (West et al., 2008).

#### Promote the proper conduct of mixed methods research

In recent years the mixed methods approach has increasingly been used in health service research (Curry et al., 2013). Some guidance on the design and implementation of mixed methods exists (Creswell et al., 2011, Curry et al., 2013, Creswell, 2014). However, there are no agreed guidelines in health service research on how to correctly report mixed methods investigations and evaluate their quality (O'Cathain et al., 2008, Curry et al., 2013). This was shown to have implications on the quality of mixed methods studies published (O'Cathain et al., 2008, Wisdom et al., 2012). There are also additional unresolved challenges of mixed method research, which were faced during the implementation of this research: [1] Demand for extensive human and financial resources, [2] need of a multidisciplinary team with a team leader experienced in both quantitative as well as qualitative research, [3] attention to adherence to methodological standards of each component, and [4] trade-off between high-quality mixed methods study and the regulations of peer-reviewed journals regarding word count limitations (Creswell et al., 2011, Curry et al., 2013). Moving forward on these issues requires the attention of the research community to ensure proper conduct of mixed methods research.

#### Think critical and be diligent about quality of data

As discussed in section 9.2 above, data quality has been an issue throughout. The experience gained from this research made clear that it is of outmost importance to keep in mind the context out of which research findings arose and think critically about what implications limited or unknown data quality might have for the "evidence" produced. This is even more important nowadays in an era of data abundancy (Cai and Zhu, 2015). Special attention also needs to be paid to the quality of data gathered during short term country visits, where time and resources might not have been sufficient to grasp all the necessary details. This is of particular importance for stakeholders who tend to predominantly rely on consultancy work in the frame of short country visits (e.g. external donor). Yet, it is the researcher's responsibility to provide a reasonable account of data origin (e.g. following standardized guidelines such as STROBE, COREQ, CONSORT, etc.) and to have a critical reflection about the quality of the produced evidence (e.g. using GRADE, GRADE-CERQual, etc.). Later, policy makers cannot assess these aspects.

#### Do not try to simplify if it is complex

As implementation research strongly depends on the context, it is important to know in which context the research is conducted (Peters et al., 2013a). According to the Cynefin framework, the context can be simple, complicated, complex or chaotic (Snowden, 2003). The major difference between these is that in a simple and complicated context cause and effect relationships are known, or can be discovered with sufficient expertise (Mark and Snowden, 2017). In a complex and chaotic context, however, cause and effects can only be determined retrospectively or not at all (Mark and Snowden, 2017). This means complexity represents a radical departure from thinking in terms of linear cause and effect relationships (Mark and Snowden, 2017). It also implies that complex contexts, like health systems, cannot be overly simplified. When operating in complex and adaptive systems, researchers need to acknowledge that complexity and find methods and approaches to deal with it. Practically, it is essential that the analysis is in-depth and does not only look at the first layer of the system. For example, this research confirmed the high CHF administration cost as reported by Borghi et al., (Borghi et al., 2015), but it went on to demonstrate through a more in-depth analysis the considerable cross subsidisation in terms of financing sources that were paying for CHF administration. Additionally, not only a more in-depth, but also a wider analysis is indispensable. As illustrated by findings of the CHF administration analysis, looking at all the sources of financing was crucial to understand the wider context.

#### Shift attention from structures to processes

The findings of this research confirmed that that processes are central for quality of care and healthcare financing. Assessing service delivery processes not only made quality measures more accurate, but also improved the processes at the same time owing to adequate feedback (Leonard and Masatu, 2017). In our health financing work, major bottlenecks in CHF administration led to failures in CHF scheme implementation. A recent paper on the "redesigned CHF" additionally showed that despite the revised design (structure), implementation failures still undermined the scheme (Kalolo et al., 2017). Thus, shifting attention from structures to processes is crucial for health system research. This could be done by making use of process maps before attempting to improve the implementation of interventions. Process maps describe all major processes and actors involved in the implementation of an intervention and allow all stakeholders to have a common understanding of the system (de Savigny et al., 2017). They can also help to identify the degree to which an intervention was implemented as originally designed (Peters et al., 2013a).

#### Potential areas for further research

Finally, the research conducted within the frame of this thesis revealed that further research might be needed or could be of interest in some areas. Appendix 3 lists potential research areas, by topic, according to their perceived importance.

# 9.4 Implications and recommendations for policy and practice

The findings presented in this thesis have several implications for policy and practice. These will be described in the following section. Each implication will be accompanied by key recommendations. The first set of recommendations is primarily based on findings from chapter 4 and 5, whereas findings from chapter 6 and 7 allowed for the second set of recommendations. The last three sets build on finding across several chapters and are therefore seen as cross-cutting issues.

#### Increase measurability of quality of care

Our findings revealed that when intending to measure quality of care there is a constant trade-off between implementation feasibility, efficiency, effectiveness, validity, precision and acceptance of quality assessment measures (chapter 5). The following recommendations aim to point out how quality of care could be measured more consistently based on what was found to be important in the frame of this research.

#### General recommendations:

- For the purpose of routinely monitoring and steering quality of care a rather concise set of indicators ought to be used, whereas for evaluation or accreditation purposes the number of indicators could be increased.
- The indicator set used for monitoring purposes should be a sub-set of the set used for evaluation purposes in order to ensure alignment of indicators.
- Indicators should focus on areas in which improvements are most effective, such as processes and structural adequacy.
- Indicators ought to cover a broad range of topics (multi-dimensional quality concept),
   but focus on service delivery processes.
- Assigning weights to indicators in order to reflect their relative importance might not be worth given the additional burden on design and analysis.
- Use the same answer scale for all indicators and clearly define the answer "not applicable".
- Increase feasibility of process measures through strengthening capacity to routinely
  assess service delivery processes (e.g. conduct clinical observations) and by using
  available supportive technologies (e.g. tablets).

#### Recommendations for Tanzania

 Consider minor revisions of the e-TIQH assessment tool indicators based on above recommendations and issues listed in chapter 5, and then use these indicators to overcome the lack of national indicators for routinely monitor quality of healthcare.

#### Strengthen routine supportive supervision

This research showed that when implemented adequately, supportive supervision of healthcare providers can effectively improve and maintain quality of care. Thus, the following recommendations point out issues identified to be important for effectiveness of supportive supervision in the Tanzanian context, which may also be applicable for other LMIC settings.

#### General recommendations:

- Use an electronic assessment tool for better data quality, greater user-friendliness, and more efficient reporting.
- Use a mixed assessment team of local stakeholders with a diverse skill set for less bias and more acceptance.
- Close know-do gap and improve consultation ethics through clinical observations.
- Provide immediate and constructive on-site feedback, using adequate language of supportive nature.
- Have solution-oriented joint discussions directly at the health facility, leading to clear, achievable tasks assigned to all stakeholders involved.
- Involve community representatives during the feedback round at the health facility to increase accountability.
- Leave behind a short written feedback to health facilities.
- Ensure contextual knowledge of the assessment team and strengthen their organisational, management and professional capacity to conduct proper supportive supervision.

#### Recommendations for Tanzania:

- Use the e-TIQH supportive supervision approach as the standard approach for routine CHMT supportive supervision throughout Tanzania.
- Ensure timely and consistent implementation of routine supportive supervision through council-owned, early, and transparent supportive supervision planning (e.g. fixed work plan).
- Limit area specific supportive supervision to those health facilities where routine supportive supervision identified weak performance.

- Better coordinate/harmonize supportive supervision attempts of different stakeholders to reduce fragmentation and burden on CHMTs and healthcare providers.
- Stimulate motivation and ownership of CHMTs to conduct supportive supervision through stronger involvement of RHMTs.
- Consider using a subset of e-TIQH indicators for cascade supportive supervision.

## Increase health worker's performance through boosting staff morale without financial incentives

Low health worker's performance is recognized as a major challenge of the Tanzanian health system (see Table 2), and several approaches have already been implemented to address this issue with P4P schemes being the most prominent ones (Songstad et al., 2012). However, this work clearly pointed out the possibilities to increase health workers' performance through boosting staff morale without financial incentives and without adding an additional administrative structure to the already burdened health system. Based on this the subsequent recommendations are provided:

- Strengthen leadership and management capacity of CHMTs to adequately boost staff morale.
- Ensure timely and equitable implementation of proper supportive supervision.
- Provide fair and timely feedback to ensure translation of results into practice.
- Follow up on issues that ought to be addressed, even if just reporting on status quo.
- Establish a close employee-management relationship (McKnight et al., 2001).
- Use the results of quality assessments to put in place a system for recognition and rewarding good performance.
- Provide non-financial rewards, such as performance feedback to allow for comparison
  of health facility performances (dissemination meeting or written report), verbal or
  written appreciation, certificates for well performing health facilities, radio
  announcements, small in-kind presents or appointment as worker of the year.
- Organize fora at council level for the dissemination of supportive supervision result, as well as for mutual learning and understanding (share best practice, lesson learned, success and failures).
- Ensure sufficient allocation and timely payment of statutory employment benefits and per diem.
- Ensure availability of supplies and vehicles.

# Improve routine health system data quality and its usage: not quantity, but quality matters

Experience from across all studies revealed that the Tanzanian health system is data-rich, but information-poor due to insufficient quality and usage of routine data. This ultimately resulted in untimely and/or inadequate actions, as well as financial losses and high opportunity costs. Therefore, building on the findings around the e-TIQH supportive supervision approach, which demonstrated that improved data quality led to better availability of meaningful and actionable data, the following recommendations are given to improve routine health system data quality and usage.

- Harmonize vertical programs and donor-funded initiatives with reporting requirements
  of national routine measures to reduce the amount of data generated.
- Generate demand for high-quality data.
- Strengthen data management capacity at all levels (health facility to national level).
- Use automated data entry and analysis for simple, immediate, and continuous access to aggregated and comparable quality data.
- Induce transition from staff with data entry skills to staff with IT skills.
- Strengthen the analytical capacity of managers to use automatically generated and aggregated data more systematically, and to allocate resources effectively and efficiently based on evidence.
- Ensure that all health-relevant data feed into one national health information system that is accessible for planning and budgeting.

#### Improve processes: time is money

A major cross-cutting issue of the present research was cumbersome or unclear processes. This led to delays or non-implementation of activities and ambiguity in terms of roles and responsibilities. It was also shown to result in enhanced inequity and a higher burden for the health system, both in terms of financial and opportunity cost. Thus, human and financial resources could be spent more efficient and effective through continuously improving processes. Building on this the following recommendations are given to improve processes::

- Before trying to fix individual parts of a system, assess all processes involved and clearly define reporting formats as well as roles and responsibilities of all relevant stakeholders (e.g. using process mapping; see 9.3 above).
- Anticipate consequences of potential system modifications on other parts of the system, based on a comprehensive process analysis.

- Avoiding adding additional processes to an already complex system just to get around a non-functional process.
- Improving processes does not mandatorily include a change in structures (e.g. design, guidelines) as structures might be in place, but simply not be adequately used.
- If of added value, use new technology (e.g. electronic data collection, electronic mobile payment) to improve processes.
- Analyse the role of the civil society in these processes and acknowledge its potential to strengthen the system and unburden the public sector.

### 10. Conclusion

The research conducted within the framework of this thesis intended to contribute to a better understanding of how to promote UHC in Tanzania. In particular it provided actionable evidence and recommendations for moving towards improved health service quality and financial protection. The quality assessment tool, for which we demonstrated its accuracy to measure quality of primary healthcare, offers a unique opportunity to establish routine monitoring of healthcare quality countrywide. Through integrating this tool into a bigger supportive supervision approach we could also show a direct impact of the approach on improved quality of care. Additionally, a comparison between current practices and the new supportive supervision approach revealed increased efficiency and effectiveness of the latter. Thus, if used as the standard supportive supervision approach by CHMTs, the new approach could contribute to increased and more equitable health service coverage in a cost-effective way. Importantly, these findings also provided informed guidance to overcome several problems of healthcare quality assessments and supportive supervision in LMICs. Thus, the experience presented here may prove useful to enhance quality of care beyond Tanzania.

In terms of financial protection our findings raised questions whether efforts to fix bottlenecks of CHF administration processes were feasible, scalable and value-for-money. The evidence provided in the frame of this research called for a realistic reconsideration of approaches taken to address the challenges in the Tanzanian health financing system.

Throughout the research we also identified cross-cutting issues that revealed to be important for both health service quality and financial protection. For example, it was seen as indispensable to increase health worker's performance through boosting staff morale. Yet, this ought to be done without financial incentives and within existing structures. There is also a strong need to improve the quality and usage of routine health system data, as well as system processes to ensure better health system performance.

Apart from its implication on policy and practice, the present work additionally provided valuable insights for conducting implementation research. Mixed methods proved to be a feasible and effective design for analysing interventions that were routinely implemented in complex real world settings, with no comparison areas or groups. Yet, proper conduct of mixed methods is essential. Additionally, the work re-emphasised the importance of data quality in research, especially in an era of data abundancy. It also demonstrated that acknowledging complexity, and focusing on system processes are key elements of health system research.

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## 12. Appendices

- 12.1 Appendix 1: Paper-based version of e-TIQH assessment tool (2014 final version)
- 12.2 Appendix 2: Example of poor data quality in CHF administration
- 12.3 Appendix 3: Detailed list of potential areas for further research

## 12.1 Appendix 1: Paper-based version of e-TIQH assessment tool (2014 final version)

### TOOL 1: ASSESSMENT OF FACILITY'S PHYSICAL ENVIRONMENT AND TOOLS/EQUIPMENT

Date	_ /  / _ _ _  DD MM YYYY	District Code	
Health Facility Name		Health Facility ID	_ _
Health Facility Level 1= Dispensary 2= Health Centre 3= Hospital	<u>  </u>	Health Facility Owner  1 = Public  2 = Faith-based  3 = Private for profit  4 = Institutional	<u>  </u>
Assessor's name:		Assessor's Function:	

### **Directions for use:**

Observe all areas of the health facility and enter the score (either YES = 1, NO = 0 OR NA = Non-applicable = 99) accordingly in the last column.

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
1.1	Does the facility have a clean and conducive physical infrastructure that facilitates sound working?	1.1a	1	The facility's immediate surroundings are free from long grass, paper debris and solid waste.	
		1.1b	1	The facility has clear demarcated boundaries.	
		1.1c	1	The building infrastructure is in good and solid condition.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		1.1d	1	The roof is intact.	
		1.1e	1	The walls and floors are intact, smooth and cleanable.	
		1.1f	1	The infrastructure is user friendly for physically challenged individuals.	
1.2	Does the facility have the required facilities for solid waste	1.2a	1	The facility has waste bins that are well managed and not overflowing.	
	management?	1.2b	1	The facility has a waste storage section at the incinerator house according to MoHSW guidelines.	
		1.2c	1	The facility has waste segregation equipment i.e. color coded bins, with bin liners according to MoHSW guidelines:	
				<ul> <li>Red for infectious waste,</li> <li>Blue or black for non infectious waste and</li> </ul>	
				Yellow for sharps (safety boxes).	
		1.2d	1	The facility has safety boxes for sharps disposal.	
		1.2e	1	Safety boxes are emptied when ¾ full.*	
		1.2f	1	The facility has a waste disposal pit (for non-infectious material), which is properly used, fenced, and there is no waste lying around the ground.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99	
		1.2g	1	The facility has a final waste storage (for infectious material) in an area which is fenced and closed (where required).		
		1.2h	3	The facility has a functional incinerator to burn health care waste, which is fenced off and well managed.		
		1.2i	1	The facility has an ash pit which is properly used, and there are no ashes lying around the pit.		
		1.2j	3	The facility has a placenta pit with tight cover, a vent, and it is used properly.		
1.3	Are basic facilities available to ensure minimum hygiene in the	The following basic facilities are available:				
	facility?	1.3a	3	The facility has reliable supply of safe water.		
		1.3b	3	The facility has enough water storage tanks.		
		1.3c	3	Functional hand washing points exist in all service delivery areas including liquid soap and running water.		
		1.3d	3	The facility has a functional waste water drainage system where applicable.		
		1.3e	3	The facility has essential disinfectants such as chlorine solution, powder or tablets in stock.		

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		1.3f	3	0.5% chlorine is used for decontamination of instruments; three buckets system exists and the process abides with MoHSW IPC standards.	
		1.3g	3	<ul> <li>The facility has essential antiseptics such as</li> <li>Ethyl or Isopropyl alcohol (60–90%),</li> <li>Cetrimide and chlorhexidine gluconate (2–4%), e.g., Savlon®,</li> <li>OR chlorhexidine gluconate (2–4%), e.g., Hibiclens®, Hibiscrub®, Hibitane®</li> <li>OR iodine preparations (0.5–3%), e.g., Lugol's</li> <li>OR iodophors (usually not diluted), e.g., Betadine.</li> </ul>	
1.4	Do staff and clients have access to a functioning and clean toilet or latrine?	1.4a	3	The facility has functional toilets / latrines in the premises.	
		1.4b	3	Separate toilets / latrines for male and female clients available.	
		1.4c	3	Separate toilet / latrine for staff available.	
		1.4d	3	The toilets / latrines is/are clean.	
		1.4e	3	The facility has a user friendly latrine / toilet for people who are physically challenged.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		1.4f	3	Liquid soap and water are available at the washing point near the toilets or latrines.	
1.5	Is the waiting area comfortable for clients?	1.5a	1	The facility has a comfortable waiting area with enough seats/slabs and space for clients to seat while waiting for services available.	
		1.5b	1	Enough chairs / benches or slabs for clients to sit while waiting for services are available.	
1.6	Is/are the examination room(s) private and comfortable?	1.6a	3	The examination rooms ensure(s) visual and auditory privacy.	
		1.6b	3	The examination room(s) has/have a functioning and clean examination couch.	
1.7	Are facility buildings clean, well lit and arranged?	1.7a	1	All rooms are mopped, free of dust, trash, dirt and of spider webs and the rooms are generally tidy.	
		1.7b	2	The facility has the required cleaning equipment and tools.	
		1.7c	1	Cleaning equipment / tools are properly stored.*	
		1.7d	1	The facility has a cleaning schedule for all areas.	
		1.7e	1	Service delivery rooms are well ventilated and illuminated.	
		1.7f	1	The facility is free from insects, bats and other animals.	
		1.7g	1	All beds are clean and neatly laid with clean bed sheets.	
		1.7h	1	Furniture, equipment, tools and items are well kept, arranged, dusted and labeled.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
1.8	Does the facility have reliable source of energy including during emergency?	1.8a	3	Reliable energy supply (source: national grid, generator or solar thermal) are available where required	
1.9	Is an up-to-date inventory list available in each room?	1.9a	1	Every room has an up-to-date inventory list not older than 6 months.	
1.10	Does the facility have the following	The following es	ssential equip	oments and supplies are available and function	nal:
	basic / essential medical equipment and supplies?	Maternal and ne	wborn care:		
	ши сприсс	1.10a	4	Delivery kit where required.	
		1.10b	4	Infant weighing scale where required.	
		1.10c	4	Baby weighing scale where required.	
	CHECK EACH ITEM IN THE FACILITY/WARD.	1.10d	4	Delivery bed where required.	
	INSPECT EACH ITEM TO SEE IF IT	1.10e	4	Partograph where required.	
	IS FUNCTIONING PROPERLY	1.10f	4	MVA kit where required.	
		1.10g	4	Resuscitation kit where required.	
		Other equipments and supplies:			
		1.10h	4	Stethoscope.	
		1.10i	4	Blood pressure cuff/machine.	
		1.10j	4	Adult weighing scale.	
		1.10k	3	Microscope.	
		1.10l	3	Laboratory reagents.	
		1.10m	4	Malaria-RDT kits	
		1.10n	4	HIV test kits	
		1.100	4	Refrigerator for blood and blood bags where required.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		1.10p	4	Gloves.	
		1.10q	4	ENT diagnostic tools (spatula, auriscope, torch).	
		1.10r	3	Thermometer.	
		1.10s	3	Wheel chair where applicable	
		1.10t	3	Fire extinguisher / colour coded and bucket with sand.	

### **TOOL 2: ASSESSMENT OF JOB EXPECTATIONS**

Date	_ /  /  _  DD MM YYYY	District Code	
Health Facility Name		Health Facility ID	
Health Facility Level 1 = Dispensary 2 = Health Centre 3 = Hospital	<u>  </u>	Health Facility Owner  1 = Public  2 = Faith-based  3 = Private for profit  4 = Institutional	<u>  </u>
Assessor's name:		Assessor's Function: _	
<ul> <li>In health centres</li> <li>Interview provide</li> <li>Fill out a separate</li> <li>Ask the following</li> </ul>	nterview all trained health providers. and hospitals interview 10 health providers ers working in different sections/clinical e questionnaire for each provider. g questions and enter the score NO = 0 OR NA = Non-applicable = 99) acc	departments, OPD and IPD.	
Interviewee's job title:  1 = Medical Officer  2 = Assistant Medical Officer  3 = Clinical Officer  4 = Clinical Assistant  5 = Registered Nurse	_  cer	8	7 = Enrolled nurse = Laboratory Technician 9 = Medical Attendant 10 = Health Officer 11 = Health Assistant

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
2.1	Can you name at least 5 essential	2.1a	2	The provider is able to mention at least 5	
	services provided at the facility?			essential preventive, promotive and curative	
				services which are provided according to the facility level.	
2.2	Does the provider have a job	2.2a	2	The provider has a job description according	
	description?			to his/her qualification. (Assessor to verify)	
2.3	Are the following current treatment			the current treatment/management guidelines	5
	/ management guidelines for the	•	verify availab	pility of guidelines)	
	different common conditions	2.3a	2	IMCI.	
	treated in the facility available?	2.3b	2	Malaria.	
		2.3c	2	Opportunistic infections.	
		2.3d	2	Sexually Transmitted Infections.	
		2.3e	2	Focused Antenatal Care.	
		2.3f	2	Basic Emergency Obstetric Care.	
		2.3g	2	Life Saving Skills.	
		2.3h	2	TB and Leprosy.	
		2.3i	2	Infection Prevention and Control.	
		2.3j	2	National Standard Treatment Guideline.	
		2.3k	2	National Guideline for HIV/AIDS	
				Management.	
		2.3l	2	Quality Improvement Guidelines.	
		2.3m	2	e-MTCT.	
		2.3n	2	Emergency preparedness and Response.	
		2.30	2	Disease surveillance and response.	
		2.3p	2	National standard guideline for Laboratory	
				services where applicable.	
2.4	Are the following treatment		orithms displa	ayed in appropriate places:	
	algorithms for the most common	2.4a	2	IMCI case management algorithm displayed.	
	diseases / conditions displayed in	2.4b	2	ALu treatment algorithm displayed.	

INDICATOR QUAL	ITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
the cor	nsulting, dispensing and	2.4c	2	IPT algorithm displayed.	
other s	ervice delivery areas, in a	2.4d	2	Post abortal management algorithm	
place w	where the provider can refer			displayed.	
to at a	glance?	2.4e	2	Diarrhoea management algorithm displayed.	

#### TOOL 3: PROFESSIONAL KNOWLEDGE, SKILLS AND ETHICS (PROFESSIONALISM) **District Code** Date MM YYYY DD **Health Facility Name Health Facility ID Health Facility Level Health Facility Owner** 1 = Dispensary 1 = Public2 = Health Centre 2 = Faith-based 3 = Private for profit 3 = Hospital 4 = Institutional Assessor's name: Assessor's Function: Directions for use: Observe once each trained provider in a dispensary and 10 providers in a health centre or hospital. • Fill out a separate checklist for each provider. Greet the provider and explain the purpose of the observation. • Observe clinical sessions for IMCI, antenatal care, fever case management, or other common conditions treated at the facility. • Observe the clinical practice and enter the score (either YES = 1, NO = 0 OR NA = Non-applicable = 99) accordingly in the last column. Interviewee's job title: 1 = Medical Officer 5 = Enrolled nurse 6 = Registered Nurse 2 = Assistant Medical Officer 3 = Clinical Officer 7 = Medical Attendant 4 = Clinical Assistant

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
3.1	Does the provider adhere to	3.1a	3	The provider greets the client.	
	principles of clinical history and	3.1b	3	The provider sees the client in privacy.	
	physical examination?	3.1c	4	The provider recognizes and addresses non verbal communication from the client.	
		3.1d	4	The provider asks open ended questions during history taking.	
		3.1e	4	The provider gives the client the opportunity to ask questions, listens and responds.	
		3.1f	4	The provider performs physical examination systematically as per individual case requirement.	
		3.1g	4	The provider requests / performs investigations required and gives clear explanations to the client concerning the purpose of tests and the procedures.	
3.2	Does the provider adhere to hand hygiene as per national IPC guidelines?	3.2a	2	The provider thoroughly wets hands with running water.	
		3.2b	1	The provider applies (liquid) soap.	
		3.2c	1	The provider vigorously rubs all areas of hands and fingers for 10-15 seconds.	
		3.2d	1	The provider rinses hands thoroughly with clean water.	
		3.2e	1	The provider dries hands with paper or single use towel using tapping technique for rubbing, or air-dries the hands.	
		3.2f	1	The provider adheres to procedures of alcohol hand rub using alcohol where recommended.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
3.3	Does the provider decontaminate	3.3a	4	The provider applies proper	
	used instruments as per national			decontamination procedures by soaking	
	IPC standards and guideline?			contaminated instruments into 0.5% chlorine	
				for 10 minutes in clean soap water and rinse	
				in clean water before sterilization.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
	serve the IMCI management skills duri				
3.4	Does the provider adhere to IMCI case management procedures	The provider ass process:	esses and m	anages the sick child according to IMCI man	agement
	when attending sick children aged up to 5 years?	3.4a	4	The provider asks if the sick child has had convulsions during the current illness.	
		3.4b	4	The provider asks whether the child vomits everything.	
		3.4c	4	The provider checks whether the child is lethargic or unconscious.	
		3.4d	4	The provider checks if the child is convulsing.	
		3.4e	4	The provider asks about cough or difficult breathing.	
		3.4f	4	The provider asks about diarrhoea.	
		3.4g	4	The provider asks about fever.	
		3.4h	4	The provider asks about ear problems.	
		3.4i	4	The provider assesses the sick child for malnutrition and anemia where appropriate.	
		3.4j	4	The provider assesses the sick child for HIV infection symptoms where indicated.	
		3.4k	4	The provider assesses the sick child for immunization status.	
		3.41	4	The provider assesses the sick child for other problems.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		3.4m	4	The provider correctly classifies the sick child.	
		3.4n	5	The provider gives correct treatment for IMCI classification.	
		3.40	5	The provider demonstrates to mother / caretaker how to administer the medicine to the sick child.	
		3.4p	5	The provider explains to mother / caretaker the danger signs for immediate return.	
		3.4q	4	The provider gives the mother / caretaker a follow up appointment.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99				
	serve the assessment and managemen								
3.5	Does the provider adhere to the		The provider gives health education and advices a pregnant woman						
	principles of Focused Antenatal	correctly about:							
	Care during the assessment and	3.5a	2	Danger signs during pregnancy.					
	management of a pregnant	3.5b	2	Family planning after delivery.					
	woman?	3.5c	2	Birth preparedness.					
		3.5d	2	STIs and correct uses of condoms.					
		The provider reg	isters pregna	nt women and enquires about:					
		3.5e	2	Age.					
		3.5f	2	Education.					
		The provider end							
		3.5g	2	Gravidity.					
		3.5h	2	Parity					
		3.5i	2	Number of living children.					
		3.5j	2	Abortions if any.					
		The provider end	uires about h	nistory of the current pregnancies:	1				
		3.5k	2	Last normal Menstrual Period (LNMP).					
		3.5l	2	The provider calculates the EDD.					
		3.5m	2	Vaginal bleeding / discharge.					
		In case of first vi	sit the provid	er asks about risk factors:	<b>-</b>				
		3.5n	3	Duration of 10 years or more from last					
				pregnancy.					
		3.50	3	Operative deliveries / vacuum extraction.					
		3.5p	3	History of SB / early neonatal death (					
		- r		during first week).					
		3.5q	3	History of recurrent abortion two or more.					
		3.5r	3	History of heart disease.					
		3.5s	3	History of Diabetes Mellitus.					

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		3.5 t	3	History of Tuberculosis.	
		3.5u	3	Gravida 5 or more.	
		3.5v	3	Elderly primigravida 35years or more.	
		3.5w	3	Provider assess for pelvic deformity	
		3.5x	3	Provider asks about history of PPH	
		3.5y	3	History of retained placenta	
3.6	Does the provider assess and	3.6a	3	Body weight.	
	request / perform the following	3.6b	3	Blood pressure.	
	important tests?	3.6c	3	Haemoglobin.	
		3.6d	3	Blood group.	
		3.6e	3	Urine for sugar.	
		3.6f	3	RPR for syphilis.	
		3.6g	3	Rhesus factor (RH).	
		The provider exa	mines the pro	egnant as per FANC principles:	
		3.6h	3	Breast examination.	
		3.6i	3	Fundal height by week.	
		3.6j	3	Gestational age.	
		3.6k	3	Lie.	
		3.61	3	Presenting part (from 36weeks).	
		3.6m	3	Quickening (after 20 weeks).	
		3.6n	3	FHR after 20 weeks.	
		3.60	3	Genital inspection.	
		3.6p	3	Oedema of lower limbs.	
		The provider adn	ninisters /pre	scribes medications / vaccines as required	l:
		3.6q	3	Ferrous sulphate.	
		3.6r	3	Folic Acid.	
		3.6s	3	SP after 20 weeks.	
		3.6t	3	Mebendazole.	
		3.6u	3	TT.	
		3.6v	3	A bed net voucher.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
3.7	Does the provider adhere to e- MTCT principles?	3.7a	4	The provider counsels and obtains consent for HIV testing.	
		3.7b	4	In case of HIV positive, the provider prescribes / administers / refers pregnant woman for ART (TEL) and enrolment in CTC.	
		3.7c	4	The provider checks / refers pregnant woman for CD4 counting.	
		3.7d	4	The provider administers / prescribes Cotrimoxazole for pregnant woman with CD4 counting below 350 or with HIV stage 3 or 4.	
		3.7e	4	The provider counsels HIV positive pregnant woman on breast feeding.	
		3.7f	4	The provider counsels the HIV positive pregnant woman on adherence to ART.	
co	Does the provider understand correctly the steps for post exposure prophylaxis in case of	3.8a	4	The provider explains correctly the first aid procedures in an event of exposure to blood or body fluids.	
	exposure to blood or body fluids?	3.8b	4	The provider knows the reporting procedures in an event of exposure to blood or body fluid.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
Scenario C: Obs	serve the assessment of a fever case in				
3.9	Does the provider follow the	The provider ass	esses and pe	erforms the following on the patient:	
	clinical assessment procedures,	3.9a	4	Detailed history taking including the most	
	investigations and treatment			frequent possible causes of fever according	
	guidelines?			to age, sex and geographical location of a	
				patient.	
		3.9b	4	Body temperature.	
		3.9c	4	Anaemia.	
		3.9d	4	Jaundice.	
		3.9e	4	Enlarged spleen.	
		3.9f	4	m-RDT / blood slide where available if malaria is suspected.	
		3.9g	4	Investigations/laboratory tests to determine other causes of fever following clinical judgment.	
		3.9h	5	Clear and correct instructions on how to take ALu if malaria is diagnosed.	
		3.9i	5	Instructions on how take medicines prescribed for other diseases / conditions identified.	
		3.9j	5	Advice on prevention of further episodes of the condition / disease treated.	

INDICATOR	QUALITY STANDARD TO BE MET serve the assessment and management	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
			•		
3.10	Does the provider assess and manage a (potential) TB/HIV patient	management gui	nanages a (potential) TB / HIV patient as per		
	correctly?	In case of a first			
		3.10a	4	TB diagnostic algorithm.	
		3.10b	4	Main symptoms of TB such as chronic	
				cough, loss of body weight, fever, night	
				sweat, etc.	
		3.10c	4	Systematic physical examination.	
		3.10d	5	Sputum examination in case TB is	
				suspected.	
		3.10e	4	Chest-X-Ray where required.	
		In case of a posi-	tive TB diagr	nosis:	
		3.10f	5	Explanations to the patient on objective of DOT regimen and the choice to take the daily treatment either at home or at the health facility, with the help of a treatment supporter or a health worker.	
		3.10g	5	Prescription of correct treatment regimen based on body weight.	
		3.10h	5	Clear and correct instructions from DOT nurse on daily treatment intake and possible side effects.	
		3.10i	5	Clear instructions to patient on cough hygiene	
		3.10j	5	In case of HIV suspect: Provider Initiated Testing and Counseling (PITC) session initiated.	
		3.10k	5	In case of HIV suspect: HIV testing performed according to guidelines.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		3.10l	5	In case of HIV suspect, if HIV positive: clinical staging.	
		3.10m	5	In case of HIV suspect: Cotrimoxazole preventive therapy prescribed and explained.	
		3.10n	5	In case of HIV suspect: Antiretroviral treatment initiated and explained.	
		In case of home-	based TB tre	atment:	
		3.100	5	<ul> <li>If home-based treatment starts: clear and correct instructions to treatment supporter</li> <li>On how to observe daily intake and possible side effects.</li> <li>On when to collect medicines (once a week during intensive phase, once every two weeks during continuation phase).</li> </ul>	
		3.10p	5	<ul> <li>If treatment supporter comes for new drugs:</li> <li>Check of drug intake / empty blister packs and side effects.</li> <li>Provision of correct treatment according to treatment phase.</li> </ul>	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
3.11	Does the provider adhere to good dispensing practices?	3.11a	4	The provider uses dispensing spoon.	
		3.11b	4	The provider uses dispensing trays.	
		3.11c	4	The provider uses proper dispensing envelops.	
		3.11d	5	Medicines are labeled well and dosage written clearly.	
		3.11e	5	Dispenser/provider explains to patient/caretaker the dosage, frequency, possible adverse drug effects and precaution if there is any in the use of their medications.	
3.12	3.12 Does the provider understand correctly the steps for post exposure prophylaxis in case of	3.12a	4	The provider explains correctly the first aid procedures in an event of exposure to blood or body fluids.	
	exposure to blood or body fluids?	3.12b	4	The provider knows the reporting procedures in an event of exposure to blood or body fluid.	

### TOOL 4: ASSESSMENT OF FACILITY MANAGEMENT AND ADMINISTRATION

Date	_ / _ _ / _ _ _  DD MM YYYY	District Code	
Health Facility Name		Health Facility ID	
Health Facility Level 1 = Dispensary 2 = Health Centre 3 = Hospital		Health Facility Owner  1 = Public  2 = Faith-based  3 = Private for profit  4 = Institutional	
Assessor's name:		Assessor's Function:	

#### Directions for use:

- At the facility (hospital, health centre or dispensary) conduct the interview with the health facility in charge, the nurse in charge or the hospital administrator.
- Ask the following questions and enter the score (either YES = 1, NO = 0 OR NA = Non-applicable = 99) accordingly in the last column.

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
4.1	Is the health facility registered with the appropriate regulatory bodies?	4.1a	5	Valid license for operating the health facility is available.	
4.2	Does the facility have the required manning level?	4.2a	5	The facility has the required manning level according to prescribed level for dispensary, health centre or hospital.	
		4.2b	3	Duty rosters, job descriptions and job allocations are displayed and are adhered to by each staff in his/her area of service.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
4.3	Does the health facility plan incorporate quality improvement	4.3a	3	The health facility annual plan is in place.	
	initiatives?	4.3b	2	The health facility plan incorporates quality improvement activities.*	
		4.3c	3	Quality Improvement Team (QIT) and Work Improvement Team (WIT) are in place (where required).	
		4.3d	2	The facility has an emergency preparedness action plan.	
4.4	Does the health facility effectively respond to clients' needs?	4.4a	2	The opening and closing hours are visibly displayed to the public.	
		4.4b	2	The facility has clear signboards and identification labels to guide clients to various areas.	
		4.4c	2	The facility has a notice board that shows lists of all services and up-to-date prices.	
		4.4d	2	Guidelines for waivers and exemption mechanisms are clearly displayed to the public.	
		4.4e	2	Worker / personnel is aware of the policies, acts and guidelines in relation to people with disabilities and other vulnerable groups.	
		4.4f	2	Clients' rights' chart displayed to the public.	
4.5	Are the following essential IEC materials visibly displayed to	4.5a	2	IEC materials for malaria visibly displayed to clients.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99	
	clients?	4.5b	2	IEC materials for family planning visibly displayed to clients.		
		4.5c	2	IEC materials for TB and HIV visibly displayed to clients.		
		4.5d	2	IEC materials for STI visibly displayed to clients.		
4.6	Does the facility have mechanisms to get public opinion on the quality of services?	4.6a	2	The facility has a suggestion box, which can be used by clients.		
4.7	Does the health care provider have skills in managing and ordering medicines and medical supplies?	4.7a	3	The provider correctly fills in specified R&R forms when requesting for medicines and medical supplies.		
4.8	Does the facility have pharmaceutical inventory documents available, updated and	4.8a	3	Information recorded in all movements (issuing, receiving, loan, damaged, physical inventory etc.).		
	verified?	4.8b	3	The facility has daily dispensing register that is current.		
4.9	Product availability	a) For how long	has SP bee	n available?		
		During the past 90	days or long	ger (4)		
		Between 60 and 8	39 days (3)			
		Between 30 and 5	59 days (2)			
		Less than 30 days	s (1)			
		Not applicable				
		b) For how long has ALu pediatric/adult formulation (dispersible, 5-10 Kg or 10 to 35Kg) been available?				
		During the past 90		ger		
		Between 60 and 8	•			
		Between 30 and 5				
		Less than 30 days	5			
		Not applicable				

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99	
				ult formulation (>35Kg) been available?		
		During the past 90		ger		
		Between 60 and 8				
		Between 30 and 5				
		Less than 30 days	3			
		Not applicable	have Ovinin	as inicatables have sucilable?		
				ne injectables been available?		
		During the past 90		ger		
		Between 60 and 8 Between 30 and 5				
		Less than 30 days	•			
		Not applicable	•			
				ne tablets been available?		
		During the past 90		ger		
		Between 60 and 8				
		Between 30 and 5				
		Less than 30 days	5			
		Not applicable				
				Penicillin (X-Pen) been available?	1	
		During the past 90		ger		
		Between 60 and 8				
		Between 30 and 5				
		Less than 30 days	5			
		Not applicable				
		g) For how long has Cotrimoxazole been available?				
		During the past 90 days or longer				
		Between 60 and 89 days Between 30 and 59 days				
		Less than 30 days			<del> </del>	
		Not applicable	<b>)</b>			

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99	
				illin been available?		
		During the past 90		ger		
		Between 60 and 8				
		Between 30 and 5				
		Less than 30 days	S			
		Not applicable				
		,		cllin been available?	1	
		During the past 90		ger		
		Between 60 and 8	•			
		Between 30 and 5	•			
		Less than 30 days	3			
		Not applicable	lana Matua di	in anala haan ayallahla?		
				inazole been available?		
		During the past 90		ger		
		Between 60 and 8				
		Between 30 and 5 Less than 30 days				
		Not applicable	>			
			hae TR Eive	ed-dose Combination Therapy for adults in	intonsiyo	
		phase (FDC)	heen availah	su-dose combination merapy for addits in	IIICIISIVE	
		During the past 90				
		Between 60 and 8		<del>301</del>		
		Between 30 and 5				
		Less than 30 days				
		Not applicable				
		For how long has TB Fixed-dose Combination Therapy for adults in continuation.				
		phase (FDC) been available?				
		During the past 90				
		Between 60 and 8				
		Between 30 and 5	9 days			

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		Less than 30 days	5		
		Not applicable			
		l) For how long available?	has Tenofo	vir Efaverence and Lamivudin (TEL) has	been
		During the past 90	days or long	ger	
		Between 60 and 8	•		
		Between 30 and 5	-		
		Less than 30 days	3		
		Not applicable			
				s sulphate been available?	
		During the past 90		ger	
		Between 60 and 8			
		Between 30 and 5	,		
		Less than 30 days	5		
		Not applicable	has Falia a	cid been available?	
		During the past 90			
		Between 60 and 8		<del>Je</del> i	
		Between 30 and 5	-		
		Less than 30 days	•		
		Not applicable			
		o) For how long	has ORS be	en available?	
		During the past 90			
		Between 60 and 8			
		Between 30 and 59 days			
		Less than 30 days			
		Not applicable			
				nycin been available?	
		During the past 90		ger	
		Between 60 and 8	89 days		

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
		Between 30 and 5			
		Less than 30 days	3		
		Not applicable			

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
4.10	Does the facility have a separate storage room for medicines and medical supplies?	4.10a	3	The storage room is equipped with shelves and pallets.	
		4.10b	3	The facility has store ledgers that are up-to- date and accurately filled in.	
		4.10c	3	There is a separate cupboard for storage of expired / damaged / medicines and medical supplies.	
		4.10d	3	There is a separate secure cupboard for storage of controlled drugs such as DDA.	
		4.10e	3	The facility has a separate ledger for expired / damaged products.	
		4.10f	3	The facility has a separate ledger for controlled drugs such as DDA.	
4.11	Does the facility maintain an effective cold chain system for keeping vaccines and other products cool?	4.11a	4	The facility has functioning cold chain / refrigeration fitted with temperature monitoring chart.	
4.12	Does the facility have the essential HIMS books and are they duly filled in?	4.12a	2	HIMS books are available and duly filled in, and reports are submitted to CHMT.	
4.13	Does the Health Facility Governing Committee (HFGC) meet quarterly?	4.13a	3	HFGC meeting conducted quarterly and minutes available.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
4.14	Does the facility conduct regular staff meetings to discuss work improvement?	4.14a	3	Last facility staff meeting conducted during last quarter and minutes available.	
4.15	Does the facility have mechanisms to facilitate referral of emergency patients to the next level?	4.15a	3	The provider is able to describe facility plans for referral of patients.	
4.16	Has the facility received a supervisory visit during the past 6 months?	4.16a	2	The facility has received a supervisory visit in the past six months and comments are available.	

# **TOOL 5: ASSESSMENT OF STAFF MOTIVATION**

Date	_ /  / _ _ _  DD MM YYYY	District Code	
Health Facility Name		Health Facility ID	
Health Facility Level 1= Dispensary 2= Health Centre 3= Hospital		Health Facility Owner  1 = Public  2 = Faith-based  3 = Private for profit  4 = Institutional	
Assessor's name:		Assessor's Function: _	
<ul><li>Fill in a se</li><li>Greet the</li><li>Ask the fe</li></ul>	5 providers in a dispensary and 10 pro eparate questionnaire for each provide provider and explain the purpose of the following questions and enter the score ES = 1, NO = 0 OR NA = Non-applicable	er. he interview. e	
Interviewee's job title:  1 = Medical Officer  2 = Assistant Medical Officer  3 = Clinical Officer  4 = Clinical Assistant  5 = Registered Nurse  6 = Dental officer  7 = Dental Therapist  8 = Social Welfare Officer  9 = Technician, please special Pharmacist:  11=Pharmaceutical technician	cify	13	12 = Enrolled nurse B = Maternal and Child Health AIDE 14 = Medical Attendant 15 = Health Officer 16 = Health Assistant

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
5.1	Have you received any in-service training in the period of 3 years?	The provider has received in-service training within the period of 3 years in the following areas:			
		5.1a	3	IMCI.	
		5.1b	3	Malaria.	
		5.1c	3	VCT.	
		5.1d	3	HIV Treatment and Opportunistic Infections (ART)	
		5.1e	3	TB and Leprosy.	
		5.1f	3	Focused Antenatal Care.	
		5.1g	3	Elimination of Mother to Child Transmission of HIV (e-MTCT).	
		5.1h	3	Post Abortal Care.	
		5.1i	3	Family planning.	
		5.1j	3	Life saving skills.	
		5.1k	3	Immunization.	
		5.11	3	Infection Prevention and Control.	
		5.1m	3	Integrated Logistic System (ILS) and ILS gateway.	
		5.1n	3	Rational use of Medicines and Medical Supplies.	
5.2	Have you received any supervisory follow up related to the training you attended?	5.2a	3	Supervisory follow up visit received following the training.	
5.3	Does your immediate supervisor / facility manager give you moral and professional support to improve your work performance?	5.3a	3	The provider gets moral and professional support on professional and non-professional issues.	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
5.4	Have you participated in any in- house continuing education sessions in the previous 3 months?	5.4a	3	The provider has participated in continuing professional development activities such as mentoring and coaching including clinical meetings during the previous 3 months.	
5.5	Have you received your salary on time in the previous 3 months?	5.5a	3	The provider received the salary on time (26 <sup>th</sup> -5 <sup>th</sup> of next month).	
5.6	Are your promotions effected regularly?	5.6a	3	The provider has been promoted within the previous 3 years.	
		5.6b	3	Salary increment effected following promotion	
5.7	Are your employment benefits provided as per work contract?	5.7a	3	The provider has been paid leave allowance within the last 3 years.	
		5.7b	3	The provider was allocated a house as entitled staff.	
		5.7c	3	The provider was paid Extra Duty Allowance (EDA).	
		5.7d	3	The provider had training opportunities outside his work place.	
5.8	Were you rewarded during the	The following types of rewards were given:			
	previous 3 years?	5.8a	3	Money.	
		5.8b	2	Appointed as best worker of the year.	
		5.8c	2	Letter of appreciation.	
I		5.8d	2	Verbal appreciation.	

# **TOOL 6: ASSESSMENT OF CLIENT SATISFACTION**

Date	_ / _ _ / _ _ _  DD MM YYYY	District Code	_ _
Health Facility Name		Health Facility ID	
Health Facility Level 1 = Dispensary 2 = Health Centre 3 = Hospital	<u>  </u>	Health Facility Owner  1 = Public  2 = Faith-based  3 = Private for profit  4 = Institutional	
Assessor's name:		_ Assessor's Function:	

#### Directions for use:

- Interview 5 clients in a dispensary and 10 clients in a health centre or hospital.
- Fill in a separate questionnaire for each client.
- Greet the client and welcome her/him; then explain the purpose of the interview; finally ask for his/her consent and thank her/him.
- Ask the following questions and enter the score (either YES = 1, NO = 0 OR NA = Non-applicable = 99) accordingly in the last column.

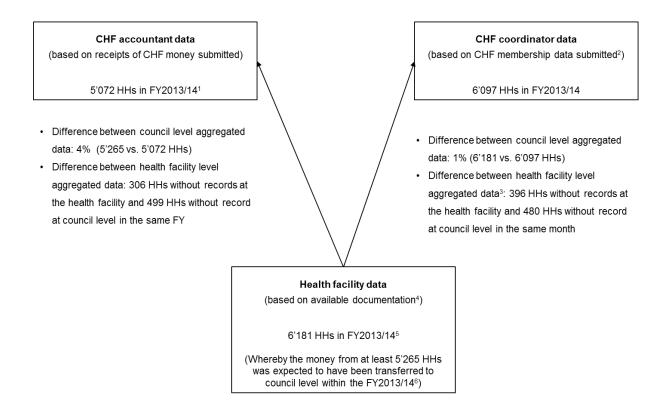
INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
6.1	At the beginning of the consultation, were you given the chance to express your state of health and symptoms?	6.1a	4	The client was given the chance to express her/his state of health.	
6.2	During your visit today, did the provider ensure your privacy?	6.2a	4	The client expressed satisfaction with the privacy.	
6.3	Did the provider explain the	6.3a	4	The client was given explanations /	

INDICATOR	QUALITY STANDARD TO BE MET	SUB- INDICATOR	WEIGHT (1-5)	VERIFICATION CRITERIA	SCORE YES=1 NO=0 NA=99
	investigations, your health problem and the treatment in clear and simple terms to you?			instructions about the investigations, his/her health problem and treatment.	
6.4	During consultation were you given the opportunity to ask questions about the investigations, your health problem and treatment?	6.4a	4	The client was given the opportunity to ask questions about the investigations, his/her health problem and treatment.	
6.5	Did the provider listen carefully to your concerns and questions and did he / she give satisfactory answers?	6.5a	4	The provider listened to the concerns and questions of the patient and gave satisfactory answers.	
6.6	Did the dispenser explain to you how to use the prescribed medicines in terms of dosage, frequency and possible adverse effects?	6.6a	4	The client was given instructions on medication and can recall the instructions given.	
6.7	During consultation, did you get any advice on your health problem?	6.7a	4	Health advice was given during consultation.	
6.8	Were you satisfied with the facility environment cleanness, i.e., building and toilets?	6.8a	4	The client expressed satisfaction with facility cleanness.	
6.9	During your visit today did the health facility staff handle you with empathy (being polite and caring)?	6.9a	4	The client expressed satisfaction with the way the provider handled him/her (good language politeness and caring attitude).	

# 12.2 Appendix 2: Example of poor data quality in CHF administration

Reference is made to chapter 8 and 9.2:

Data from the health accountant in council A revealed the amount of CHF money received in the FY 2013/14 from each health facility within the council (16'387USD). This allowed comparing accountant's and health facility CHF enrolment data. The difference in the number of households enrolled between the at council level aggregated figures (5'265 vs. 5'072) was considerably low (4%) (Figure 34). Yet, the comparison of the at health facility level aggregated data showed that there must have been households for which money was submitted to the accountant but their details were not captured at the health facility (306). Also, the opposite was the case, meaning there were households that were registered at health facility level, but their money was not submitted to the health accountant (499). In both scenarios it could have been that the money submitted to the accountant was wrongly declared (e.g. as user fee instead of CHF money or vice versa) or documentation at health facility or council level was erroneous. The case of having CHF money without records at health facility level could also be explained by the lack of registration supplies, such as counter books, CHF cards and receipt books (observational data). For missing CHF money at council level, suspected fraud could not be fully excluded. Importantly, both scenarios (lack of household registration details or proof of money submission) led to the situation where for at least 805 (14%) households documentation was not enough to request for matching funds (equal to 2'476USD). The problem of inadequate CHF documentation was further confirmed by the discrepancies seen between health facility CHF registers and the CHF coordinator's data base. In the latter 816 households were incorrectly reported (396 over-reported and 420 under-reported) and 60 households were not reported due to lack of information. Quality of reporting strongly varied between health facilities. However, since the introduction of the CHF registers produced by NHIF in July 2014 reporting problems decreased (1.4 wrongly reported households per monthly report between July and December 2014 compared to 2.9 households per monthly report in July 2013 to June 2014).



**Figure 34** CHF data consistency between health facility and council level for council A (FY2013/14). <sup>1</sup>Given a contribution of 3.08USD, 16'387USD equals 5'328 households (HHs), but the contributions of 256 HHs, which were collected in FY2012/13 and submitted in FY2013/14, were subtracted; <sup>2</sup>Based on 284 monthly CHF membership figures recorded from 26 health facilities (10.92months/health facility); <sup>3</sup>Calculated based on the positive difference between health facility and CHF coordinator data per health facility and month; <sup>4</sup>Based on documentation available for 299 months from 26 health facilities (11.5months/health facility); <sup>5</sup>Includes the 972 HHs registered during ISAQH sensitization meetings in December 2013; <sup>6</sup>HHs that enrolled after the date, when money was submitted last by the health facility in-charge at council level (based on the date noted on the receipt), were subtracted.

# 12.3 Appendix 3: Detailed list of potential areas for further research

Potential research areas were listed, by topic, according to perceived importance.

### Health service quality:

- How to best measure service delivery processes under routine conditions? Validation and feasibility of measuring process quality by means of clinical observations
- Value of using patient satisfaction as a measure for quality of care: perceived vs. technical healthcare quality
- Link quality of care data with CHF enrolment data to investigate if and what factors of quality of care influences enrolment
- Proof that improved processes lead to improved health outcomes through linking community health data with health facility data

#### Financial protection:

- Compare cost and other implications for abolishing user fees with the efforts required for effectively improving cost sharing and insurance fund mechanisms and policies
- Investigate reasons for the low number of patients paying user fees in council A using an in-depth qualitative approach
- Analyse healthcare seeking behaviour by insurance status based on the hypothesis that uninsured seek care in the non-public sector, not at all or only at very late stages
- Analyse provider financing modalities, including the allocation of money to the MSD and establishment of health facility accounts
- Analyse options for innovative financing mechanisms to increase domestic revenues for health

#### Leadership and governance:

- Assess and subsequently improve the following process:
  - Medical supply chain management
  - Cash flow of various health financing sources
  - Provision of exemption for the poor
  - Procurement and Management Unit processes (e.g. vehicle maintenance, administrative supplies)
- Define factors relevant for harmonization, coordination and integration of vertical programs and development partners to reduce competing tasks and ad-hoc

- assignments (e.g. regarding training implementation, supportive supervision, offbudget funding)
- Define factors relevant for adequate allocation of limited funds during health sector planning and budgeting
- Investigate reasons for substantial differences in performances between councils of the same type (rural, urban) and between rural and urban councils with a focus on the importance of decentralization and therewith leadership, management capacity and commitment of council officials
- Examine reasons for better collaboration of the public health sector with the privatenot-for-profit than the private-for-profit sector
- Explore if there is a difference in health facility management capacity between female and male health facility in-charges
- Shed light behind the lack of transparency in public health employee's salary scale and investigate reasons for high per diem rates instead of salary increases
- Investigate effective ways to empower CHSB and HFGC as well as the civil society more generally

# Methodological

 Carefully analyse the type and number of indicators needed for assessments/surveys as indicator quality might matter more than quantity

# 13. Curriculum Vitae

# SABINE RENGGLI

#### PERSONAL INFORMATION

Allschwilerstrasse 22, CH-4055 Basel +41 79 375 57 46 (mobile) sabine.renggli@bluewin.ch Swiss 30<sup>th</sup> April 1985, Basel-Stadt, Switzerland

#### SHORT PERSONAL PROFILE

Multidisciplinary education background with a Master of Advanced Studies in Development and Cooperation and a Master of Science in Molecular Biology

Excellent writing, analytical, communication, coordination, organisation and problem-solving skills

A total of over 3.5 years work experience in resource-constrained countries across Africa, Asia and South America

Broad knowledge of languages and great intercultural skills due to extensive experience living and travelling worldwide

Strong commitment and team spirit owing to experiences gained in sports and at work

#### **EDUCATION**

12/2013 - University of Basel, Basel, Switzerland

O6/2017 Swiss Tropical and Public Health Institute, Basel, Switzerland & Ifakara Health Institute, Ifakara, Tanzania

#### PhD in Epidemiology

<u>Title:</u> "Promoting Universal Health Coverage in Tanzania: Towards Improved Health Service Quality and Financial Protection"

Research activities: Implementation research; mixed methods approach; design, implementation and analysis of household and health facility surveys; in-depth interviews; economic costings and secondary data collection and analysis

Relevant courses: Policy evaluation methods (Institute for Fiscal Studies, London); Qualitative research in Health (SSPH+); Health economics; Health policy; Health financing and economic evaluations; Qualitative data analysis; Concepts in epidemiology; Biostatistics; Statistical modelling; Data analysis in epidemiology; Health systems (University of Basel)

09/2010 - Swiss Federal Institute of Technology (ETH), Zurich, Switzerland
 06/2012 Centre for Development and Cooperation (NADEL) Zurich, Switzerland

# Master of Advanced Studies in Development and Cooperation

<u>Project assignment:</u> Swiss Tropical and Public Health Institute, NETCELL Project, Dar es Salaam, Tanzania

<u>Relevant courses:</u> Private sector development; Methods and approaches in organisation development; Capacity building in international cooperation; Financial management and economic efficiency of development projects; Design and monitoring of projects; Training for facilitators

09/2008 - University of Basel, Basel, Switzerland

01/2010 Actelion Pharmaceuticals Ltd. & Center for Molecular Life Science, Basel Switzerland

#### Master of Science in Molecular Biology with Major in Infection Biology

<u>Title:</u> "Development and Validation of a Whole-Cell Assay to Detect Bactericidal Translation Inhibitors"

08/2004 - University of Basel, Basel, Switzerland

06/2008 Bachelor of Science in Biology with Major in Integrative Biology

#### **WORK EXPERIENCE**

09/2012 - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH,

10/2013 Ulaanbaatar, Mongolia

**Junior advisor** in a project supporting the reform of the social health insurance in Mongolia

<u>Relevant activities:</u> Human resource and organisational development; project management; organisation of an international conference; contribution to a policy paper; knowledge management; project public relations

02/2011 - Swiss Tropical and Public Health Institute, NETCELL Project, Dar es Salaam, 11/2011 Tanzania

Internship in the Tanzanian National Malaria Control Programme

<u>Relevant activities:</u> Capacity development; advisory role; project management; stakeholder coordination; data management; dissemination of programme experiences

#### **LANGUAGES**

**German** Native language

**English** Advanced proficiency (~C2<sup>1</sup>)

Certificate in Advanced English (CAE), June 2004 (C1<sup>1</sup>) Language school in Colchester, England (08-10/2003)

**Swahili** Advanced (C1<sup>1</sup>)

Language school in Dar es Salaam, Tanzania (02-11/2011) State University of Zanzibar, Stone Town, Tanzania (10-12/2013)

**Spanish** Upper intermediate (B2<sup>1</sup>)

Diplomas de Español como Lengua Extranjera (DELE), May 2010 (B2<sup>1</sup>)

Language school in San Sebastian, Spain (07/2008) Language school in Bariloche, Argentina (02-04/2010)

**French** Intermediate (B1<sup>1</sup>)

Diplôme d'Etudes en Langue Française (DELF), June 2010 (B1<sup>1</sup>)

**Portuguese** Elementary (~A2<sup>1</sup>)

Language school in Florianópolis, Brazil (10/2015)

**Mongolian** Elementary (~A2<sup>1</sup>)

Language school in Ulaanbaatar, Mongolia (10/2012-09/2013)

<sup>&</sup>lt;sup>1</sup>Common European Framework of Reference for Languages

	RELEVANT VOLUNTEER WORK
2010	Volunteer in the zonal hospital of Bariloche, Argentina (2 months)
	EDP KNOWLEDGE
	Competent with Microsoft Word, Excel and PowerPoint as well as MAXQDA, STATA and ODK
	Some experience with Microsoft Access and Quantum Geographic Information System (QGIS)
	PUBLICATIONS AND POSTERS
06/2017	Renggli S, Mayumana I, Mshana C, Mboya D, Kessy F, Tediosi F, Peiffer C, Aerts A, Lengeler C: Beyond a single health financing mechanism: Administration of the Tanzanian Community Health Fund in the light of a complex system. (forthcoming)
05/2017	Renggli S, Mayumana I, Mboya D, Charles C, Maeda J, Mshana C, Kessy F, Tediosi F, Peiffer C, Schulze S, Aerts A, Lengeler C: Towards improved health service quality in Tanzania: An approach to increase cost-effectiveness of routine supportive supervision. <i>Plos One (under review)</i>
04/2017	Renggli S, Mayumana I, Mboya D, Charles C, Mshana C, Kessy F, Glass T, Lengeler C, Schulze S, Aerts A, Peiffer C: Towards improved health service quality in Tanzania: Contribution of a supportive supervision approach to increased quality of primary healthcare. <i>Int J Health Plann Manage (under review)</i>
04/2017	Renggli S, Mayumana I, Mboya D, Charles C, Mshana C, Kessy F, Glass T, Peiffer C, Schulze S, Aerts A, Lengeler C: Towards improved health service quality in Tanzania: Appropriateness of an electronic tool to assess quality of primary healthcare. <i>Int J Health Plann Manage (under review)</i>
11/2016	Renggli S, Mayumana I, Mboya D, Charles C, Mshana C, Kessy F, Peiffer C, Vander Plaetse B, Lengeler C: Strengthening Routine Supportive Supervision of Primary Healthcare in Tanzania through an Innovative Approach Using an Electronic Tool. 4 <sup>th</sup> Global Symposium on Health System Research (poster)
10/2016	Mboya D, Mshana C, Kessy F, Alba S, Lengeler C, Renggli S, Vander Plaetse B, Mohamed MA, Schulze A: Embedding systematic quality assessments in supportive supervision at primary healthcare level: application of an electronic Tool to Improve Quality of Healthcare in Tanzania. <i>BMC Health Service Research</i>
09/2013	Renggli S, Keck W, Jenal U, Ritz D: Role of auto-fluorescence in flow- cytometric analysis of Escherichia coli treated with antibiotics. <i>Journal of</i> <i>Bacteriology</i>
03/2013	Renggli S, Mandike R, Kramer K, Patrick F, Brown NJ, McElroy PD, Rimisho W, Msengwa A, Mnzava A, Nathan R, Mtung'e R, Mgullo R, Lweikiza J, Lengeler C: Design, implementation and evaluation of a national campaign to distribute free bed nets to uncovered sleeping spaces in Tanzania. <i>Malaria Journal</i>
12/2011	Renggli S, Mandike R, Albrecht D, Lengeler C, McElroy PD, Nathan R, Brown NJ: The Tanzanian National Voucher Scheme: Improving Take-up by Reducing the Top-up Price Paid by Voucher Beneficiaries. 60 <sup>th</sup> ASTMH Meeting (poster)

# INTERESTS AND ACHIEVEMENTS

# **Sports**

2008/09/12	Cross-country ski marathon finisher, S-Chanf, Switzerland
2009	Mountain bike marathon finisher, Scuol, Switzerland
2005/06/09	Gigathlon <sup>2</sup> finisher as a couple, Switzerland
2002/04/07	Gigathlon <sup>2</sup> finisher as a team of five, Switzerland
2004	Marathon finisher, Basel, Switzerland
2003	Certificate as a snowboard instructor, Switzerland
2002	6 <sup>th</sup> 25km French Long-Distance Swimming Championships, France
2001/02	Member of the Swiss National Team for Long-Distance Swimming
2001	Finalist Swiss Swimming Championships
2000/01	2 <sup>nd</sup> Swiss Youth Swimming Championships

## Living abroad and travelling

2013	Living in Ifakara, Tanzania (17 months) Living with a local family in Stone Town, Tanzania (2 months)
2012/13	Living in Ulaanbaatar, Mongolia (13 months)
2011	Living in Dar es Salaam, Tanzania (10 months)
2010	Living with a local family in Bariloche, Argentina (3 months)
2008	Living with a local family in San Sebastian, Spain (1 month)
2004	Living with a local family in Cairns, Australia (3 months)
2003	Living with a local family in Colchester, England (3 months)
2000-17	Travel experiences in more than 30 countries worldwide, including Africa, Asia, Australia, Europe, North- and South America

#### REFERENCES

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Werner Kosemund Former Portfolio Manager and Deputy Country Director, Deutsche

Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH,

Ulaanbaatar, Mongolia, w\_kosemund@web.de

Dr. Wolfgang Keck Former Head of Anti-Infectives Group, Actelion Pharmaceuticals

Ltd., Allschwil, Switzerland, keck.wolfgang@t-online.de

Basel, 1<sup>st</sup> June 2017

<sup>&</sup>lt;sup>2</sup> Multi-day Swiss endurance sports competition, including swimming, cycling, running, mountain biking and inline skating each day