# Antimicrobial stewardship in Tanzania

## A consideration of strengths, weaknesses, opportunities and challenges for maintenance and further development of efforts

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## Abstract

**Purpose** – Worldwide situation analysis on antimicrobial resistance (AMR) released in 2015 by the World Health Organisation (WHO) has revealed inadequate capability to respond to AMR in African region. Report of antibiotics use and resistance in Tanzania revealed rising levels of healthcare associated *Methicilin Resistant Staphylococcus aureus* infections; while other studies have reported high prevalence of Expanded Spectrum Beta-Lactamase (ESBL). The purpose of this paper is to review the current situation of antimicrobial stewardship (AMS) in Tanzania using strengths, weaknesses, opportunities and challenges (SWOC) analysis.

**Design/methodology/approach** – General literature review was done on use of antimicrobials in Google Scholar, websites of key organisations including WHO, and grey literature. Conceptual framework designed by the authors was used to inform SWOC analysis of the Tanzanian health sector.

**Findings** – The SWOC analysis has revealed much strength in the Tanzanian health sector indicating that increasing investments in laboratory services, in medicines Regulatory Authority and Pharmacy Council, and strengthening management teams at all levels of service delivery, including Medicines and Therapeutics Committees; and strengthening advocacy on rational use of antimicrobials both in humans and livestock will improve AMS.

**Research limitations/implications** – This is a general literature review. No interview of experts or use of questionnaires was used. However, based on the literature found and author's experience in the health sector, the information contained is valid for consideration in making policy decisions about AMR in Tanzania.

**Practical implications** – Designing policy interventions to prevent development of AMR to commonly used antimicrobials.

**Social implications** – Improving social wellbeing in the community through prevention of morbidity and mortality resulting from multi-resistant pathogens.

**Originality/value** – This is the authors original idea backed by available literature.

**Keywords** Health policy, Management, Leadership, Governance structures, Microbiology, Antimicrobial resistance

**Paper type** Viewpoint

## Background on antimicrobial stewardship (AMS)

The emphasis on stewardship function in health system was championed by the World Health Report of 2000, in which it pointed out requirements for successful stewardship implementation to be "vision, intelligence, and influence" (World Health Organisation, 2000). MacDougall and Polk (2005) described the application of stewardship function in use of antimicrobials. Their paper described the efforts as antimicrobial stewardship programmes (ASPs), which "focus on ensuring the proper use of antimicrobials to

provide the best patient outcomes, lessen the risk of adverse effects, promote cost-effectiveness, and reduce or stabilize levels of resistance"; and also identified key personnel for ASPs implementation in a hospital setting. Subsequent literatures have concretised the understanding of ASPs as follows – Dellit *et al.* (2007) provided a guidance on how to establish stewardship programme in hospitals focusing on inpatients; Owens (2008) described its key components and principles for its successful operations in the twenty-first century; Drew (2009) identified strategies to enhance its implementation; Lawrence and Kollef (2009) and Kaki *et al.* (2011), looked at its impact on use of antimicrobials in delivery of intensive care services; and Cosgrove *et al.* (2014) described the knowledge and skills required for ASPs leaders.

AMS is defined in this paper as a combination of efforts and interventions at policy, management, implementation, public and community levels aiming at ensuring: appropriate use of antimicrobials, improved patient outcomes, minimal occurrence of adverse events, prevention of antimicrobial resistance (AMR), and that there are quality medicines in the market and in health facilities. A well-organised AMS programme will have the following components (Table I): awareness creation; policy and regulatory roles; inter-sectoral advocacy and regulation; implementation in health facilities, pharmacies and pharmaceutical outlets; governance; and surveillance and audits interventions (Drew, 2009; Owens, 2008).

## Antimicrobial use in Tanzania
Use of antimicrobials in Tanzania occurs both in humans and livestock. The use in animals is mainly for growth promotion and treatment of diseases. The rational use of

| Component of AMS | Outline of its elements |
|---|---|
| Awareness creation | Providing education to prescribers, patients and the public in general on antimicrobial use |
| Policy and regulatory roles | Development of national formulary; treatment guidelines and essential medicines lists; various guidelines and plans incorporating rational use of antimicrobials; having an effective regulatory framework – agency and bodies for regulation of products, professionals and practice, as well as post marketing surveillance; a system for monitoring and evaluation |
| Inter-sectoral advocacy and regulation | Antimicrobial use in animals; efforts in the water sector to ensure availability of clean and safe water; sanitation efforts |
| Implementation in health facilities, pharmacies and pharmaceutical outlets | Dose optimisation; use of technology to assist clinical decisions; use of evidence-based guidelines; choice of route of administration to minimise length of stay; demand for prescriptions in pharmacies; educating patients/clients on rational use as they collect antimicrobials in pharmacy |
| Governance | Having a Medicine and Therapeutic Committee (MTC); facility management supporting efforts to ensure rational use of antimicrobials; multidisciplinary involvement in the MTC to ensure clinicians are taken on board; motivation to members of MTC and other staff |
| Surveillance and audits | Having an effective system for monitoring use of antimicrobials; laboratory capacity to identify and categorise AMR; regular review of prescriptions followed with provision of feedback |

**Sources:** Owens (2008) and Drew (2009)

Table I.
Components of AMS
programme

antimicrobials in humans in Tanzania is affected by – unnecessary prescriptions by clinicians for conditions where not required like acute watery diarrhoea and common colds (Gwimile *et al.*, 2012); tendency of clients to self-medicate and pharmacies to sell antimicrobials without prescriptions (Kagashe and Msela, 2012; Kagashe *et al.*, 2011; Mwambete, 2009); drug dispensing outlets selling antibiotics that they are not allowed (van den Boogaard *et al.*, 2010); clients demanding for antimicrobials (Dillip *et al.*, 2015; Kagashe *et al.*, 2011); and dispensers recommending to clients (Dillip *et al.*, 2015; Kagashe *et al.*, 2011). Use of antimicrobials in livestock possess risk to health of humans due to antimicrobial residues in meat and other products like eggs (Nonga *et al.*, 2009, 2010). The risk is posed by the following facts – some livestock keepers lack awareness about withdrawal period, they use antimicrobials without prescription from a veterinarian, and are not aware if antibiotics used in animals possess risk to human health (Katakweba *et al.*, 2012); many farmers treat their chickens themselves (Nonga *et al.*, 2010); and some farmers despite being aware of withdrawal period, they decide to slaughter their chicken before withdrawal period (Nonga *et al.*, 2009).

### Rationale of this paper
A worldwide situation analysis on AMR has revealed an inadequate capability to respond to AMR in African region in terms of plans and strategies; surveillance and laboratory capacity; access to quality assured antimicrobial medicines; rational use of antimicrobials; public awareness; and infection prevention and control (World Health Organisation, 2015). Report of antibiotics use and resistance in Tanzania (Global Antibiotic Resistance Partnership-Tanzania Working Group (GARP-TWG), 2015), revealed rising levels of healthcare associated *Methicilin Resistant Staphylococcus aureus (MRSA)* infections at Muhimbili National Hospital between 1999 and 2010 (1999 was 0.6 per cent; 2004 was 2 per cent; and in 2010 was 23 per cent). At Bugando Medical Centre (BMC), the prevalence of *MRSA* was 16.3 per cent in 2009 and 18.8 per cent in 2011 (Mshana *et al.*, 2013). In gram-negative bacteria, a study at BMC by Mshana *et al.* (2009), found that prevalence of Expanded Spectrum Beta-Lactamase (ESBL) was 29.2 per cent. These findings call for strengthening of AMS in the country. This paper aims at reviewing the current situation of AMS in Tanzania using strengths, weaknesses, opportunities and challenges (SWOC) analysis to inform AMS strengthening strategies. Framework for SWOC analysis is shown in Figure 1 and key elements for each of the components are shown in Table II.

### The SWOC analysis per level of service delivery
Tanzanian health sector is a decentralised system (Ministry of Health and Social Welfare, 2015b) under two ministries, namely: Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), formerly – Ministry of Health and Social Welfare and President's Office – Regional Administration and Local Government, Public Service, and Good Governance, formerly known as Prime Minister's Office – Regional Administration and Local Government. The decentralised services delivery is organised by levels (see Figure 2 (developed by the author) for highlights on key elements in each level related to AMS). Table III presents results of SWOC analysis.

### Key roles in improving AMS according to level of service delivery
Looking at the SWOC results, this part of the paper synthesise the information into key roles in AMS which need to be done by levels to ensure that the sector is well prepared to address AMR.
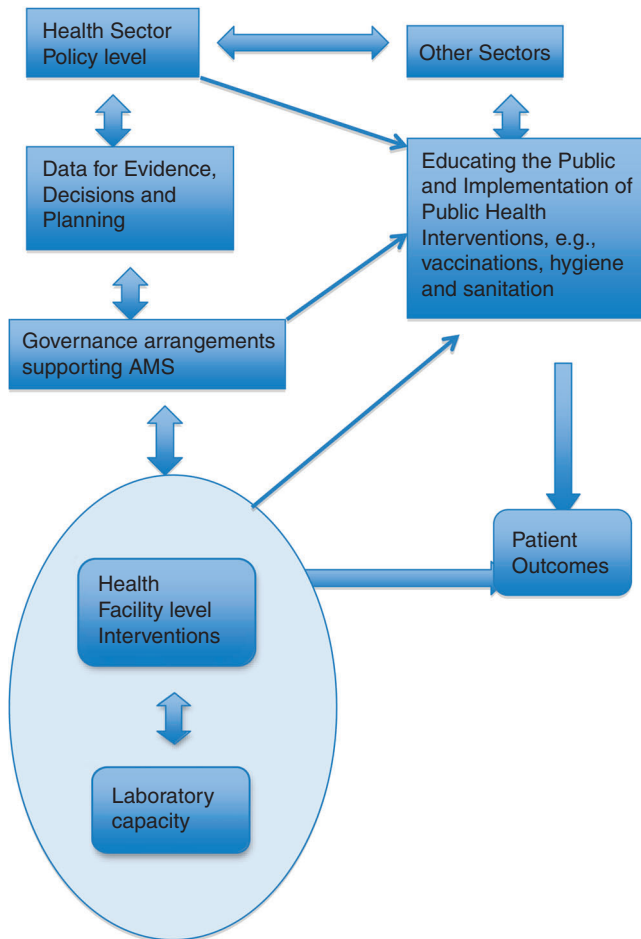
Figure 1.
Conceptual
framework for core
components of a
nationwide AMS
analysis

*National level*
The MoHCDGEC should establish a surveillance system for AMR and strengthening
plan for laboratories in hospitals at national, zonal, regional and LGA level
to enable routine testing for ESBL and *MRSA*, since this is a critical element in
addressing AMR (Mshana *et al.*, 2013). The National Health Laboratory
Strategic Plan 2007-2015, and the Standard Operating Procedures for laboratory
(Ministry of Health and Social Welfare, 2009) need to be revised to accommodate
issues of AMR especially on blood specimen collection; filling of forms; as well as
ensuring complete and accurate data entry (Nyasulu *et al.*, 2014). TFDA
needs to strengthen its post-marketing surveillance and Pharmacy Council to
strengthen its enforcement of prescriptions regulation in private pharmacies.
The ministries responsible for health and livestock need to establish an expert panel
to address antimicrobial use in animals (GARP-TWG, 2015; Mshana *et al.*, 2013), and
laydown procedure for testing of chicken farms for residues before slaughtering
(Nonga *et al.*, 2009).

| AMS-conceptual framework component | Key elements considered |
| --- | --- |
| Health sector policy level | Regulatory body for medicines and pharmacy practice |
| | Guidelines and pharmaceutical policy/tools |
| | Standard treatment guidelines and essential medicines list (STG&NEMLIT) |
| | Trainings on rational use of antimicrobials |
| | Programmes with role on AMS: |
| |    Programme with oversight role on the immunisation services and vaccines routinely provided that have a role in antimicrobial use minimisation |
| |    Programme with oversight on prevention and management of sexually transmitted infections (STIs) |
| | Presence of a structure within ministry with role on: environmental health, hygiene and sanitation (EHHS); health promotion; laboratory services; and epidemiology and disease surveillance |
| | Any system for prescription audits, and pharmacovigilance activities if done |
| Other sectors | Policies and laws in the livestock development sector with focus on rational use of antimicrobials |
| | Water sector – policies, plans and their role in ensuring availability of clean and safe water for sanitation |
| | Any working arrangements within the Sectoral Ministry to address AMR |
| Data for evidence and decision making | Availability of AMR surveillance system |
| | Research conducted on AMR |
| | Data system |
| Governance arrangements | Presence of a division or unit within Sectoral Ministry overseeing pharmaceutical services |
| | Presence of MTCs at all levels of service delivery |
| | Role of the sector wide approach (SWAp) arrangements |
| | Roles of: |
| |    Regional Health Management Teams (RHMTs) and Council Health Management Teams (CHMTs) |
| |    Health Facility Management Teams (HFMTs) |
| |    Health Facilities Governing Committees (HFGCs) and Hospital Advisory Boards (HABs) |
| |    Quality Improvement Teams (QITs) |
| Health facility level interventions | Key staff for AMS like clinical or hospital pharmacist; clinical microbiologists; medical epidemiologists; infection control staff |
| | Availability of guidelines and tools for implementation of AMS |
| | IPC programme |
| | MTCs and QITs |
| | Whether treatment provided follows STG&NEMLIT |
| | Surveillance for healthcare associated infections (HAIs) and AMR |
| | Regular system for prescription audits and feedback to prescribers |
| | On-job training for key staff on rational use of antimicrobials and IPC |
| Laboratory capacity | Laboratory personnel with knowledge and skills on AMR |
| | Techniques for isolation and characterisation of pathogens |
| | Capacity of laboratories by levels |
| | Accreditation system |
| Educating the public and implementation of public health interventions | Public campaigns (using information, education and communication (IEC) materials; media-radio, social media, television; etc.) on responsible use of antimicrobials, and the need for reducing unnecessary use |
| | Emphasis on sanitation, hygiene, and immunisation services uptake |
| Patients outcomes | System for tracking patients outcomes; and whether it covers outcomes caused by AMR or use of non-quality assured antimicrobials |

**Table II.**
Key elements
of AMS considered
in the SWOC
analysis

- MoHCDGEC with role of policy formulation
- PO-RALG with role of policy implementation
- TFDA for regulation of food and medicines
- Pharmacy Council for regulation of professionals, practice and premises
- MSD for procurement, storage, and distribution of medicines
- NHLQATC for quality assurance in lab services

National level

- Referral Hospitals at Zonal level
- Zonal level services for the MSD to facilitate logistics to health facilities
- Zonal Health Resource Centres with role of training and capacity support to regional level and LGA

Zonal Level

- This constitutes a secondary level of health services
- There is a Regional Health Management Team (RHMT) in each region with a role of supervising delivery of health services (there are 26 regions in mainland side)
- Core members of RHMT include a Regional Pharmacist and Regional Laboratory Technologist/Scientist
- There is a Hospital Management Team (HMT) for Referral Hospitals at Regional Level with Hospital Pharmacist and Hospital Lab Technologist/Scientist as members

Regional Level

- This constitutes a Primary Health Care (PHC) level
- There is a Council Health Management Team (CHMT) in each Local Government Authority (LGA) in respective region. Main role of CHMT is supervision of health services delivery in respective LGA. Core members of CHMTs include a District Pharmacist and District Lab Technologist
- Each hospital at LGA level has a HMT whose role is management of the hospital and services delivery to clients. Members of HMT include a Pharmacist and Lab Technologist
- There are Dispensaries and Health Centres as first and second level respectively of contact with health care system

LGA Level

- This constitutes the foundation of PHC services, including health promotion activities
- The services to community and households
- Players in Community Health Services Programmes, including the Community Health Workers
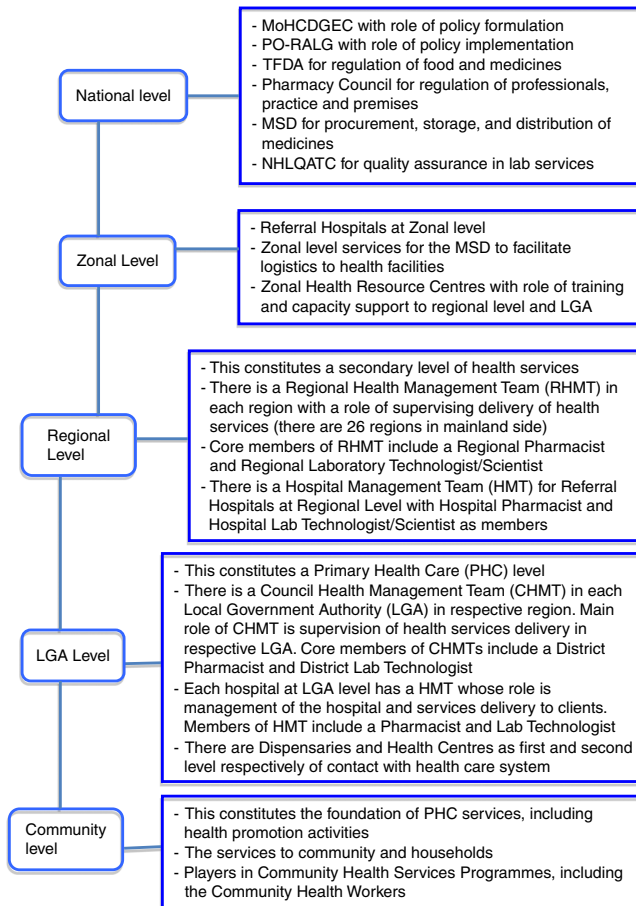
Community level

**Figure 2.**
Health sector
organisation in
Tanzania

*Zonal level*
Hospitals at zonal level need to be supported to provide expertise on antimicrobial use in the regions within respective zone; including having a robust laboratory capacity to conduct AMR studies; and ensure that students (since all are affiliated to training institutions) receive appropriate training regarding rational use of medicines. The established Zonal Sub Committees on Laboratory Quality System and Advisory Committee on Diagnostic Services (Ministry of Health and Social Welfare, 2009, p.20) need to include AMR as a standing agenda in their meetings.

*Regional level*
The RHMTs through regional pharmacists need to strengthen its oversight on pharmaceutical management in the region, and ensure that pharmaceutical supply system is functioning properly in their regions, as a fundamental element towards rational use of medicine (Malele and Bwire, 2012). The HSSP-IV: 2015-2020, emphasises encompassing rational use of medicines (including surveillance for AMR) in the roles of Technical Committee of RHMTs. The Regional Laboratory Scientist need to ensure that

**Table III.**
SWOC analysis on
AMS in Tanzania

| Strengths | Weaknesses |
|---|---|
| *National level* | *National level* |
| Strong regulatory framework for medicines (Ministry of Health and Social Welfare, 2015b): | No specific policy addressing AMR |
| Regulatory Authority – The Tanzania Food and Drug Authority (TFDA) in place | No surveillance system for AMR |
| Pharmacy Council has mandates to regulate Pharmacy profession, Pharmacy Practice, and | Inadequate laboratory procedures and quality reliable routine blood culture data for |
| Accredited Drug Dispensing Outlets (ADDO) | surveillance system for AMR to work (Nyasulu *et al.*, 2014) |
| The TFDA has a (Ministry of Health and Social Welfare, 2013b, pp. 34-36): | Inadequate post-marketing surveillance by TFDA and challenging issues on regulation |
| Laboratory for testing medicines, which is WHO – pre-qualified for quality control | of ADDO by the Pharmacy Council (Ministry of Health and Social Welfare, 2015a, p. 21) |
| Post-marketing surveillance system – it has established mobile test kits in 15 regional | |
| referral hospitals for testing medicines procured from the Medical Stores Department (MSD) | |
| and other sources | |
| Pharmacovigilance system | |
| Guidelines, plans, and tools are in place: | |
| Health Sector Strategic Plan IV (HSSP IV); July 2015-June 2020, which identifies oversight on | |
| rational use of medicines to be one of the roles of Technical Committee under RHMTs and | |
| CHMTs (Ministry of Health and Social Welfare, 2015b, p. 59) | |
| STG&NEMLIT (Ministry of Health and Social Welfare, 2013a) | |
| Medicines and Therapeutics Committee (MTC) guidelines (Ministry of Health and Social | |
| Welfare, 2012) | |
| National Pharmaceutical Action Plan Tanzania: 2015-2020 | |
| A fundamental document known as "The Short Information Manual on – The Tanzania | |
| National Drug Policy; The Master Plan for Pharmaceutical; Sector 1992-2000, Tanzania | |
| mainland (a summary), and – Hospital Therapeutic Committees" (MoH, 1993). This | |
| fundamental document clearly identified that "the aim of the national drug policy was to | |
| ensure drugs are prescribed, dispensed and used rationally" | |
| Draft Rational Use of Medicines Communication Strategy in place (Ministry of Health and | |
| Social Welfare, 2015a, p. 19) | |
| National Immunization and Vaccine Development (IVD) previously called Expanded | |
| Programme on Immunisation (EPI) is in place. The introduction of *Haemophytus influenza* | |
| type b provided as Pentavalent vaccine (pertussis, diphtheria, tetanus, hep-b, haem-b) and the | |
| Pneumococcal vaccine have a contributory role in reducing need for antibiotic use | |
| The National AIDS Control Programme oversees the management of STIs, and regularly | |
| revises guidelines in this area | |

| Strengths | Weaknesses |
| --- | --- |
| There is a Section within MoHCDGEC – Division of Preventive Services (DPS) responsible for environmental health and sanitation | |
| Under the DPS, there is a section responsible for health promotion and education (HPES) with a role of educating public on various health issues; hence, rational use of antimicrobials can be accommodated | |
| Access to safe water and sanitation facilities has been increasing. By 2010, access to safe drinking water was 52% and plan for 2020 is to reach 75%, while coverage of sanitation facilities was 60% in 2010 and plan for 2020 is 90% (Ministry of Health and Social Welfare, 2015b, p. 49) | |
| Experts from the animal and health sector have come together since 2011 under OneHealth approach to address the issue of antibiotic resistance (GARP-TWG, 2015) | |
| There is a Pharmaceutical Services Unit (which is also the Office of Chief Pharmacist) at the MoHCDGEC with a role in AMS. The Chief Pharmacist serves as Secretary and Chief Medical Officer serves as chairperson to the National MTC | |
| There is a technical working group under SWAp arrangement on pharmaceutical services The Tanzania Quality Improvement Framework (TQIF): 2011-2016 establishes Quality Improvement Teams (QITs), which oversee all QI issues in health facilities including IPC (Ministry of Health and Social Welfare, 2011). One member of QIT is designated to oversee IPC implementation | |
| There is a National Health Laboratory Quality Assurance and Training Centre (NHLQATC) The National Referral Hospitals (and the affiliated training universities) have required technique for isolation of resistant strains and characterisation (Nyasulu et al., 2014; Blomberg et al., 2004) | |
| Programme for accreditation of laboratory services is in place | |
| Training programme for competent personnel in the areas of field epidemiology and laboratory training aiming at "strengthening the capacity of the MoHSW to conduct public health surveillance and response, manage national disease control and prevention programmes, and enhance public health laboratory support for surveillance, diagnosis, treatment and disease monitoring" is in place since 2008 (Mmbuji et al., 2011) | |

(*continued*)

**Table III.**

**Table III.**

| Strengths | Weaknesses |
|---|---|
| *Zonal level* | *Zonal level* |
| All hospitals at zonal level have hospital pharmacists, some with clinical specialization | Inadequate financial support to enable routine microbiological testing for resistant pathogens such as ESBL and *MRSA* (Mshana *et al*, 2013) |
| There are QITs with one member designated to oversee IPC implementation | |
| The zonal referral hospitals (and the affiliated training universities) have required technique for isolation of resistant strains and characterisation as evidenced by the publications coming up (Kajeguka *et al*, 2015; Mshana *et al*, 2009) | |
| *Regional level* | *Regional level* |
| There is a regional pharmacist in each RHMTs whose role is to oversee pharmaceutical services in the region including providing support to regional referral HMTs and CHMTs | No surveillance of AMR resistance as evidenced by paucity of data on AMR from these hospitals |
| The RHMTs have regional laboratory scientists who oversee laboratory services in the region and regional referral hospitals have qualified laboratory personnel who can assist in strengthening AMR monitoring in the region | |
| Technical Committee of RHMTs (Ministry of Health and Social Welfare, 2015b, p.37) will have competency in epidemiological analysis including surveillance; hence, AMR monitoring can be addressed | |
| There are QITs with one member designated to oversee IPC implementation | |
| *LGAs level* | *LGAs level* |
| There is a Council Pharmacist whose role is to oversee pharmaceutical services in the LGA including support to Health Facility Management Teams (HFMTs) for Hospitals, health centres and dispensaries in ensuring proper use and management of medicines | Inadequate budgets to strengthen laboratory services. |
| The CHMTs have district laboratory technologists (with advanced diploma in medical laboratory sciences) or scientists (with bachelor in medical laboratory sciences) who oversee laboratory services. | Less frequent meetings of MTC, probably due to the inadequate level of supportive supervision by CHMTs |
| Technical Committee under CHMTs (Ministry of Health and Social Welfare, 2015b, p.35) will improve competency in epidemiological analysis, hence AMR monitoring can be conducted | |
| *Health facility level* | *Health facility level* |
| There is a MTC chaired by facility in-charge while the secretary to the MTC is a pharmaceutical personnel | Prescriptions not adhering to standard treatment guidelines (Ministry of Health and Social Welfare, 2015a) |
| There is Health Facility Governing Committee (HFGC) for dispensaries, health centres, and hospitals at LGA level with oversight role in management of health facilities through | Less that 50% of health facilities assessed in Dodoma (Ministry of Health and Social Welfare, 2015a) and in Dar es Salaam (Malele and Bwire, 2012) had the required reference |

(*continued*)

| Strengths | Weaknesses |
| --- | --- |
| their management teams including issues related to pharmaceutical services<br>There are QITs with one member designated to oversee IPC implementation<br>At facility level, guidelines for IPC, STG&NEMLIT are available<br>The Pharmacy Council registers Pharmacy and ADDO premises, and regulates the practice | materials for prescribers (STG&NEMLIT and others)<br>MTC focusing more on procurement of medicines than on improving the use of medicines (Ministry of Health and Social Welfare, 2013b, p. 36)<br>Some pharmacies sell medicines without prescription: Kagashe *et al.* (2011) observed dispensing of 1,573 medicines in which only 23% were on prescriptions |
| *Community level*<br>Public awareness campaigns are being done in the country emphasising on sanitation, immunization uptakes, and appropriate use of antimicrobials | *Community level*<br>Suboptimal levels of sanitation leading to diarrhoeal disease outbreaks<br>Still inadequate public advocacy and campaigns for rational use of antimicrobials and adherence on IPC measures<br>Self-medication: 59.8% (of 358 respondents) had used eye medicines before going to hospital (Kagashe and Msela, 2012)<br>Most researches were done in hospital settings leaving a gap of knowledge on magnitude of the AMR situation at community level |
| *Opportunities*<br>Efforts to harmonise regulation of medicines and strengthening pharmacovigilance systems among EAC member states (www.mrh.eac.int)<br>Presence of integrated disease surveillance and response (IDSR) system in health sector. The HSSP IV: 2015-2020 plans for rollout of its electronic version countrywide (Ministry of Health and Social Welfare, 2015b, p. 51). Also, in the animal sector, there is Tanzania Epidemiological Surveillance System (GARP-TWG, 2015).<br>The OneHealth approach brings together experts in the animal and health sector to address AMR. Also, the OneHealth approach supported establishment of "Southern African Centre for Infectious Disease Surveillance (SACIDS) in 2008 working on infectious diseases of animals and humans (GARP-TWG, 2015)<br>Having good governance arrangements (including the MTCs), at all levels of health service delivery in Tanzania. This arrangement signals an easy take up of the needs to strengthen implementation of AMS roles and activities<br>Health sector being part of Big Results Now (BRN) programme (President's Delivery Bureau - PDB, 2014). Two of its four priority areas include health commodities (focusing on availability of medicines and medical supplies) and star rating of all primary health care facilities (using an assessment tool which include IPC as one of service areas assessed), to be achieved within a time frame of about three and half years (November 2014 to June 2018). This is a good opportunity to work on AMS strategies to address AMR | *Challenges*<br>Emerging and re-emerging infectious diseases in Tanzania, especially cholera outbreak which started on the 15 August 2015, with reported 14,000 cases as of 20 January 2016, including 222 deaths, representing a 1.6% case fatality rate (World Health Organisation, 2016)<br>Current resistance patterns (GARP TWG, 2015)<br>Inadequate laboratory capacity in the primary level health facilities |

**Table III.**

all laboratories in public hospitals are strengthened to be able to perform necessary microbiology tests for AMR. The TFDA needs to rollout the mobile test kits for post-marketing surveillance to remaining regional referral hospitals.

### LGA level
CHMTs need to: strengthen supervision and inspection activities (including prescription audits) in all health facilities; ensure IPC practices in health facilities are improved through supervision, mentoring and coaching; establish AMR surveillance mechanism; strengthen all laboratories in hospitals, health centres and dispensaries; include IPC supplies and equipment in Comprehensive Council Health Plans; and that each health facility has all the required pharmaceutical reference documents and IPC guidelines. The Medicines and Therapeutics Committee (MTCs) must meet regularly and keep record of their meetings since, reports show that they do not meet regularly but also they tend to focus more on procurement of medicines than addressing issues of AMR (Ministry of Health and Social Welfare, 2013b).

### Community level
The ministry through its health promotion and education section needs to prepare media messages on AMR emphasising on responsible use of antimicrobials by everyone, including those involved in livestock keeping. Importance of good hygiene and sanitation in minimising need for antimicrobials (by preventing diarrhoea diseases and other infectious diseases of bacterial origin) should be emphasised. In one study in rural Tanzania – "use of latrines regardless of quality was significantly associated with decreased risk of trachoma" (Montgomery *et al.*, 2010). Session to orient journalists on issues of AMR in Tanzania, African countries and globally needs to be organised.

## AMS in other East African countries
AMR is also a problem in other East African countries (Kimang'a, 2012; Nelson *et al.*, 2009), and thus there is a need for strengthening AMS. However, as for Tanzania, available data on AMR in other countries in the East African Community (EAC) are mostly from hospital-based studies, hence no precise information on its magnitude in the general population (Omulo *et al.*, 2015). Driving factors to the increase in AMR in the region include – nosocomial or community transmission of resistant bacteria; over prescriptions in health facilities due to inadequate diagnostics resources; inappropriate and indiscriminate use practices; contamination while handling animal products (for slaughters); and contamination in slaughterhouses (Omulo *et al.*, 2015). In all member states, there are inadequate surveillance systems for AMR (Ntirenganya *et al.*, 2015; Mshana *et al.*, 2013; Sang *et al.*, 2012). Although institutional arrangements, policies, laws and regulations to govern rational use of antimicrobials are in place, enforcements of laws and regulations as well as promotion of appropriate use of antimicrobials are still inadequate.

## Conclusion and recommendations
The paper has provided a SWOC analysis of AMS in Tanzania and described key functions according to level of services delivery, in order to remind all actors to play their roles in addressing AMR. It is recommended that the Office of Chief Pharmacist makes AMR a common agenda in all meetings chaired by or where they have a secretariat role, such as the national MTC, SWAp-TWG on pharmaceutical services, and the forum with regional and district pharmacists. The chairperson of the National

MTC in collaboration with key stakeholders particularly in the areas of pharmaceutical services, epidemiology and disease surveillance, laboratory services, emergency preparedness, and health training universities – need to take the issue of having an AMR surveillance system as a matter of urgency. Hence they need to meet and come up with a clear roadmap to achieve the target. Other stakeholders in health, animal, and water sectors need to support the efforts to address AMR taking advantage of the well organised, decentralised governance arrangements in the health sector. To improve AMS in the EAC, member states should – strengthen surveillance systems for AMR and establish a network for surveillance in the region; improve enforcement of regulations; and strengthen laboratory capacity to detect AMR. Use of existing systems on demographic health surveys can help the countries to establish robust AMR surveillance systems in the region with population-based data (Vernet *et al.*, 2014; Odhiambo *et al.*, 2012).

## Acknowledgement

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