

BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email info.bmjopen@bmj.com

BMJ Open

Governance for injury care systems in Ghana, South Africa and Rwanda: development and pilot testing of an assessment tool

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-074088
Article Type:	Original research
Date Submitted by the Author:	03-May-2023
Complete List of Authors:	<p>The Equi-Trauma, Collaborative; University of Birmingham Institute of Applied Health Research Odland, Maria Lisa; University of Birmingham, Institute of Applied Health Research; St Olavs Hospital Trondheim University Hospital, Department of Obstetrics and Gyneacology Abdul-Latif , Abdul-Malik ; Ghana Health Service, Volta Regional Health Directorate Ignatowicz, Agnieszka ; University of Birmingham Institute of Applied Health Research Bekele, Abebe; University of Global Health Equity Chu, Kathryn; Stellenbosch University Faculty of Medicine and Health Sciences, Centre for Global Surgery, Department of Global Health; University of Botswana, Department of Surgery Howard, Anthony; University of Leeds Leeds Institute of Rheumatic and Musculoskeletal Medicine; University of Oxford, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, National Institute of Health Research (NIHR) Biomedical Centre Stephen, Tabiri; Ghana Hub of NIHR Global Surgery; Tamale Teaching Hospital, Department of Surgery BYIRINGIRO, JEAN CLAUDE; University of Rwanda College of Medicine and Health Sciences; University Teaching Hospital of Kigali, Department of Surgery Davies, Justine ; University of Birmingham, Institute of Applied Health Research; Stellenbosch University Faculty of Medicine and Health Sciences, Centre for Global Surgery, Department of Global Health</p>
Keywords:	Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Trauma management < ORTHOPAEDIC & TRAUMA SURGERY, ACCIDENT & EMERGENCY MEDICINE, Clinical governance < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

SCHOLARONE™
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Governance for injury care systems in Ghana, South Africa and Rwanda: development and pilot testing of an assessment tool

The Equi-Trauma Collaborative

Maria Lisa Odland,¹⁻³ Abdul-Malik Abdul-Latif,^{1,4} Agnieszka Ignatowicz,¹ Abebe Bekele,⁵⁻⁶ Kathryn Chu,⁷⁻⁸ Anthony Howard,⁹⁻¹⁰ Stephen Tabiri,¹¹⁻¹² Jean Claude Byiringiro,¹³⁻¹⁴ Justine I Davies^{1,15,16}

1. Institute of Applied Health Research, University of Birmingham, Birmingham, U, K.
2. Department of Obstetrics and Gynecology, St. Olavs University Hospital, Trondheim, Norway
3. Malawi-Liverpool-Wellcome Trust Research Institute, Blantyre, Malawi
4. Volta Regional Health Directorate, Ghana Health Service, Ho, Ghana
5. University of Global Health Equity, Kigali, Rwanda
6. Department of Surgery, Addis Ababa University, Addis Ababa, Ethiopia
7. Centre for Global Surgery, Department of Global Health, Stellenbosch University, Cape Town, South Africa
8. Department of Surgery, University of Botswana, Gaborone, Botswana
9. Leeds Institute of Rheumatic and Musculoskeletal Medicine, School of Medicine, University of Leeds, Leeds, UK
10. Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, National Institute of Health Research (NIHR) Biomedical Centre, University of Oxford, Headington, Oxford, UK
11. Ghana HUB of NIHR Global Surgery, Tamale, Ghana. Department of Public Health, Tamale Teaching Hospital, Tamale, Ghana
12. Department of Surgery, Tamale Teaching Hospital, Tamale, Ghana
13. University of Rwanda, Kigali, Rwanda
14. Department of Surgery, University Teaching Hospital of Kigali, Kigali, Rwanda
15. Centre for Global Surgery, Department of Global Health, Stellenbosch University, Cape Town, South Africa
16. Medical Research Council/Wits University Rural Public Health and Health Transitions Research Unit, Faculty of Health Sciences, School of Public Health, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author:

Agnieszka Ignatowicz, a.m.ignatowicz@bham.ac.uk, University of Birmingham, Birmingham Clinical Trials Unit College of Medical and Dental Sciences, Birmingham B15 2TT, United Kingdom,+44 (0) 121 414 3344

Keywords: Injuries, Governance, Trauma, Health Policy, Public Health

Word count: 3926 excluding title page, abstrac references, figures and tables.

Abstract

Introduction

Injury is a leading cause of disability globally and responsible for more than 5 million deaths yearly, with 90% being in low- and middle-income countries. Still, little is done to monitor and evaluate healthcare governance for injury and trauma in this context.

Methods

Based on Siddiqi et al.'s framework for governance, we developed an online assessment tool for health system governance for injury with 37 questions covering health policy and implementation under ten overarching principles of Strategic vision, Participation and Consensus orientation, Rule of Law, Transparency, Responsiveness of Institutions, Equity, Effectiveness or Efficiency, Accountability, Ethics, and Intelligence/information. The tool was sent out to purposively selected stakeholders, including policymakers and injury care providers in Ghana, Rwanda and South Africa. Data were collected between October 2020 and February 2021. A literature review was also done to support the scoring. We derived scores using two methods - investigator scores and respondent scores.

Results

Rwanda had the highest overall investigator percentage score (70%), followed by South Africa (59%). Ghana had the lowest overall investigator score (48%). The overall results were similar for the respondent scores. Some areas such Participation and Consensus scored high in all three countries, whilst other areas such Transparency scored very low.

Conclusion

In this multi-country governance survey, we have shown that injury governance structures are limited in three Sub-Saharan African countries. This study provides insight into the governance of trauma systems in these three countries. It highlights areas that need to be prioritised to meet the increasing burden of trauma and injuries.

For peer review only

What is already known about this topic

- Injuries and trauma are major causes of mortality, especially in low and middle-income countries.
- There is a recognised need to invest in health services to provide trauma care. However, little is done to monitor and evaluate healthcare governance for trauma in low-and middle-income countries.

What does this study add

- We assessed the health systems governance for trauma care in three diverse Sub-Saharan African countries - Ghana, Rwanda and South Africa - to try to understand the foundations on which to build improved health systems for trauma.
- The application of our adapted tool revealed strengths and weaknesses in policies and governance of trauma care.

How can this study might affect research, policy and practice

- Assessing health systems governance for injury, as we did in this study, provides evidence that should not only stimulate more research in this area but also support advocacy efforts to advance trauma care systems.

Introduction

Injury is a leading cause of disability globally and responsible for more than 5 million deaths each year.¹ Mortality from injury account for more deaths than tuberculosis (TB), malaria and HIV combined,¹ and 90% of these deaths occur in low- and middle-income countries (LMICs).² Deaths from injury are predicted to become the leading cause of death by 2030.³ Despite this increasing burden, only a few LMICs have well-defined trauma systems or trauma registries.⁴

The United Nations Development Program defines governance as the exercise of political, economic, and administrative authority in managing a country's affairs at all levels.⁵

Governance has long been a critical factor that influences a country's economic growth, social advancement, and general development. It is recognised as especially important for advancing progress towards attaining the Sustainable Development Goals (SDGs) in LMICs.⁶

Over recent years, there has been increasing interest in health systems governance (HSG) with the recognition that good governance leads to better health outcomes for individuals and populations.⁶ The Lancet-University of Oslo Commission on Global Governance for Health in 2014 called for a cross-sectoral global action and platform for health governance to serve as a policy forum to allow the contribution of diverse stakeholders to frame issues, set agendas, and debate policies that affect health and health equity.⁷ The World Health Organisation first introduced the term "stewardship" – a part of governance, in the year 2000, and called for strategic policy frameworks that would allow the incorporation of effective oversight, regulation, incentives, and accountability in health governance.⁸

HSG thus involves setting evidence-based shared strategic visions and objectives, in addition to making policies, legislation, and deploying resources to ensure the goals and objectives are achieved.⁹ However, despite its importance in supporting the delivery of better services and

1
2
3 improved health outcomes, little is done to monitor and evaluate HSG in LMICs.¹⁰⁻¹²
4
5 Additionally, literature is scarce on HSG around trauma care in LMICs.¹³ Previous studies on
6
7 HSG have primarily focused on general health systems functions and particularly on the role
8
9 of government in governance and the involvement of communities.¹⁴ Moreover, the sparse
10
11 disease-specific literature that exists focuses on the governance of programs for
12
13 immunisation,¹⁵ TB control,¹⁶ mental health care,¹⁷⁻¹⁹ and achieving global HIV goals.²⁰
14
15

16
17
18 Given the prevalence of injury and the recognised need to invest in health services to provide
19
20 trauma care, good governance will be essential to ensure the care provided is of high quality
21
22 and accessible to those who need it. As part of a larger project that identified barriers in
23
24 access to quality care for people who have been injured in LMICs²¹, we adapted a tool to
25
26 access the HSG for trauma care in three diverse countries in Sub-Saharan Africa - Ghana,
27
28 Rwanda and South Africa - in order to try to understand the foundations on which to build
29
30 improved health systems for trauma.
31
32
33
34
35

36 **Methods**

37 **Study setting**

38
39
40 The study was conducted in three LMIC countries in sub-Sahara Africa: Ghana, Rwanda and
41
42 South Africa which have vastly different development and health systems. Ghana is a lower
43
44 middle-income country, an estimated population of 30.4 million people (2019), a life
45
46 expectancy of 63.8 years, and a Gross National Income (GNI) per capita of \$2,220.²² While
47
48 health service delivery in the country is largely provided by government, private health
49
50 institutions also provide significant proportion of health services to the population.²³ The
51
52 National Ambulance Service provides 24-hour pre-hospital care for accidents and
53
54 emergencies as part of the care provided by the government.²³ It has been estimated that
55
56
57
58
59
60

1
2
3 7.56% of deaths and 7.24% of disability-adjusted life years (DALYs) in Ghana are due to
4
5 trauma.^{22 24}
6
7

8
9 Rwanda, a landlocked East African country of 12.6 million people, has a life expectancy of 68.7
10
11 years and GNI per capita of \$830.²² It is classified as a low-income country. Around 9% of all
12
13 deaths and 10% of DALYs are due to trauma.²² Following the near decimation of its health
14
15 system by the 1994 genocide, the country has taken steps to strengthen it, giving autonomy
16
17 to District Health Services to serve urban and rural zones.²⁵ It introduced the Community-
18
19 Based Health Insurance (CBHI) system in 1999/2000 to provide health insurance to rural
20
21 populations.²⁶ However, the health system is still challenged, and deficiencies exist in the
22
23 provision of quality trauma care.²⁷
24
25
26
27
28

29 South Africa is an upper-middle-income country, with a population of 68.6 million and a life
30
31 expectancy of 63.8 years. Injuries are estimated to be responsible for 10% of death and 11%
32
33 of DALYs.^{22 24} South Africa has the third biggest economy in Africa and a GNI per capita of
34
35 \$6,040.²² Most South Africans (84%) access health services through government clinics, whilst
36
37 the more affluent people go to private hospitals.²⁸
38
39
40
41

42 **Data collection**

43
44

45 Building on the framework and tool developed by Siddiqi et al.⁶ for assessing the HSG in
46
47 developing countries, we developed an assessment tool for injury/trauma HSG with 37
48
49 questions covering health policy and implementation using the ten overarching principles
50
51 outlined by Siddiqi et al.: Strategic vision, Participation and Consensus orientation, Rule of
52
53 Law, Transparency, Responsiveness of Institutions, Equity, Effectiveness or Efficiency,
54
55 Accountability, Ethics, and Intelligence/information (Appendix 1 and Table 1). Adjustments to
56
57 the original tool were made to tailor question to trauma; these were made based upon
58
59
60

1
2
3 discussion between the authors of this paper. The resultant tool was piloted for acceptability
4 and comprehensibility before use. Data were collected over a five-month period from
5
6 October 2020 to February 2021 by participants self-completing an online word or google
7
8 form, based on their preference. Participants were requested to select a single response for
9
10 each question and included a free text field for notes and provision of evidence to support
11
12 their responses was encouraged. All responses were imported and analysed in Microsoft
13
14 Excel.

15
16
17
18
19
20 An extensive review of documents from grey and published literature was also done to
21
22 support the assessment, particularly the scoring.

23 24 25 26 **Survey respondent selection**

27
28
29 Our aim was to recruit participants from health policy or senior leaders in trauma care
30
31 provision in each country. Given that we expected potential participants to have sound
32
33 knowledge of the policy and governance context for injury care in their countries, we aimed
34
35 for a sample size of 5-8 respondents and contacted potential participants until at least the
36
37 minimum number was achieved. A combination of purposive and snowball sampling was used
38
39 to recruit respondents, with potential participants identified with the support of in-country
40
41 senior researchers within injury care. Emails were sent to potential participants to request
42
43 their participation in the study; for each invited participant, two further reminders were sent.
44
45
46
47
48
49

50 51 **Grey literature search**

52
53 We additionally conducted a search for and review of program documents, policies, annual
54
55 reports, and standard operating procedures for each country. Searching was done through
56
57 the websites of government organisations at the national and sub-national level, websites of
58
59
60

1
2
3 international organisations, and Google search engine. The search terms included the country
4 name and trauma policy, trauma law, strategic plan for trauma, injury, injury work plan, injury
5 policy, injury care, trauma care, injury guidelines, trauma guidelines, and combinations of
6 these. There was no restriction on the year of publication.
7
8
9
10
11
12

13 **Scoring**

14
15
16 Scoring was done separately for each country. For each question, responses were awarded
17 points and treated as binary categorical or ordinal (see appendices). We derived scores using
18 two methods - investigator scores and respondent scores. The investigator scores considered
19 the following to derive a final score for each question: results from respondents, respondents'
20 professional roles, and the availability of evidence from policy documents and guidelines
21 undertaken as a part of grey literature searches. Investigator scores were derived after
22 discussions between the authors. Consideration of the respondent's professional roles
23 depended on the question asked; more emphasis was given to responses from policymakers
24 rather than trauma care providers for policy-related questions, and more given to trauma
25 care providers where questions were related to service provision. So, for example, if a trauma
26 care provider gave a score of 0, and the policymaker gave a score of 2 on a question related
27 to policy, such as; *are there legal documents of injury care?*, the question would receive a final
28 score of 2 as the policymaker was more likely to have up-to-date knowledge on this. If there
29 was a policy document available to definitively answer a question, the literature took
30 precedence over respondents. This process was done through discussions between two
31 authors: AMAL and ML. Where there were disagreements, a third and fourth investigator
32 served as an arbiter (AI and JD).
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 For the respondent scores, the mean score across respondents for each question was simply
4
5 computed as the average score from the responses for each question. Given that the response
6
7 rate for each country differed, the denominator (n) varied based on the number of responses:
8
9
10 11 for Ghana, 5 for Rwanda and 4 for South Africa.
11
12

13 Both investigator scores and the average respondent scores for each principle were calculated
14
15 by dividing the achieved score in each country by the total score possible to achieve and
16
17 multiplying it by a 100. Comparisons across countries are described at the level of the 10
18
19 Principles and overall.
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1. Applying Siddiqi et al. governance framework to trauma care systems in Ghana, Rwanda and South Africa. Questions for each governance principle are in table 3

S/N	Governance principle	Explanation of principles based upon from Siddiqi et al (2008)	Domain captured for trauma care	Maximum score for principle
1	Strategic vision	Through an understanding of the historical, cultural and social complexities of society, leaders have a strong sense of direction for the achievement of long and broad health and human development goals.	There is a detailed long term strategic plans to improve trauma care	12
2	Participation and consensus orientation	Everyone or interest groups or institutions acting on behalf of everyone should be given the chance to have a say in relation to decisions about health. This is built on the principle of freedom of association and speech as well as capacities to participate constructively. Good governance should be able to mediate between differing opinions among stakeholders on health, policies and procedures in order to reach a mutual understanding that is beneficial for all.	There is stakeholder participation and level of engagement in policy formulation and implementation for trauma	3
3	Rule of law	Legal frameworks or policies relating to human rights on health especially should be applied impartially	There is availability and enforcement of laws, guidelines, policies to support trauma care	6
4	Transparency	There should be free flow of information on all health matters. There should be enough information available to all to not only monitor but also understand health matters. Processes, institutions and information should be directly accessible to those concerned with them.	There is transparency on commitments to trauma and available information on indicators and other trauma related information for providers (district) involved in local trauma service provision	3

5	Responsiveness	Institutions and processes should promptly serve all stakeholders and ensure that their health and non-health needs are met without delays	Trauma systems are responsive to trauma care needs of the population	10
6	Equity and inclusiveness	Everyone should have the opportunity to improve or maintain their health and well being	There is equity in access to quality trauma care	8
7	Effectiveness and efficiency	Institutions and processes should maximize available resources to render best health care services according to population needs, as well as influence improved health outcomes	There is the existence of organisational capacity including human resource, communication processes to support quality trauma provision	6
8	Accountability	People put in positions of trust from government, the private sector and civil society organisations should be accountable to the public and institutional stakeholders. Accountability in this sense varies depending on the type of institution or organisation and whether or not decisions are for internal or external purposes	There is evidence of accountability between service providers and users in the provision of trauma care	3
9	Intelligence and information	Essentials for understanding of the health system to guide the implementation of good policies that are based on empirical data to influence the behaviour of different interest groups that support the strategic vision for health.	There is availability of tools and capacity to capture trauma care data	2
10	Ethics	Widely accepted principles of health care ethics; non-maleficence, beneficence and justice. This also includes ethics in health care research essential to safeguard the interest and rights of the patients.	There is enforcement of high ethical standards in trauma care provision and research	3
	Maximum score			56

Patient and public involvement

It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Results

Table 2 shows a breakdown of the number of respondents from each country and their employment role at the time of completing the survey. Respondents were made up of key officials employed directly by or advising Department or Ministry of Health, trauma care providers (some of whom were also involved in research), and government officials. Thirteen potential respondents were contacted from each country.

Table 2. Breakdown of respondents from each country and their characteristics

S/N	Country	No of potential participants contacted	No of respondents	No of policy respondents	No of trauma care providers
1	Ghana	13	11	3	8
2	Rwanda	13	5	3	2
3	South Africa	13	5	3	2

Appendix table 2 shows the investigator score for each country according to each question and percentage score for each principle and overall for each country. Some of the respondents provided evidence to support their answers such as policy documents and peer-reviewed papers.

Rwanda had the highest overall investigator percentage score (70%) followed by South Africa (59%). Ghana had the lowest overall investigator percentage score (48%) (Table 3). The overall results were similar for the respondent average percentage score, with Rwanda scoring 39.85

(71%) in total, South Africa 31.07 (56%) and Ghana 18.5 (33%) (Appendix Table 3 – with both percentage scores shown for comparison).

Table 3 Investigator score for each question and percentage score for each principle and overall for Rwanda, Ghana and South Africa respectively

Principle	One question out of many questions asked in this principles	Maximum score for questions	Rwanda score	Ghana score	South Africa score
Strategic vision	Is there specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma care?	12	8 (67%)	4 (33%)	6 (50%)
Participation and consensus	What is the level of stakeholder engagement/community in participation at the national and provincial level in trauma policy and related interventions?	3	3 (100%)	3 (100%)	3 (100%)
Rule of law	Are there guidelines for accreditation of trauma care providers (doctors, nurses, etc) and are these enforced?	6	4 (67%)	5 (83%)	5 (83%)
Transparency	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	3	3 (100%)	0 (0%)	0 (0%)
Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is this used to define the burden of injury at a national level?	10	8 (80%)	5 (50%)	5 (50%)

Equity	Are there national level financial schemes to ensure the poor who are injured do not have to pay out of pocket direct medical costs of trauma care?	8	3 (38%)	2 (25%)	3 (38%)
Effectiveness and efficacy	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	6	5 (83%)	4 (67%)	4 (67%)
Accountability	Are there mechanisms to report failing trauma services to policy makers or regulatory authorities?	3	1 (33.3%)	1 (33.3%)	3 (100%)
Intelligence/information	Do staff providing trauma services understand what data needs to be captured and do they have the right data capturing tools to enable them to do this?	3	1 (33%)	1 (33%)	1 (33%)
Ethics	Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	3	3 (100%)	2 (67%)	3 (100%)
Peer Review Only					
Overall Total (% maximum overall score)		56	39 (70%)	27 (48%)	33 (59%)

Considering the investigator scores, Rwanda had the highest scores for each Principle except for Equity. Participation and consensus orientation in particular had a very high score in Rwanda (100%), whilst the other scores were between 70-80%, apart from Strategic vision (66.7%) and Equity (37.5%). Like Rwanda, South Africa also had high investigator-weighted scores overall, but had low scores for Strategic vision (50.0%), Equity (37.5%), and Intelligence and Information (50.0%). For Transparency, South Africa had a score of 0%. On the other

1
2
3 hand, South Africa had high scores for Participation and consensus orientation (100%), Rule
4 of Law (83.3%), Accountability (100%) and Ethics (100%). Responsiveness of institutions
5 (50.0%) and Effectiveness and efficiency (66.7% and 66.7%) received medium high scores.
6
7
8
9
10 Ghana's highest scores were for the Principles of Rule of Law (83.30%), Effectiveness and
11 Efficiency (66.70%) and Ethics (66.70%). However, the scores were low for the other
12
13 Principles, especially Strategic Vision (33.30%), Transparency (0%), Equity (25%) and
14
15 Accountability (33.30%). This gave Ghana the overall lowest score in the Governance
16
17 Assessment for Trauma with an investigator score of 48.20% (see table 3). The only Principle
18
19 that received a 100% investigator score in all the countries was Participation and consensus
20
21 orientation.
22
23
24
25
26
27
28

29 Discrepancies between investigator scores and average respondent scores were mostly seen
30
31 in Ghana, where the overall scores were 33.0% versus 48.20%, respectively, and there were
32
33 fairly large discrepancies for almost all the Principles except for Equity (17.5% versus 25%),
34
35 Effectiveness and efficiency (54.7% versus 66.70%), and Accountability (28.70% versus
36
37 33.30%) (Appendix 2) (Appendix table 3). The average respondent and investigator
38
39 percentage scores for each Principle were more similar for the other two countries. In
40
41 Rwanda, the overall average respondent percentage score was 71.2%, and the average
42
43 percentage investigator score was 69.6%; most of the individual Principles had similar
44
45 respondent percentage scores except for Transparency (60.0% versus 100.0%), Accountability
46
47 (70.0% versus 33.3%) and Intelligence and Information (80.0% versus 50.0%). In South Africa,
48
49 the overall average respondent percentage score was 55.5%, and the overall investigator
50
51 percentage score was 58.9%. Similar to Rwanda, the individual Principle scores were more or
52
53
54
55
56
57
58
59
60

1
2
3 less similar except for those of Strategic vision (38.9% versus 50.0%), Accountability (89.0%
4
5 versus 100.0%), Intelligence/information (37.5% and 50.0%) and Ethics (89.0% versus 100%).
6
7

8 9 **Discussion**

10
11
12
13 To the best of our knowledge, this is the first study that has adapted assessed governance for
14
15 trauma health systems across multiple countries. The application of our adapted tool revealed
16
17 strengths and weaknesses in policies and governance of trauma care in Ghana, South Africa
18
19 and Rwanda. Rwanda achieved fairly high scores (70%), followed by South Africa (59%), and
20
21 Ghana had the lowest score (40%). However, considering the massive burden of injuries and
22
23 trauma in these countries, our results suggest that even in the higher performing countries
24
25 there is room for improvement. Whereas the gap between the burden of disease and
26
27 available governance systems and structures was especially seen in Ghana, the focus on other
28
29 conditions in Ghana, such as the free maternal health care policy - which has been vital in
30
31 ensuring access to health care for women and children – shows what is possible to achieve ²⁹.
32
33
34
35
36

37
38 Rwanda scored relatively high in our survey. Reasons for this could be that having successfully
39
40 achieved the MDGs, Rwanda has committed to reducing morbidity and mortality due to
41
42 injuries,^{8 30} including developing policies, training healthcare providers, investing in data-
43
44 collection, and hosting first national symposium on trauma and injuries in 2019.³¹ Hence there
45
46 has been a focus on improving health systems to care for patients with injuries in the last few
47
48 years. There is still high mortality and morbidity from injuries in the country, but interventions
49
50 following recent policies and prioritisation of trauma care coupled with efforts to prevent
51
52 injuries – for example, the recent introduction of speed cameras in urban areas - is likely to
53
54 improve the situation in the years to come.
55
56
57
58
59
60

1
2
3 Given the level of development – being the only upper-middle income country in our study,
4
5 it is surprising that South Africa had mediocre percentage scores of around 50%. Many LMICs
6
7 have a high burden of injuries and trauma, but South Africa has a relatively large burden of
8
9 homicide, violence and stabbings³² in addition to other common injuries such as road traffic
10
11 accidents and burns. Even though there are programs, services, and ongoing research on this
12
13 topic, there has been an absence of government stewardship and leadership.³² In South
14
15 Africa, in particular, prevention of violence and injury should be a strategic priority for
16
17 government programmes and policies. There are valuable lessons that South Africa can learn
18
19 from its own excellent governance structures for HIV care.³³

20
21
22 Overall our results emphasise that more efforts are needed to strengthen overall governance
23
24 for injury care, considering how crucial governance is to achieve Universal Health Coverage
25
26 (UCH).³⁴ Finance cannot be neglected in this process, however it is also critical to focus on the
27
28 Principles that were particularly weak in this study (transparency, accountability and
29
30 intelligence/information), to improve the effectiveness of the health sector.³⁴ We found that
31
32 not only was the availability of financial commitments to trauma care in the public sector a
33
34 challenge, but also accountability in relation to adequate data generation and the correction
35
36 of trauma care underperformance. Whereas, WHO has developed a trauma registry for LMIC
37
38 settings which can be tailored to individual country needs, uptake of this at national levels is
39
40 lacking and use of data collected for health service quality improvement is under-developed.
41
42 Rwanda is the only country in our study that uses the WHO-based trauma registry, and this is
43
44 only used in 5 hospitals and without an active quality improvement program – although there
45
46 are plans to develop this.³⁰

1
2
3 Another thing that was evident in our findings was the difference between the investigator
4 scores and the respondent scores. Overall, Rwanda had the highest score regardless of the
5 scoring system used, and the overall investigator score, and respondent score were similar.
6
7
8 However, in the other two countries the respondent score was lower than the investigator
9
10 score, especially in Ghana, which also had the lowest scores altogether. The difference
11
12 between the respondent and investigator score suggests that many respondents are not
13
14 aware of relevant policies/governance structures for trauma in their respective countries.
15
16 Awareness of these is the first step to using them in order to improve injury and trauma care
17
18 in the respective countries; the quality of governance is associated with health systems
19
20 performance;³⁵ however, policies are of no use if the people in charge of implementing them
21
22 are not aware of them. According to our survey, this is mostly an issue in Ghana, but also
23
24 somewhat in South Africa.
25
26
27
28
29
30
31
32
33

34 This study also revealed some interesting findings in relation to “Participation and consensus
35 orientation” as it was the only principle where all three countries scored 100%. More
36
37 involvement of stakeholders may improve service delivery and reduce barriers to accessing
38
39 quality care for injuries after trauma. But, this isn't necessarily the case, as seen in Nigeria,
40
41 where an increased involvement of stakeholders in the formulation and implementation of
42
43 TB policies¹⁶ did not necessarily result in good TB control in the community and the health
44
45 services in the country.
46
47
48
49
50

51 It is likely that multiple components of governance need to be in place – in combination with
52
53 the awareness of these – for the improvement of healthcare systems. For example, in Ethiopia
54
55 improved health system governance was expected to impact critically on scaling up mental
56
57 health care within primary care facilities.¹⁷ The presence of high-level government support
58
59
60

1
2
3 was thought to be a strength along with a National Mental Health Strategy. But unfortunately,
4
5 there was still a very low baseline awareness of mental health care planning and a lack of
6
7 leadership and coordination of mental health planning at the national and district level.
8
9
10 Indeed, a qualitative study using Saddiqi's framework for mental health governance in South
11
12 Africa found that facilitating factors to implementing integrated mental health care were
13
14 using task-sharing models, establishment of district mental health teams to facilitate the
15
16 development, and implementation of mental health care plans. The challenges were weak
17
18 managerial and planning capacity to develop health care at the provincial and district level.
19
20
21 All of which speak to the need for knowledge and implementation of governance structures
22
23 for the improvement of healthcare. Hence to strengthen health care delivery there is a critical
24
25 need to strengthen leadership and coordination, and implementation at all levels; national,
26
27 regional, district, and down to individual healthcare facilities. There are valuable lessons from
28
29 these other disease areas that can be used for using governance structures for improving
30
31 trauma care systems.
32
33
34
35
36
37

38
39 In this survey, we managed to obtain responses from a range of professionals working with
40
41 trauma care in three different countries in Sub-Saharan Africa. However, a major limitation is
42
43 that we only had five participants in two of the countries (Rwanda and South Africa) and found
44
45 soliciting involvement of respondents difficult, despite having researchers with links to policy
46
47 makers leading the study in each country. The low numbers of respondents could have
48
49 introduced selection bias. We tried to overcome this bias using an investigator score.
50
51
52 However, we may have found different results if we had achieved greater numbers of
53
54 participants from each country. Nevertheless, our results have face validity, considering that
55
56 injury care has been an area of focus in Rwanda³¹, and Rwanda scored highest in our
57
58
59
60

1
2
3 governance survey. The investigator scores also had its limitations. If there was no available
4
5 evidence the investigators had to weigh the replies from the respondents according to their
6
7 background which involved making assumptions about the respondents knowledge of the
8
9 subject, which may have been false. We did our outmost to make sure the investigator scores
10
11 were correct by checking the grey literature and available information. Our scoring system
12
13 has not been validated and we cannot be certain that the scores were always reflective of the
14
15 true trauma systems governance of that country, or that one country is doing better than the
16
17 other.
18
19
20
21
22
23

24 Nevertheless, our study is novel in looking at governance assessment for injuries in LMICs.
25
26 This survey tool provides useful insight in the governance of trauma systems in three LMIC
27
28 countries with different development status and provides evidence that governance systems
29
30 for trauma need to be improved in certain areas in order to face the increasing burden of
31
32 injuries in LMICs in the years to come.
33
34
35

36 37 **Conclusions**

38
39
40 In this multi-country governance survey, we have shown that the governance structures for
41
42 trauma is limited in three different countries in Sub-Saharan Africa; Ghana, Rwanda and South
43
44 Africa. Some areas, such Participation and consensus, scored high in all three countries whilst
45
46 other areas such Transparency scored very low. This study provides insight into the
47
48 governance of trauma systems in these three countries and highlights areas that need to be
49
50 prioritised in the years to come in order to meet the increasing burden of trauma and injuries.
51
52
53 Assessment of the health systems governance for trauma, as we did in this study, provides
54
55
56
57
58
59
60

1
2
3 evidence that should not only stimulate more research in this area but also support advocacy
4
5 efforts to advance trauma care systems.
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

References

1. World Health Organisation. Injuries and Violence the Facts 2014 [Available from: <https://apps.who.int/iris/rest/bitstreams/668802/retrieve>].
2. Gosselin RA, Spiegel DA, Coughlin R, et al. Injuries: the neglected burden in developing countries. *Bull World Health Organ* 2009;87(4):246-46a. doi: 10.2471/blt.08.052290 [published Online First: 2009/06/25]
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 2006;3(11):e442. doi: 10.1371/journal.pmed.0030442 [published Online First: 2006/11/30]
4. Whitaker J, O'Donohoe N, Denning M, et al. Assessing trauma care systems in low-income and middle-income countries: a systematic review and evidence synthesis mapping the Three Delays framework to injury health system assessments. *BMJ Glob Health* 2021;6(5) doi: 10.1136/bmjgh-2020-004324 [published Online First: 2021/05/13]
5. United Nations. Human Development Report 1997 [Available from: http://hdr.undp.org/sites/default/files/reports/258/hdr_1997_en_complete_nostats.pdf].
6. Siddiqi S, Masud TI, Nishtar S, et al. Framework for assessing governance of the health system in developing countries: gateway to good governance. *Health Policy* 2009;90(1):13-25. doi: 10.1016/j.healthpol.2008.08.005 [published Online First: 2008/10/08]
7. Ottersen OP, Dasgupta J, Blouin C, et al. The political origins of health inequity: prospects for change. *Lancet* 2014;383(9917):630-67. doi: 10.1016/S0140-6736(13)62407-1 [published Online First: 2014/02/15]
8. World Health Organisation. Everybody's business: Strengthening health systems to improve health outcomes 2007 [Available from: https://www.who.int/healthsystems/strategy/everybodys_business.pdf].
9. Lewis M. and Petterson G. Governance in Health Care Delivery 2009 [Available from: <https://poseidon01.ssrn.com/delivery.php?ID=538097071083084007079107106066114005010087014021019030101052032018059029044024014036025095087006090007037092008070123064093068026009089080094025102105080027103111123030016094008003098115064&EXT=pdf&INDEX=TRUEw>].
10. Mugisha J, Ssebunnya J, Kigozi FN. Towards understanding governance issues in integration of mental health into primary health care in Uganda. *Int J Ment Health Syst* 2016;10:25. doi: 10.1186/s13033-016-0057-7 [published Online First: 2016/03/26]
11. Bossert TJ. Health systems. *Health Policy Plan* 2012;27(1):8-10. doi: 10.1093/heapol/czr008 [published Online First: 2011/02/19]
12. Cole E. The national major trauma system within the United Kingdom: inclusive regionalized networks of care. *Emergency and Critical Care Medicine* 2022;2(2):76-79. doi: 10.1097/ec9.0000000000000040
13. Reynolds TA, Stewart B, Drewett I, et al. The Impact of Trauma Care Systems in Low- and Middle-Income Countries. *Annu Rev Public Health* 2017;38:507-32. doi: 10.1146/annurev-publhealth-032315-021412 [published Online First: 2017/01/27]
14. Rosato M, Laverack G, Grabman LH, et al. Community participation: lessons for maternal, newborn, and child health. *Lancet* 2008;372(9642):962-71. doi: 10.1016/S0140-6736(08)61406-3 [published Online First: 2008/09/16]
15. Grundy J. Country-level governance of global health initiatives: an evaluation of immunization coordination mechanisms in five countries of Asia. *Health Policy Plan* 2010;25(3):186-96. doi: 10.1093/heapol/czp047 [published Online First: 2009/11/21]
16. Ogbuabor DC, Onwujekwe OE. Governance of tuberculosis control programme in Nigeria. *Infect Dis Poverty* 2019;8(1):45. doi: 10.1186/s40249-019-0556-2 [published Online First: 2019/06/18]

17. Hanlon C, Eshetu T, Alemayehu D, et al. Health system governance to support scale up of mental health care in Ethiopia: a qualitative study. *Int J Ment Health Syst* 2017;11:38. doi: 10.1186/s13033-017-0144-4 [published Online First: 2017/06/13]
18. Petersen I, Marais D, Abdulmalik J, et al. Strengthening mental health system governance in six low- and middle-income countries in Africa and South Asia: challenges, needs and potential strategies. *Health Policy Plan* 2017;32(5):699-709. doi: 10.1093/heapol/czx014 [published Online First: 2017/04/04]
19. Marais DL, Petersen I. Health system governance to support integrated mental health care in South Africa: challenges and opportunities. *Int J Ment Health Syst* 2015;9:14. doi: 10.1186/s13033-015-0004-z [published Online First: 2015/03/26]
20. Khalid H, Fox AM. Political and Governance Challenges to Achieving Global HIV Goals with Injecting Drug Users: The Case of Pakistan. *Int J Health Policy Manag* 2019;8(5):261-71. doi: 10.15171/ijhpm.2018.131 [published Online First: 2019/06/18]
21. Odland ML, Abdul-Latif A-M, Ignatowicz A, et al. Equitable access to quality trauma systems in low-income and middle-income countries: assessing gaps and developing priorities in Ghana, Rwanda and South Africa. *BMJ Global Health* 2022;7(4):e008256. doi: 10.1136/bmjgh-2021-008256
22. The World Bank. World Bank Open Data 2021 [Available from: <https://data.worldbank.org/>].
23. Ghana Health Service Ministry of Health. Ghana Health Service 2014 Annual Report 2014 [Available from: https://www.ghanahealthservice.org/downloads/Ghana_Health_Service_2014_Annual_Report.pdf].
24. Institute for Health Metrics and Evaluation. Country profiles [Available from: <http://www.healthdata.org/results/country-profiles>].
25. The DHS Program. Rwanda: Standard DHS, 2019-20 2020 [
26. Nyandekwe M, Nzayirambaho M, Kakoma JB. Universal health insurance in Rwanda: major challenges and solutions for financial sustainability case study of Rwanda community-based health insurance part I. *Pan Afr Med J* 2020;37:55. doi: 10.11604/pamj.2020.37.55.20376 [published Online First: 2020/11/20]
27. Ntakiyiruta G, Wong EG, Rousseau MC, et al. Trauma care and referral patterns in Rwanda: implications for trauma system development. *Can J Surg* 2016;59(1):35-41. doi: 10.1503/cjs.008115 [published Online First: 2016/01/27]
28. Mahlahti P. and Dlamini J. MINIMUM DATA SETS FOR HUMAN RESOURCES FOR HEALTH AND THE SURGICAL WORKFORCE IN SOUTH AFRICA'S HEALTH SYSTEM 2015 [Available from: https://www.who.int/workforcealliance/031616south_africa_case_studiesweb.pdf].
29. Adu J, Mulay S, Owusu MF. Reducing maternal and child mortality in rural Ghana. *Pan Afr Med J* 2021;39:263. doi: 10.11604/pamj.2021.39.263.30593 [published Online First: 20210824]
30. Jayaraman S, Ntirenganya F, Nkeshimana M, et al. Building Trauma and EMS Systems Capacity in Rwanda: Lessons and Recommendations. *Ann Glob Health* 2021;87(1):104. doi: 10.5334/aogh.3324 [published Online First: 20211026]
31. Rosenberg A, Ntirenganya F, Bagahirwa I, et al. First Rwanda National Trauma Symposium 2019: Challenges and priorities. *J Glob Health* 2020;10(1):010201. doi: 10.7189/jogh.10.010201 [published Online First: 2020/04/08]
32. Seedat M, Van Niekerk A, Jewkes R, et al. Violence and injuries in South Africa: prioritising an agenda for prevention. *Lancet* 2009;374(9694):1011-22. doi: 10.1016/s0140-6736(09)60948-x [published Online First: 20090824]
33. Lodge T. The politics of HIV/AIDS in South Africa: government action and public response. *Third World Quarterly* 2015;36(8):1570-91. doi: 10.1080/01436597.2015.1037387
34. Fryatt R, Bennett S, Soucat A. Health sector governance: should we be investing more? *BMJ Glob Health* 2017;2(2):e000343. doi: 10.1136/bmjgh-2017-000343 [published Online First: 2017/12/12]

- 1
2
3 35. Olafsdottir AE, Reidpath DD, Pokhrel S, et al. Health systems performance in sub-Saharan Africa:
4 governance, outcome and equity. *BMC Public Health* 2011;11:237. doi: 10.1186/1471-2458-
5 11-237 [published Online First: 2011/04/19]
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

Appendix table 1. Copy of the governance survey

Principle	Questions	Responses (please circle one response for each question)	Maximum score
Strategic vision	Is there a specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma	Don't know No (0) Yes (1)	1
	Is there a national trauma strategy?	Don't know No (0) Yes (1)	1
	What percentage of the country's health budget goes to trauma care?	Don't know <10% (0) 10-20% (1) >20% (2)	2
	Is public sector trauma care provided free of charge	Don't know No-not at all (0) Partly (1) Yes-fully (2)	2
	Is there a national insurance scheme that covers trauma care	Don't know No-not at all (0) Partly (1) Yes-fully (2)	2
	Is there a department within the National Ministry of Health dedicated for trauma?	Don't know No department for trauma at all (0) Department for trauma included in another department (1) Stand-alone department for trauma (2)	2
	If the National health plan mentions trauma, or if there are national health policies for trauma care, are there specific objectives	Don't know No (0)	1

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

	relating to trauma and timelines to achieve them?	Yes (1)	
	If you have answered yes to question 7, have any of those specific trauma objectives been implemented?	Don't know No (0) Yes (1)	1
Scores			12
Participation and consensus orientation	Are stakeholders (e.g: NGOs, private companies) involved in health policy formulation for trauma?	Don't know No organisation is involved (0) 1-3 organisations are involved (1) > 3 organisations are involved (2)	2
	What is the level of stakeholder engagement/community participation at the national and provincial level in trauma policy and related interventions?	Don't know No involvement at all (0) These groups are involved (1)	1
Scores			3
Rule of law	Are there guidelines for accreditation of trauma care providers (doctors, nurses, etc) and are these enforced?	Don't know No guidelines present (0) Guidelines present are not enforced (1) Guidelines present and enforced (2)	2
	Are there laws to enforce a duty of care by hospitals to treat uninsured trauma patients?	Don't know No laws (0) Laws present are not enforced (1) Laws present and enforced (2)	2
	Are there laws to protect against trauma? Example Seat belt laws?	Don't know No laws (0) Laws present are not enforced (1)	2

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

		Laws present and enforced (2)	
Scores			6
Transparency	Is information readily available on financial commitments or allocated budget to trauma care in the public sector at either national or provincial level?	Don't know Don't know No (0) Yes (1)	1
	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	Don't know No trauma related criteria for assessment (0) Trauma related criteria for assessment is used, but not available (1) Trauma related criteria for assessment is used and available (2)	2
Scores			3
Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is this used to define the burden of injury at a national level?	Don't know No (1) Some data (1) Adequate/complete data (2)	2
	Are these data used to inform national or provincial policy?	Don't know No (0) Yes (1)	1
	Are data on clinical post-injury outcomes captured routinely by health facilities?	Don't know No (0) Yes partially captured (1) Yes adequately captured (2)	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

<p>Are data on post -injury care patient satisfaction routinely captured?</p>	<p>Don't know No (0) Yes partially captured (1) Yes adequately captured (2)</p>	<p>2</p>
<p>Are these trauma data used in planning services?</p>	<p>Don't know No (0) Yes (1)</p>	<p>1</p>
<p>What is the level of responsiveness of the health system to non-medical needs of injured people (social needs, mental health needs etc) ?</p>	<p>Don't know Health services cater to or assess only medical needs (1) Health services consider other outcomes relevant to patients, for example their opinions on services provided (2)</p>	<p>2</p>
<p>Scores</p>		<p>10</p>
<p>Equity Are there national level financial schemes to ensure the poor who are injured do not have to pay out of pocket direct medical costs of trauma care?</p>	<p>Don't know No scheme (0) Partial scheme (1) All people are covered (2)</p>	<p>2</p>
<p>Are there health policies in place to address inequality in access to care for trauma?</p>	<p>Don't know No policies in place (0) Policies in place for general health equity (1) Policies in place specifically for trauma (2)</p>	<p>2</p>
<p>Are there data which show whether access is equitable or not? And do those data show that access is equitable?</p>	<p>Don't know No data available (0) Data available (1) Data available and show that access is equitable (2)</p>	<p>2</p>

1

2

3		Is the allocation of trauma care staff to districts and hospitals appropriate and based on needs? Do districts in urban centres get more staff than districts in remote areas?	Don't know Less than 2:1 (1) More than 2:1 (0)	1
4				
5				
6				
7				
8				
9		Is there a mechanism to equitably distribute the budget for health or trauma care?	Don't know No (0) Yes (1)	1
10				
11				
12				
13				
14				
15	Scores			8
16				
17				
18				
19	Effectiveness and efficiency	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	Don't know No (0) Yes (1)	1
20				
21				
22				
23				
24		Are there national or provincial guidelines for in-service training of staff on trauma care?	Don't know No (0) Yes (1)	1
25				
26				
27				
28				
29		Is there a pre-hospital referral system (e.g: ambulance service)?	Don't know No (0) Yes (1)	1
30				
31				
32				
33				
34				
35		If pre-hospital referral systems are available, what has been the experience of patients regarding pre hospital referrals?	Don't know Poor (0) Fair (1) Good (2)	2
36				
37				
38				
39				
40				
41				
42		Are local transport operators (e.g: taxis) involved in transporting people to hospital?	Don't know No (0) Yes (1)	1
43				
44				
45				
46				
47				
48	Scores			6
49				
50				
51	Accountability	Are there mechanisms to report failing trauma services to policy makers or regulatory authorities	Don't know No (0) Yes (1)	1
52				
53				
54				
55				
56		Are there any mechanisms of correcting under performance of trauma services?	Don't know No mechanisms (0)	2
57				
58				
59				
60				

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

		Mechanisms of reporting but no onwards mechanisms to improve quality (1)	
		Mechanisms of reporting and mechanisms to improve quality (2)	
Scores			3
Intelligence/Information	Do staff providing trauma services understand what data needs to be captured and do they have the right data capturing tools to enable them do this?	Don't know No understanding and no tools (0) Understanding but no or limited tools (1) Understanding and useful tools (2)	2
Scores			2
Ethics	Is there any policy available for regulating trauma related research?	Don't know No (0) Yes (1)	1
	Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	Don't know No (0) Yes (1)	1
	Are there mechanisms in place in institutes for enforcing high ethical standards in the treatment of trauma patients	Don't know No (0) Yes (1)	1
Scores			3
Overall maximum score			56

Appendix 2 Investigator score for each question and percentage score for each principle and overall for Rwanda, Ghana and South Africa respectively

Principle	Questions	Maximum score for question	Rwanda score	Ghana score	South Africa score
Strategic vision	Is there specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma care?	1	1	1	1
	Is there a national trauma strategy?	1	1	0	0
	What percentage of the country's public health budget goes to trauma care?	2	0	0	2
	Is public sector trauma care provided free of charge?	2	1	1	1
	Is there a national insurance scheme that covers trauma care?	2	2	1	1
	Is there a department within the National Ministry of Health dedicated for trauma?	2	1	1	1
	If the National health plan mentions trauma, or if there are national health policies for trauma care, are there specific objectives relating to trauma and timelines to achieve them?	1	1	0	0
	If you have answered yes to question 7, have any of those specific trauma objectives been implemented?	1	1	0	0
Score for Principle (% of total possible)		12	8 (67%)	4 (33%)	6 (50%)
Participation and consensus	Are stakeholders (e.g: NGOs, private companies) involved in	2	2	2	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

	What is the level of stakeholder engagement/community participation at the national and	1	1	1	1
Score for Principle (% of total possible)		3	3 (100%)	3 (100%)	3 (100%)
Rule of law	Are there guidelines for accreditation of trauma care	2	2	2	1
	Are there laws to enforce a duty of care by hospitals to treat uninsured	2	0	2	2
	Are there laws to protect against trauma? Example Seat belt laws?	2	2	1	2
Score for Principle (% of total possible)		6	4 (67%)	5 (83%)	5 (83%)
Transparency	Is information readily available on financial commitments or allocated budget to trauma care in the public sector at either national or provincial level?	1	1	0	0
	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	2	2	0	0
Score for Principle (% of total possible)		3	3 (100%)	0 (0%)	0 (0%)
Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is	2	2	1	1
	Are these data used to inform national or provincial policy?	1	1	1	1
	Are data on clinical post-injury outcomes captured routinely by	2	2	1	0
	Are data on post-injury care patient satisfaction routinely captured?	2	0	0	0
	Are these trauma data used in planning services?	1	1	1	1
	What is the level of responsiveness of the health system to non-medical needs of injured people (social needs, mental health needs etc)?	2	2	1	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Score for Principle (% of total possible)		10	8 (80%)	5 (50%)	5 (50%)
Equity	Are there national level financial schemes to ensure the poor who are injured do not have to pay out	2	2	1	2
	Are there health policies in place to address inequality in access to care for trauma?	2	1	1	1
	Are there data which show whether access is equitable or not? And do those data show that access is equitable?	2	0	0	0
	Is the allocation of trauma care staff to districts and hospitals appropriate and based on needs? Do districts in urban centres get more staff than districts in remote areas?	1	0	0	0
	Is there a mechanism to equitably distribute the budget for health or trauma care?	1	0	0	0
Score for Principle (% of total possible)		8	3 (38%)	2 (25%)	3 (38%)
Effectiveness and efficacy	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	1	1	0	0
	Are there national or provincial guidelines for in-service training of staff on trauma care?	1	1	1	1
	Is there a pre-hospital referral system (e.g: ambulance service)?	1	1	1	1
	If pre-hospital referral systems are available, what has been the experience of patients regarding pre-hospital referrals?	2	1	1	2
	Are local transport operators (e.g: taxis) involved in transporting	1	1	1	0
Score for Principle (% of total possible)		6	5 (83%)	4 (67%)	4 (67%)

1					
2					
3	Accountability	Are there mechanisms to report failing trauma services to policy	1	0	1
4		Are there any mechanisms of correcting under performance of	2	1	0
5					2
6					
7					
8	Score for Principle (% of total possible)		3	1 (33.3%)	1 (33.3%)
9					3 (100%)
10	Intelligence/information	Do staff providing trauma services understand what data needs to be captured and do they have the right	3	1	1
11					1
12					
13					
14	Score for Principle (% of total possible)		3	1 (33%)	1 (33%)
15					1 (33%)
16	Ethics	Is there any policy available for regulating trauma related research?	1	1	1
17					1
18					
19					
20		Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	1	1	0
21					1
22					
23					
24					
25					
26		Are there mechanisms in place in institutes for enforcing high ethical standards in the treatment of trauma patients?	1	1	1
27					1
28					
29					
30					
31					
32	Score for Principle (% of total possible)		3	3 (100%)	2 (67%)
33					3 (100%)
34					
35	Overall		56	39 (70%)	27 (48%)
36	Total (% maximum overall score)				33 (59%)
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

Appendix table 3: Summary results by principle for each country individually including average score, investigator score, maximum score possible for each question and achieved percentage score (average score and investigator score).

Principle	Maximum scores	Rwanda				Ghana				South Africa			
		Respondent scores (average [%])	Investigator scores (number [%])	% achieved (average scores)	% achieved (Investigator scores)	Respondent scores (average [%])	Investigator scores (number [%])	% achieved (average scores)	% achieved (Investigator scores)	Respondent scores (average [%])	Investigator scores (number [%])	% achieved (average scores)	% achieved (Investigator scores)
Strategic vision	12	8.05	8	67.1%	66.7%	2.07	4	17.30%	33.30%	4.67	6	38.9%	50.0%
Participation and consensus orientation	3	3	3	100.0%	100.0%	1.4	3	46.70%	100%	3	3	100.0%	100.0%
Rule of law	6	4.75	4	79.2%	66.7%	3.16	5	63.20%	83.30%	4.83	5	80.5%	83.3%
Transparency	3	1.8	3	60.0%	100.0%	0.49	0	16.30%	0%	0	0	0.0%	0.0%
Responsiveness of institutions	10	7.65	8	76.5%	80.0%	3.54	5	35.40%	50%	5.25	5	52.5%	50.0%
Equity	8	2.95	3	36.9%	37.5%	1.4	2	17.50%	25%	3.23	3	40.4%	37.5%
Effectiveness and efficiency	6	5.35	5	89.2%	83.3%	3.28	4	54.70%	66.70%	4	4	66.7%	66.7%
Accountability	3	2.1	1	70.0%	33.3%	0.86	1	28.70%	33.30%	2.67	3	89.0%	100.0%
Intelligence/information	2	1.6	1	80.0%	50.0%	0.73	1	36.50%	50%	0.75	1	37.5%	50.0%
Ethics	3	2.6	3	86.7%	100.0%	1.57	2	52.30%	66.70%	2.67	3	89.0%	100.0%
Overall score	56	39.85	39	71.2%	69.6%	18.5	27	33.00%	48.20%	31.07	33	55.5%	58.9%

BMJ Open

Governance for injury care systems in Ghana, South Africa and Rwanda: development and pilot testing of an assessment tool

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-074088.R1
Article Type:	Original research
Date Submitted by the Author:	10-Jul-2023
Complete List of Authors:	The Equi-Trauma, Collaborative; University of Birmingham Institute of Applied Health Research Odland, Maria Lisa; University of Birmingham, Institute of Applied Health Research; St Olavs Hospital Trondheim University Hospital, Department of Obstetrics and Gyneacology Abdul-Latif , Abdul-Malik ; Ghana Health Service, Volta Regional Health Directorate Ignatowicz, Agnieszka ; University of Birmingham Institute of Applied Health Research Bekele, Abebe; University of Global Health Equity Chu, Kathryn; Stellenbosch University Faculty of Medicine and Health Sciences, Centre for Global Surgery, Department of Global Health; University of Botswana, Department of Surgery Howard, Anthony; University of Leeds Leeds Institute of Rheumatic and Musculoskeletal Medicine; University of Oxford, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, National Institute of Health Research (NIHR) Biomedical Centre Stephen, Tabiri; Ghana Hub of NIHR Global Surgery; Tamale Teaching Hospital, Department of Surgery BYIRINGIRO, JEAN CLAUDE; University of Rwanda College of Medicine and Health Sciences; University Teaching Hospital of Kigali, Department of Surgery Davies, Justine ; University of Birmingham, Institute of Applied Health Research; Stellenbosch University Faculty of Medicine and Health Sciences, Centre for Global Surgery, Department of Global Health
Primary Subject Heading:	Global health
Secondary Subject Heading:	Emergency medicine, Global health, Health services research, Health policy
Keywords:	Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Trauma management < ORTHOPAEDIC & TRAUMA SURGERY, ACCIDENT & EMERGENCY MEDICINE, Clinical governance < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60





I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Governance for injury care systems in Ghana, South Africa and Rwanda: development and pilot testing of an assessment tool

The Equi-Trauma Collaborative

Maria Lisa Odland,¹⁻³ Abdul-Malik Abdul-Latif,^{1,4} Agnieszka Ignatowicz,¹ Abebe Bekele,⁵⁻⁶ Kathryn Chu,⁷⁻⁸ Anthony Howard,⁹⁻¹⁰ Stephen Tabiri,¹¹⁻¹² Jean Claude Byiringiro,¹³⁻¹⁴ Justine I Davies^{1,15,16}

1. Institute of Applied Health Research, University of Birmingham, Birmingham, U, K.
2. Department of Obstetrics and Gynecology, St. Olavs University Hospital, Trondheim, Norway
3. Malawi-Liverpool-Wellcome Trust Research Institute, Blantyre, Malawi
4. Volta Regional Health Directorate, Ghana Health Service, Ho, Ghana
5. University of Global Health Equity, Kigali, Rwanda
6. Department of Surgery, Addis Ababa University, Addis Ababa, Ethiopia
7. Centre for Global Surgery, Department of Global Health, Stellenbosch University, Cape Town, South Africa
8. Department of Surgery, University of Botswana, Gaborone, Botswana
9. Leeds Institute of Rheumatic and Musculoskeletal Medicine, School of Medicine, University of Leeds, Leeds, UK
10. Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, National Institute of Health Research (NIHR) Biomedical Centre, University of Oxford, Headington, Oxford, UK
11. Ghana HUB of NIHR Global Surgery, Tamale, Ghana. Department of Public Health, Tamale Teaching Hospital, Tamale, Ghana
12. Department of Surgery, Tamale Teaching Hospital, Tamale, Ghana
13. University of Rwanda, Kigali, Rwanda
14. Department of Surgery, University Teaching Hospital of Kigali, Kigali, Rwanda
15. Centre for Global Surgery, Department of Global Health, Stellenbosch University, Cape Town, South Africa
16. Medical Research Council/Wits University Rural Public Health and Health Transitions Research Unit, Faculty of Health Sciences, School of Public Health, University of the Witwatersrand, Johannesburg, South Africa

Corresponding author:

Agnieszka Ignatowicz, a.m.ignatowicz@bham.ac.uk, University of Birmingham, Birmingham Clinical Trials Unit College of Medical and Dental Sciences, Birmingham B15 2TT, United Kingdom,+44 (0) 121 414 3344

Keywords: Injuries, Governance, Trauma, Health Policy, Public Health

Word count: 3926 excluding title page, abstrac references, figures and tables.

1
2
3 **40 Abstract**
4
5

6 **41 Objectives:** This study aims to evaluate health systems governance for injury care in three
7
8
9 **42** sub-Saharan countries from policymakers' and injury care providers' perspectives.
10

11
12 **43 Setting:** Ghana, Rwanda and South Africa.
13

14
15 **44 Design:** Based on Siddiqi at al.'s framework for governance, we developed an online
16
17 **45** assessment tool for health system governance for injury with 37 questions covering health
18
19 **46** policy and implementation under ten overarching principles of Strategic vision, Participation
20
21 **47** and Consensus orientation, Rule of Law, Transparency, Responsiveness of Institutions, Equity,
22
23 **48** Effectiveness or Efficiency, Accountability, Ethics, and Intelligence/information. A literature
24
25 **49** review was also done to support the scoring. We derived scores using two methods -
26
27 **50** investigator scores and respondent scores.
28
29
30

31
32
33 **51 Participants:** The tool was sent out to purposively selected stakeholders, including
34
35 **52** policymakers and injury care providers in Ghana, Rwanda and South Africa. Data were
36
37 **53** collected between October 2020 and February 2021.
38
39

40
41 **54 Primary and secondary outcomes:** Investigator-weighted and respondent percentage scores
42
43 **55** for health system governance for injury care. This was calculated for each country in total and
44
45 **56** per principle.
46
47

48
49 **57 Results:** Rwanda had the highest overall investigator-weighted percentage score (70%),
50
51 **58** followed by South Africa (59%). Ghana had the lowest overall investigator score (48%). The
52
53 **59** overall results were similar for the respondent scores. Some areas, such as Participation and
54
55 **60** Consensus, scored high in all three countries, whilst other areas, such as Transparency, scored
56
57 **61** very low.
58
59
60

1
2
3 62 **Conclusion:** In this multi-country governance survey, we provide insight into and evaluation
4
5
6 63 of health system governance for trauma in three low and middle-income countries in Sub-
7
8 64 Saharan Africa. It highlights areas of improvement that need to be prioritised, such as
9
10 65 transparency, to meet the high burden of trauma and injuries in low and middle-income
11
12
13 66 countries.
14
15
16 67
17
18
19 68
20
21
22 69
23
24
25 70
26
27
28 71
29
30
31 72
32
33
34 73
35
36
37 74
38
39
40
41 75
42
43
44 76
45
46
47 77
48
49
50 78
51
52
53 79
54
55
56 80
57
58
59 81
60

For peer review only

82 **Strengths and limitations**

- 83 • This is the first study to use an adapted tool to assess health systems governance for
84 injury care in low and middle-income countries.
- 85 • We obtained responses from a range of professionals working with trauma care in
86 three different countries in Sub-Saharan Africa.
- 87 • A major limitation is that we only had five participants in two of the countries (Rwanda
88 and South Africa) and the low number of respondents could have introduced selection
89 bias.
- 90 • If there was no available evidence, the investigators had to weigh the replies from the
91 respondents according to their background, which involved making assumptions
92 about the respondents' knowledge of the subject.
- 93 • This survey tool provides useful insight in the governance of trauma systems in three
94 LMIC countries with different development status.

100

101

102 Introduction

103 Injury is a leading cause of disability globally and responsible for more than 5 million deaths
104 each year.[1] Mortality from injury account for more deaths than tuberculosis (TB), malaria
105 and HIV combined[1], and 90% of these deaths occur in low- and middle-income countries
106 (LMICs).[2] Whilst deaths and disability life years (DALYs) lost from many other conditions are
107 in decline, DALYs from injuries remain stubbornly high. Indeed, deaths from injury are
108 predicted to become the leading cause of death by 2030.[3] Despite improvements in road
109 traffic safety in most high-income countries, many LMICs are now having an increasing
110 number of motorised vehicles and road traffic accidents in addition to other common
111 accidents causing injuries such as falls and burns. Still, only a few LMICs have well-defined
112 trauma systems or trauma registries.[4]

113 The United Nations Development Program defines governance as the exercise of political,
114 economic, and administrative authority in managing a country's affairs at all levels.[5]
115 Governance has long been a critical factor that influences a country's economic growth, social
116 advancement, and general development. It is recognised as especially important for
117 advancing progress towards attaining the Sustainable Development Goals (SDGs) in LMICs.[6]
118 Over recent years, there has been increasing interest in health systems governance with the
119 recognition that good governance leads to better health outcomes for individuals and
120 populations.[6] In 2014 the Lancet-University of Oslo Commission on Global Governance for
121 Health called for a cross-sectoral global action and platform for health governance. This
122 platform may serve as a policy forum to allow the contribution of diverse stakeholders to
123 frame issues, set agendas, and debate policies that affect health and health equity.[7] The
124 World Health Organisation first introduced the term "stewardship" – a part of governance, in

1
2
3 125 the year 2000, and called for strategic policy frameworks that would allow the incorporation
4
5
6 126 of effective oversight, regulation, incentives, and accountability in health governance.[8]
7

8
9 127 Health system governance thus involves setting evidence-based shared strategic visions and
10
11 128 objectives, in addition to making policies, legislation and deploying resources to ensure the
12
13
14 129 goals and objectives are achieved.[9] However, despite its importance in supporting the
15
16 130 delivery of better services and improved health outcomes, little is done to monitor and
17
18 131 evaluate health system governance in LMICs.[10-12] Additionally, literature on health system
19
20 132 governance around trauma care in LMICs is scarce.[13] Previous studies on health system
21
22 133 governance have primarily focused on general health systems functions and particularly on
23
24 134 the role of government in governance and the involvement of communities.[14] Moreover,
25
26 135 the sparse disease-specific literature that exists focuses on the governance of programs for
27
28 136 immunisation[15], TB control[16], mental health care[17-19], and achieving global HIV
29
30 137 goals.[20]
31
32
33
34
35

36 138 Given the prevalence of injuries and the recognised need to invest in health services to
37
38 139 provide trauma care, good governance will be essential to ensure that the care provided is of
39
40 140 high quality and accessible to those who need it. As part of a larger project that identified
41
42 141 barriers in access to quality care for people who have been injured in LMICs[21], we adapted
43
44 142 a tool to assess the health system governance for trauma care in three diverse countries in
45
46 143 Sub-Saharan Africa – Ghana, Rwanda and South Africa. Our aim was to try to understand the
47
48 144 foundations on which to build improved health systems for trauma and injuries in LMICs.
49
50
51
52
53

54 145
55
56
57

58 146
59
60

1
2
3 147
4
5
67 148 **Methods**
8
910 149 **Study setting**
11
12

13 150 The study was conducted in three LMIC countries in sub-Saharan Africa: Ghana, Rwanda and
14
15 151 South Africa which have vastly different development and health systems. Ghana is a lower
16
17 152 middle-income country, an estimated population of 30.4 million people (2019), a life
18
19 153 expectancy of 63.8 years, and a Gross National Income (GNI) per capita of \$2,220.[22] While
20
21 154 health service delivery in the country is largely provided by government, private health
22
23 155 institutions also provide significant proportion of health services to the population.[23] The
24
25 156 National Ambulance Service provides 24-hour pre-hospital care for accidents and
26
27 157 emergencies as part of the care provided by the government.[23] It has been estimated that
28
29 158 7.56% of deaths and 7.24% of disability-adjusted life years (DALYs) in Ghana are due to
30
31 159 trauma.[22, 24]
32
33
34
35
36
37
38 160 Rwanda, a landlocked East African country of 12.6 million people, has a life expectancy of 68.7
39
40 161 years and GNI per capita of \$830.[22] It is classified as a low-income country. Around 9% of
41
42 162 all deaths and 10% of DALYs are due to trauma.[22] Following the near decimation of its
43
44 163 health system by the 1994 genocide, the country has taken steps to strengthen it, giving
45
46 164 autonomy to District Health Services to serve urban and rural zones.[25] It introduced the
47
48 165 Community-Based Health Insurance (CBHI) system in 1999/2000 to provide health insurance
49
50 166 to rural populations.[26] However, the health system is still challenged, and deficiencies exist
51
52 167 in the provision of quality trauma care.[27]
53
54
55
56
57
58
59
60

1
2
3 168 South Africa is an upper-middle-income country, with a population of 68.6 million and a life
4
5
6 169 expectancy of 63.8 years. Injuries are estimated to be responsible for 10% of death and 11%
7
8 170 of DALYs.[22, 24] South Africa has the third biggest economy in Africa and a GNI per capita of
9
10 171 \$6,040.[22] Most South Africans (84%) access health services through government clinics,
11
12
13 172 whilst the more affluent people go to private hospitals.[28]

16 173 **Data collection**

17
18
19 174 Building on the framework and tool developed by Siddiqi et al.[6] for assessing the health
20
21 175 system governance in developing countries, we developed an assessment tool for
22
23 176 injury/trauma health system governance with 37 questions covering health policy and
24
25 177 implementation using the ten overarching principles outlined by Siddiqi et al.: Strategic vision,
26
27 178 Participation and Consensus orientation, Rule of Law, Transparency, Responsiveness of
28
29 179 Institutions, Equity, Effectiveness or Efficiency, Accountability, Ethics, and
30
31 180 Intelligence/information (Appendix 1 and Table 1). Adjustments to the original tool were
32
33 181 made to tailor the questions to trauma; these were made based on discussions between the
34
35 182 authors of this paper. The resultant tool was piloted for acceptability and comprehensibility
36
37 183 before use. Data were collected over a five-month period from October 2020 to February
38
39 184 2021 by participants self-completing an online Word or Google form, based on their
40
41 185 preference. Participants were requested to select a single response for each question and
42
43 186 included a free text field for notes, and provision of evidence to support their responses was
44
45 187 encouraged. All responses were imported and analysed in Microsoft Excel.

46
47 188 An extensive review of grey and published literature documents was also done to support the
48
49 189 assessment, particularly the scoring.

50
51
52
53
54
55
56
57
58
59
60 190

191 **Survey respondent selection**

192 Our aim was to recruit participants from health policy or senior leaders in trauma care
193 provision in each country. Given that we expected potential participants to have sound
194 knowledge of the policy and governance context for injury care in their countries, we aimed
195 for a sample size of 5-8 respondents. We contacted potential participants until at least the
196 minimum number was achieved. A combination of purposive and snowball sampling was used
197 to recruit respondents, with potential participants identified with the support of in-country
198 senior researchers within injury care. Emails were sent to potential participants to request
199 their participation in the study; for each invited participant, two further reminders were sent.

200 **Grey literature search**

201 We also searched for and reviewed program documents, policies, annual reports, and
202 standard operating procedures for each country. Searching was done through the websites
203 of government organisations at the national and sub-national level, websites of international
204 organisations, and the Google search engine. The search terms included the country name
205 and trauma policy, trauma law, strategic plan for trauma, injury, injury work plan, injury
206 policy, injury care, trauma care, injury guidelines, trauma guidelines, and combinations of
207 these. There was no restriction on the year of publication.

208 **Scoring**

209 Scoring was done separately for each country. For each principle there were already a set
210 number of questions outlined by Siddiqi et al. to give a maximum score. Responses were
211 awarded points for each question and treated as binary categorical (0 or 1) or ordinal (0, 1 or
212 2) (see appendices). We derived scores using two methods - investigator-weighted scores

1
2
3 213 and respondent scores. For the respondent scores, the mean score across respondents for
4
5
6 214 each question was computed as the average score from the responses for each question.
7
8 215 Given that the response rate for each country differed, the denominator (n) varied based on
9
10 216 the number of responses: 11 for Ghana, 5 for Rwanda and 5 for South Africa.

11
12
13 217 Whilst the investigator-weighted scores considered the following to derive a final score for
14
15
16 218 each question: results from respondents, respondents' professional roles, and the availability
17
18 219 of evidence from policy documents and the grey literature searches. These investigator scores
19
20 220 were derived after discussions between the authors. Consideration of the respondent's
21
22 221 professional roles depended on the question asked; more emphasis was given to responses
23
24 222 from policymakers rather than trauma care providers for policy-related questions, and more
25
26 223 was given to trauma care providers for questions related to service provision. So, for example,
27
28 224 if a trauma care provider gave a score of 0, and the policymaker gave a score of 2 on a question
29
30 225 related to policy, such as; "*are there legal documents of injury care?*", the question would
31
32 226 receive a final score of 2 as the policymaker was more likely to have up-to-date knowledge. If
33
34 227 a policy document was available to answer a question definitively, the literature took
35
36 228 precedence over respondents. This process was done through discussions between two
37
38 229 authors: AMAL and MLO. When there were disagreements, third and fourth investigators
39
40 230 served as arbiters (AI and JD).

41
42
43 231 Both investigator scores and the average respondent scores for each principle were calculated
44
45 232 by dividing the achieved score in each country by the total score possible to achieve and
46
47 233 multiplying it by 100. Comparisons across countries are described for each of the 10 Principles
48
49 234 and overall.
50
51
52
53
54
55
56
57
58
59
60

235 **Table 1. Applying Siddiqi et al. governance framework to trauma care systems in Ghana,**
 236 **Rwanda and South Africa. Questions for each governance principle are in table 3**

S/N	Governance principle	Explanation of principles based upon from Siddiqi et al (2008)	Domain captured for trauma care	Maximum score for principle
1	Strategic vision	Through an understanding of the historical, cultural and social complexities of society, leaders have a strong sense of direction for the achievement of long and broad health and human development goals.	There is a detailed long term strategic plans to improve trauma care	12
2	Participation and consensus orientation	Everyone or interest groups or institutions acting on behalf of everyone should be given the chance to have a say in relation to decisions about health. This is built on the principle of freedom of association and speech as well as capacities to participate constructively. Good governance should be able to mediate between differing opinions among stakeholders on health, policies and procedures in order to reach a mutual understanding that is beneficial for all.	There is stakeholder participation and level of engagement in policy formulation and implementation for trauma	3
3	Rule of law	Legal frameworks or policies relating to human rights on health especially should be applied impartially	There is availability and enforcement of laws, guidelines, policies to support trauma care	6
4	Transparency	There should be free flow of information on all health matters. There should be enough information available to all to not only monitor but also understand health matters. Processes, institutions and information should be directly accessible to those concerned with them.	There is transparency on commitments to trauma and available information on indicators and other trauma related information for providers (district) involved in local trauma service provision	3

5	Responsiveness	Institutions and processes should promptly serve all stakeholders and ensure that their health and non-health needs are met without delays	Trauma systems are responsive to trauma care needs of the population	10
6	Equity and inclusiveness	Everyone should have the opportunity to improve or maintain their health and well being	There is equity in access to quality trauma care	8
7	Effectiveness and efficiency	Institutions and processes should maximize available resources to render best health care services according to population needs, as well as influence improved health outcomes	There is the existence of organisational capacity including human resource, communication processes to support quality trauma provision	6
8	Accountability	People put in positions of trust from government, the private sector and civil society organisations should be accountable to the public and institutional stakeholders. Accountability in this sense varies depending on the type of institution or organisation and whether or not decisions are for internal or external purposes	There is evidence of accountability between service providers and users in the provision of trauma care	3
9	Intelligence and information	Essentials for understanding of the health system to guide the implementation of good policies that are based on empirical data to influence the behaviour of different interest groups that support the strategic vision for health.	There is availability of tools and capacity to capture trauma care data	2
10	Ethics	Widely accepted principles of health care ethics; non-maleficence, beneficence and justice. This also includes ethics in health care research essential to safeguard the interest and rights of the patients.	There is enforcement of high ethical standards in trauma care provision and research	3
	Maximum score			56

237

238

1
2
3 **239 Patient and public involvement**
4
5

6 240 It was not appropriate or possible to involve patients or the public in the design, or conduct,
7
8 241 or reporting, or dissemination plans of our research.
9
10

11
12 242

13
14
15 **243 Results**
16

17
18 244 Table 2 shows a breakdown of the number of respondents from each country and their
19
20 245 employment role at the time of completing the survey. Respondents were made up of key
21
22 246 officials employed directly by or advising Department or Ministry of Health, trauma care
23
24 247 providers (some of whom were also involved in research), and government officials. Thirteen
25
26 248 potential respondents were contacted from each country.
27
28
29

30
31 **249 Table 2. Breakdown of respondents from each country and their characteristics**
32

S/N	Country	No of potential participants contacted	No of respondents	No of policy respondents	No of trauma care providers
1	Ghana	13	11	3	8
2	Rwanda	13	5	3	2
3	South Africa	13	5	3	2

33
34
35
36
37
38
39
40
41
42
43 250

44
45
46 251 Appendix table 2 shows the investigator score for each country according to each question
47
48 252 and percentage score for each principle and overall for each country. Some of the
49
50 253 respondents provided evidence to support their answers such as policy documents and peer-
51
52 254 reviewed papers.
53

54
55
56 255 Rwanda had the highest overall investigator percentage score (70%) followed by South Africa
57
58 256 (59%). Ghana had the lowest overall investigator percentage score (48%) (Table 3). The overall
59
60

257 results were similar for the respondent average percentage score, with Rwanda scoring 39.85
 258 (71%) in total, South Africa 31.07 (56%) and Ghana 18.5 (33%) (Appendix Table 3 – with both
 259 percentage scores shown for comparison).

261 **Table 3 Investigator score for each question and percentage score for each principle and**
 262 **overall for Rwanda, Ghana and South Africa, respectively**

Principle	One question out of many questions asked in this principles	Maximum score for questions	Rwanda score	Ghana score	South Africa score
Strategic vision	Is there specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma care?	12	8 (67%)	4 (33%)	6 (50%)
Participation and consensus	What is the level of stakeholder engagement/community in participation at the national and provincial level in trauma policy and related interventions?	3	3 (100%)	3 (100%)	3 (100%)
Rule of law	Are there guidelines for accreditation of trauma care providers (doctors, nurses, etc) and are these enforced?	6	4 (67%)	5 (83%)	5 (83%)
Transparency	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	3	3 (100%)	0 (0%)	0 (0%)

Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is this used to define the burden of injury at a national level?	10	8 (80%)	5 (50%)	5 (50%)
Equity	Are there national level financial schemes to ensure the poor who are injured do not have to pay out of pocket direct medical costs of trauma care?	8	3 (38%)	2 (25%)	3 (38%)
Effectiveness and efficacy	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	6	5 (83%)	4 (67%)	4 (67%)
Accountability	Are there mechanisms to report failing trauma services to policy makers or regulatory authorities?	3	1 (33.3%)	1 (33.3%)	3 (100%)
Intelligence/information	Do staff providing trauma services understand what data needs to be captured and do they have the right data capturing tools to enable them to do this?	3	1 (33%)	1 (33%)	1 (33%)
Ethics	Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	3	3 (100%)	2 (67%)	3 (100%)
Overall Total (% maximum overall score)					
		56	39 (70%)	27 (48%)	33 (59%)

263

264 Considering the investigator scores, Rwanda had the highest scores for each Principle except
 265 for Equity. Participation and consensus, in particular had a very high score in Rwanda (100%),
 266 whilst the other scores were between 70-80%, apart from Strategic vision (66.7%) and Equity
 267 (37.5%). Like Rwanda, South Africa also had high investigator-weighted scores overall but had

1
2
3 268 low scores for Strategic vision (50.0%), Equity (37.5%), and Intelligence and Information
4
5
6 269 (50.0%). For Transparency, South Africa had a score of 0%. On the other hand, South Africa
7
8 270 had high scores for Participation and consensus orientation (100%), Rule of Law (83.3%),
9
10 271 Accountability (100%) and Ethics (100%). Responsiveness of institutions (50.0%) and
11
12 272 Effectiveness and efficiency (66.7% and 66.7%) received medium-high scores. Ghana's highest
13
14 273 scores were for the Principles of Rule of Law (83.30%), Effectiveness and Efficiency (66.70%)
15
16 274 and Ethics (66.70%). However, the scores were low for the other Principles, especially
17
18 275 Strategic Vision (33.30%), Transparency (0%), Equity (25%) and Accountability (33.30%). This
19
20 276 gave Ghana the overall lowest score in the Governance Assessment for Trauma with an
21
22 277 investigator score of 48.20% (see Table 3). The only Principle that received a 100%
23
24 278 investigator score in all the countries was Participation and consensus orientation.
25
26
27
28
29
30
31 279 Discrepancies between investigator scores and average respondent scores were mostly seen
32
33 280 in Ghana, where the overall scores were 33.0% versus 48.20%, respectively (Table 4 and
34
35 281 Appendix table). There were fairly large discrepancies for almost all the Principles except for
36
37 282 Equity (17.5% versus 25%), Effectiveness and efficiency (54.7% versus 66.70%), and
38
39 283 Accountability (28.70% versus 33.30%) (Appendix 2). The average respondent and
40
41 284 investigator percentage scores for each Principle were more similar for the other two
42
43 285 countries. In Rwanda, the overall average respondent percentage score was 71.2%, and the
44
45 286 average percentage investigator score was 69.6%. Most of the individual Principles had similar
46
47 287 respondent percentage scores except for Transparency (60.0% versus 100.0%), Accountability
48
49 288 (70.0% versus 33.3%) and Intelligence and Information (80.0% versus 50.0%). In South Africa,
50
51 289 the overall average respondent percentage score was 55.5%, and the overall investigator
52
53 290 percentage score was 58.9%. Similar to Rwanda, the individual Principle scores were more or
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

291 less similar except for those of Strategic vision (38.9% versus 50.0%), Accountability (89.0%
292 versus 100.0%), Intelligence/information (37.5% and 50.0%) and Ethics (89.0% versus 100%).

293

For peer review only

294 **Table 4 Summary results by principle for each country individually including achieved percentage score (average score and investigator score)**

		Rwanda		Ghana		South Africa	
Principle	Maximum scores	% achieved (Respondent scores)	% achieved (Investigator scores)	% achieved (Respondent scores)	% achieved (Investigator scores)	% achieved (Respondent scores)	% achieved (Investigator scores)
Strategic vision	12	67.1%	66.7%	17.30%	33.30%	38.9%	50.0%
Participation and consensus orientation	3	100.0%	100.0%	46.70%	100%	100.0%	100.0%
Rule of law	6	79.2%	66.7%	63.20%	83.30%	80.5%	83.3%
Transparency	3	60.0%	100.0%	16.30%	0%	0.0%	0.0%
Responsiveness of institutions	10	76.5%	80.0%	35.40%	50%	52.5%	50.0%
Equity	8	36.9%	37.5%	17.50%	25%	40.4%	37.5%
Effectiveness and efficiency	6	89.2%	83.3%	54.70%	66.70%	66.7%	66.7%
Accountability	3	70.0%	33.3%	28.70%	33.30%	89.0%	100.0%
Intelligence/information	2	80.0%	50.0%	36.50%	50%	37.5%	50.0%
Ethics	3	86.7%	100.0%	52.30%	66.70%	89.0%	100.0%
Overall score	56	71.2%	69.6%	33.00%	48.20%	55.5%	58.9%

295

296 Discussion

297 To the best of our knowledge, this is the first study that has assessed governance for trauma
298 health systems across multiple countries. The application of our adapted tool revealed
299 strengths and weaknesses in policies and governance of trauma care in Ghana, South Africa
300 and Rwanda. Rwanda achieved fairly high scores (70%), compared to South Africa (59%), and
301 Ghana, which had the lowest score (40%). However, considering the massive burden of
302 injuries and trauma in these countries, our results suggest that there is room for improvement
303 even in the higher-performing countries. At the same time, the gap between the burden of
304 disease and available governance systems and structures was especially seen in Ghana. –The
305 benefits in policies can be seen when considering the free maternal health care policy which
306 has been vital in ensuring access to health care for women and children, but policies do not
307 exist for injuries and trauma care.[29]

308 Rwanda scored relatively highly in our survey. This could be because having successfully
309 achieved the MDGs, Rwanda has committed to reducing morbidity and mortality due to
310 injuries.[8, 30] This includes developing policies, training healthcare providers, investing in
311 data collection, and hosting its first national symposium on trauma and injuries in 2019.[31]
312 Hence there has been a focus on improving health systems to care for patients with injuries
313 in the last few years. There is still high mortality and morbidity from injuries in the country.
314 Still, interventions following recent policies and prioritisation of trauma care coupled with
315 efforts to prevent injuries, for example, the recent introduction of speed cameras in urban
316 areas, will likely improve the situation in the coming years.

317 Given the level of development – being the only upper-middle income country in our study,
318 it is surprising that South Africa had mediocre percentage scores of around 50%. Many LMICs

1
2
3 319 have a high burden of injuries and trauma, but South Africa has a relatively large burden of
4
5
6 320 homicide, violence and stabbings.[32] In addition to this, there are other common injuries,
7
8 321 such as road traffic accidents and burns. Even though there are programs, services, and
9
10 322 ongoing research on this topic, government stewardship and leadership has been absent.[32]
11
12
13 323 Prevention of violence and injury should be a strategic priority for government programmes
14
15 324 and policies, and this requires governance and leadership; there are valuable lessons that
16
17 325 South Africa can learn from its own excellent governance structures for HIV care.[33]
18
19
20
21 326 Overall our results emphasise that more efforts are needed to strengthen overall governance
22
23 327 for injury care, considering how crucial governance is to achieve Universal Health Coverage
24
25 328 (UCH).[34] Finance cannot be neglected in this process. However, it is also critical to focus on
26
27 329 the Principles that were particularly weak in this study (transparency, accountability and
28
29 330 intelligence/information), to improve the effectiveness of the health sector.[34] In
30
31 331 particular, accountability and the correction of trauma care underperformance will remain
32
33 332 issues without adequate data generation. Whereas, WHO has developed a trauma registry
34
35 333 for LMIC settings that can be tailored to individual country needs, uptake at national levels is
36
37 334 lacking, and the use of data collected for health service quality improvement is
38
39 335 underdeveloped. Rwanda is the only country in our study that uses the WHO-based trauma
40
41 336 registry, and this is only used in five hospitals and without an active quality improvement
42
43 337 program, although there are plans to develop this.[30]
44
45
46
47
48 338 Another thing that was evident in our findings was the difference between the investigator
49
50 339 and respondent scores. Rwanda had the highest score regardless of the scoring system used,
51
52 340 and the overall investigator and respondent scores were similar. However, in the other two
53
54 341 countries, the respondent score was lower than the investigator score, especially in Ghana,
55
56
57
58
59
60

1
2
3 342 which had the lowest scores altogether. The difference between the respondent and
4
5
6 343 investigator scores suggests that many respondents are unaware of relevant
7
8 344 policies/governance structures for trauma in their respective countries. Awareness of these
9
10
11 345 is the first step to using them in order to improve injury and trauma care in the respective
12
13 346 countries.[35] Policies are useless if the people in charge of implementing them are unaware
14
15 347 of them. According to our survey, this is mostly an issue in Ghana, but also somewhat in South
16
17
18 348 Africa.

19
20
21 349 This study also revealed some interesting findings in relation to “Participation and consensus
22
23
24 350 orientation”, as it was the only principle where all three countries scored 100%. More
25
26 351 involvement of stakeholders may improve service delivery and reduce barriers to accessing
27
28 352 quality care for injuries after trauma. But, this isn't necessarily the case, as seen in Nigeria,
29
30
31 353 where an increased involvement of stakeholders in the formulation and implementation of
32
33
34 354 TB policies did not necessarily result in good TB control in the community and the health
35
36 355 services in the country.[16]

37
38
39
40 356 It is likely that multiple components of governance need to be in place – in combination with
41
42 357 the awareness of these – for the improvement of healthcare systems. For example, in
43
44
45 358 Ethiopia, improved health system governance was expected to impact critically on scaling up
46
47 359 mental health care within primary care facilities.[17] The presence of high-level government
48
49
50 360 support was thought to be a strength along with a National Mental Health Strategy. But
51
52 361 unfortunately, there was still a very low baseline awareness of mental health care planning
53
54 362 and a lack of leadership and coordination of mental health planning at the national and district
55
56
57 363 level. Indeed, a qualitative study using Siddiqi's framework for mental health governance in
58
59 364 South Africa found that facilitating factors to implementing integrated mental health care
60

1
2
3 365 were using task-sharing models and establishment of district mental health teams to facilitate
4
5
6 366 the development, and implementation of mental health care plans. The challenges were weak
7
8 367 managerial and planning capacity to develop health care at the provincial and district level.
9
10 368 All of which speak to the need for knowledge and implementation of governance structures
11
12
13 369 for the improvement of healthcare. Hence to strengthen health care delivery there is a critical
14
15 370 need to strengthen leadership and coordination, and implementation at all levels; national,
16
17 371 regional, district, and down to individual healthcare facilities. There are valuable lessons from
18
19
20 372 these other disease areas that can be used for governance structures to improve trauma care
21
22
23 373 systems.

24
25
26 374 In this survey, we managed to obtain responses from a range of professionals working with
27
28
29 375 trauma care in three different countries in Sub-Saharan Africa. However, a major limitation is
30
31 376 that we only had five participants in two of the countries (Rwanda and South Africa) and found
32
33
34 377 soliciting the involvement of respondents difficult, despite having researchers with links to
35
36 378 policy makers leading the study in each country. The low number of respondents could have
37
38
39 379 introduced selection bias. We tried to overcome this bias using an investigator score.
40
41 380 However, we may have found different results if we had achieved greater numbers of
42
43
44 381 participants from each country. Nevertheless, our results have face validity, considering that
45
46 382 injury care has been an area of focus in Rwanda [31], and Rwanda scored highest in our
47
48
49 383 governance survey. The investigator scores also had their limitations. If there was no available
50
51 384 evidence the investigators had to weigh the replies from the respondents according to their
52
53
54 385 background, which involved making assumptions about the respondents' knowledge of the
55
56 386 subject. We did our best to make sure the investigator scores were correct by checking the
57
58 387 grey literature and available information. Our scoring system has not been validated and we
59
60

1
2
3 388 cannot be certain that the scores were always reflective of the true trauma systems
4
5
6 389 governance of that country, or that one country is doing better than the other. Another
7
8 390 limitation was that there was only one question focusing on injury prevention in our survey.
9
10
11
12 391 Nevertheless, our study is novel in looking at governance assessment for injuries in LMICs.
13
14 392 This survey tool provides useful insight in the governance of trauma systems in three LMIC
15
16 393 countries with different development status and provides evidence that governance systems
17
18 394 for trauma need to be improved in certain areas in order to face the high burden of injuries
19
20
21 395 in LMICs in the years to come.
22
23
24

25 396 **Conclusions**

26
27
28 397 In this multi-country governance survey, we have shown that the governance structures for
29
30 398 trauma is limited in three different countries in Sub-Saharan Africa; Ghana, Rwanda and South
31
32
33 399 Africa. Some areas, such Participation and consensus, scored high in all three countries whilst
34
35
36 400 other areas such Transparency scored very low. This study provides insight into the
37
38 401 governance of trauma systems in these three countries and highlights areas that need to be
39
40
41 402 prioritised in the years to come in order to meet the high burden of trauma and injuries.
42
43 403 Assessment of the health systems governance for trauma, as we did in this study, provides
44
45
46 404 evidence that should not only stimulate more research in this area but also support advocacy
47
48 405 efforts to advance trauma care systems.
49
50

51 406

52
53
54 407

55
56
57 408
58
59
60

1
2
3 409 **Contributorship statement**
4
5

6 410 The study was designed by MLO, AA, AI and JD. MLO, AA, KC, AB, ST and JCB contributed to
7
8 411 the data collection. MLO, AA, AI and JD did the analysis and interpretation of results. MLO,
9
10 412 AA, AI and JD drafted the manuscript. All authors reviewed the results and approved the final
11
12
13 413 version of the manuscript.
14
15

16 414 **Competing interest**
17
18

19
20 415 The authors declare no conflict of interest.
21
22

23 416 **Funding**
24
25

26 417 This research was funded by the National Institute for Health and Care Research grant number
27
28 418 130036.
29
30

31 419 **Data sharing statement**
32
33

34 420 The data that support the findings of this study are available on reasonable request from the
35
36 421 corresponding author, AI.
37
38
39

40 422 **Ethics statement**
41
42

43 423 The overall study was approved by University of Birmingham Research Ethics Committee, UK
44
45 424 (ERN_20- 00880).
46
47
48

49 425 **Acknowledgements**
50
51

52 426 We would like to acknowledge to all of the participants in our study, who generously shared
53
54 427 their time, experiences, and insights with us.
55
56
57

58 428
59
60

429

430

431

432 **References**

- 433 1. World Health Organisation. *Injuries and Violence the Facts*. 2014; Available from:
434 <https://apps.who.int/iris/rest/bitstreams/668802/retrieve>.
- 435 2. Gosselin, R.A., et al., *Injuries: the neglected burden in developing countries*. Bull World Health
436 Organ, 2009. **87**(4): p. 246-246a.
- 437 3. Mathers, C.D. and D. Loncar, *Projections of global mortality and burden of disease from 2002*
438 *to 2030*. PLoS Med, 2006. **3**(11): p. e442.
- 439 4. Whitaker, J., et al., *Assessing trauma care systems in low-income and middle-income countries:*
440 *a systematic review and evidence synthesis mapping the Three Delays framework to injury*
441 *health system assessments*. BMJ Glob Health, 2021. **6**(5).
- 442 5. United Nations. *Human Development Report*. 1997; Available from:
443 http://hdr.undp.org/sites/default/files/reports/258/hdr_1997_en_complete_nostats.pdf.
- 444 6. Siddiqi, S., et al., *Framework for assessing governance of the health system in developing*
445 *countries: gateway to good governance*. Health Policy, 2009. **90**(1): p. 13-25.
- 446 7. Ottersen, O.P., et al., *The political origins of health inequity: prospects for change*. Lancet,
447 2014. **383**(9917): p. 630-67.
- 448 8. World Health Organisation. *Everybody's business: Strengthening health systems to improve*
449 *health outcomes*. 2007; Available from:
450 https://www.who.int/healthsystems/strategy/everybodys_business.pdf.
- 451 9. Lewis M. and Petterson G. *Governance in Health Care Delivery*. 2009; Available from:
452 <https://poseidon01.ssrn.com/delivery.php?ID=538097071083084007079107106066114005010087014021019030101052032018059029044024014036025095087006090007037092008070123064093068026009089080094025102105080027103111123030016094008003098115064&EXT=pdf&INDEX=TRUEw>.
- 456 10. Mugisha, J., J. Ssebunnya, and F.N. Kigozi, *Towards understanding governance issues in*
457 *integration of mental health into primary health care in Uganda*. Int J Ment Health Syst, 2016.
458 **10**: p. 25.
- 459 11. Bossert, T.J., *Health systems*. Health Policy Plan, 2012. **27**(1): p. 8-10.
- 460 12. Cole, E., *The national major trauma system within the United Kingdom: inclusive regionalized*
461 *networks of care*. Emergency and Critical Care Medicine, 2022. **2**(2): p. 76-79.
- 462 13. Reynolds, T.A., et al., *The Impact of Trauma Care Systems in Low- and Middle-Income*
463 *Countries*. Annu Rev Public Health, 2017. **38**: p. 507-532.
- 464 14. Rosato, M., et al., *Community participation: lessons for maternal, newborn, and child health*.
465 Lancet, 2008. **372**(9642): p. 962-71.
- 466 15. Grundy, J., *Country-level governance of global health initiatives: an evaluation of*
467 *immunization coordination mechanisms in five countries of Asia*. Health Policy Plan, 2010.
468 **25**(3): p. 186-96.
- 469 16. Ogbuabor, D.C. and O.E. Onwujekwe, *Governance of tuberculosis control programme in*
470 *Nigeria*. Infect Dis Poverty, 2019. **8**(1): p. 45.
- 471 17. Hanlon, C., et al., *Health system governance to support scale up of mental health care in*
472 *Ethiopia: a qualitative study*. Int J Ment Health Syst, 2017. **11**: p. 38.

- 1
2
3 473 18. Petersen, I., et al., *Strengthening mental health system governance in six low- and middle-*
4 474 *income countries in Africa and South Asia: challenges, needs and potential strategies.* Health
5 475 Policy Plan, 2017. **32**(5): p. 699-709.
- 6 476 19. Marais, D.L. and I. Petersen, *Health system governance to support integrated mental health*
7 477 *care in South Africa: challenges and opportunities.* Int J Ment Health Syst, 2015. **9**: p. 14.
- 8 478 20. Khalid, H. and A.M. Fox, *Political and Governance Challenges to Achieving Global HIV Goals*
9 479 *with Injecting Drug Users: The Case of Pakistan.* Int J Health Policy Manag, 2019. **8**(5): p. 261-
10 480 271.
- 11 481 21. Odland, M.L., et al., *Equitable access to quality trauma systems in low-income and middle-*
12 482 *income countries: assessing gaps and developing priorities in Ghana, Rwanda and South*
13 483 *Africa.* BMJ Global Health, 2022. **7**(4): p. e008256.
- 14 484 22. The World Bank. *World Bank Open Data.* 2021; Available from: <https://data.worldbank.org/>.
- 15 485 23. Ghana Health Service Ministry of Health. *Ghana Health Service 2014 Annual Report.* 2014;
16 486 Available from: [https://www.ghanahealthservice.org/downloads/Ghana_Health_Service_2014_Annual_Rep](https://www.ghanahealthservice.org/downloads/Ghana_Health_Service_2014_Annual_Report.pdf)
17 487 [ort.pdf](https://www.ghanahealthservice.org/downloads/Ghana_Health_Service_2014_Annual_Rep).
18 488
- 19 489 24. Institute for Health Metrics and Evaluation. *Country profiles.* Available from:
20 490 <http://www.healthdata.org/results/country-profiles>.
- 21 491 25. The DHS Program. *Rwanda: Standard DHS, 2019-20.* 2020.
- 22 492 26. Nyandekwe, M., M. Nzayirambaho, and J.B. Kakoma, *Universal health insurance in Rwanda:*
23 493 *major challenges and solutions for financial sustainability case study of Rwanda community-*
24 494 *based health insurance part I.* Pan Afr Med J, 2020. **37**: p. 55.
- 25 495 27. Ntakiyiruta, G., et al., *Trauma care and referral patterns in Rwanda: implications for trauma*
26 496 *system development.* Can J Surg, 2016. **59**(1): p. 35-41.
- 27 497 28. Mahlahti P. and Dlamini J. *MINIMUM DATA SETS FOR HUMAN RESOURCES FOR HEALTH AND*
28 498 *THE SURGICAL WORKFORCE IN SOUTH AFRICA'S HEALTH SYSTEM.* 2015; Available from:
29 499 https://www.who.int/workforcealliance/031616south_africa_case_studiesweb.pdf.
- 30 500 29. Adu, J., S. Mulay, and M.F. Owusu, *Reducing maternal and child mortality in rural Ghana.* Pan
31 501 Afr Med J, 2021. **39**: p. 263.
- 32 502 30. Jayaraman, S., et al., *Building Trauma and EMS Systems Capacity in Rwanda: Lessons and*
33 503 *Recommendations.* Ann Glob Health, 2021. **87**(1): p. 104.
- 34 504 31. Rosenberg, A., et al., *First Rwanda National Trauma Symposium 2019: Challenges and*
35 505 *priorities.* J Glob Health, 2020. **10**(1): p. 010201.
- 36 506 32. Seedat, M., et al., *Violence and injuries in South Africa: prioritising an agenda for prevention.*
37 507 *Lancet*, 2009. **374**(9694): p. 1011-1022.
- 38 508 33. Lodge, T., *The politics of HIV/AIDS in South Africa: government action and public response.*
39 509 *Third World Quarterly*, 2015. **36**(8): p. 1570-1591.
- 40 510 34. Fryatt, R., S. Bennett, and A. Soucat, *Health sector governance: should we be investing more?*
41 511 *BMJ Glob Health*, 2017. **2**(2): p. e000343.
- 42 512 35. Olafsdottir, A.E., et al., *Health systems performance in sub-Saharan Africa: governance,*
43 513 *outcome and equity.* BMC Public Health, 2011. **11**: p. 237.

514

Appendix table 1. Copy of the governance survey

Principle	Questions	Responses (please circle one response for each question)	Maximum score
Strategic vision	Is there a specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma	Don't know No (0) Yes (1)	1
	Is there a national trauma strategy?	Don't know No (0) Yes (1)	1
	What percentage of the country's health budget goes to trauma care?	Don't know <10% (0) 10-20% (1) >20% (2)	2
	Is public sector trauma care provided free of charge	Don't know No-not at all (0) Partly (1) Yes-fully (2)	2
	Is there a national insurance scheme that covers trauma care	Don't know No-not at all (0) Partly (1) Yes-fully (2)	2
	Is there a department within the National Ministry of Health dedicated for trauma?	Don't know No department for trauma at all (0) Department for trauma included in another department (1) Stand-alone department for trauma (2)	2
	If the National health plan mentions trauma, or if there are national health policies for trauma care, are there specific objectives	Don't know No (0)	1

1

2

3		relating to trauma and timelines to achieve them?	Yes (1)	
4				
5				
6				
7		If you have answered yes to question 7, have any of those specific trauma objectives been implemented?	Don't know No (0) Yes (1)	1
8				
9				
10				
11				
12				
13	Scores			12
14				
15				
16	Participation and consensus orientation	Are stakeholders (e.g: NGOs, private companies) involved in health policy formulation for trauma?	Don't know No organisation is involved (0) 1-3 organisations are involved (1) > 3 organisations are involved (2)	2
17				
18				
19				
20				
21				
22				
23				
24				
25				
26		What is the level of stakeholder engagement/community participation at the national and provincial level in trauma policy and related interventions?	Don't know No involvement at all (0) These groups are involved (1)	1
27				
28				
29				
30				
31				
32	Scores			3
33				
34	Rule of law	Are there guidelines for accreditation of trauma care providers (doctors, nurses, etc) and are these enforced?	Don't know No guidelines present (0) Guidelines present are not enforced (1) Guidelines present and enforced (2)	2
35				
36				
37				
38				
39				
40				
41				
42				
43				
44		Are there laws to enforce a duty of care by hospitals to treat uninsured trauma patients?	Don't know No laws (0) Laws present are not enforced (1) Laws present and enforced (2)	2
45				
46				
47				
48				
49				
50				
51				
52				
53		Are there laws to protect against trauma? Example Seat belt laws?	Don't know No laws (0) Laws present are not enforced (1)	2
54				
55				
56				
57				
58				
59				

60

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

		Laws present and enforced (2)	
Scores			6
Transparency	Is information readily available on financial commitments or allocated budget to trauma care in the public sector at either national or provincial level?	Don't know Don't know No (0) Yes (1)	1
	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	Don't know No trauma related criteria for assessment (0) Trauma related criteria for assessment is used, but not available (1) Trauma related criteria for assessment is used and available (2)	2
Scores			3
Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is this used to define the burden of injury at a national level?	Don't know No (1) Some data (1) Adequate/complete data (2)	2
	Are these data used to inform national or provincial policy?	Don't know No (0) Yes (1)	1
	Are data on clinical post-injury outcomes captured routinely by health facilities?	Don't know No (0) Yes partially captured (1) Yes adequately captured (2)	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

<p>Are data on post -injury care patient satisfaction routinely captured?</p>	<p>Don't know No (0) Yes partially captured (1) Yes adequately captured (2)</p>	<p>2</p>
<p>Are these trauma data used in planning services?</p>	<p>Don't know No (0) Yes (1)</p>	<p>1</p>
<p>What is the level of responsiveness of the health system to non-medical needs of injured people (social needs, mental health needs etc) ?</p>	<p>Don't know Health services cater to or assess only medical needs (1) Health services consider other outcomes relevant to patients, for example their opinions on services provided (2)</p>	<p>2</p>
<p>Scores</p>		<p>10</p>
<p>Equity Are there national level financial schemes to ensure the poor who are injured do not have to pay out of pocket direct medical costs of trauma care?</p>	<p>Don't know No scheme (0) Partial scheme (1) All people are covered (2)</p>	<p>2</p>
<p>Are there health policies in place to address inequality in access to care for trauma?</p>	<p>Don't know No policies in place (0) Policies in place for general health equity (1) Policies in place specifically for trauma (2)</p>	<p>2</p>
<p>Are there data which show whether access is equitable or not? And do those data show that access is equitable?</p>	<p>Don't know No data available (0) Data available (1) Data available and show that access is equitable (2)</p>	<p>2</p>

1

2

3		Is the allocation of trauma care staff to districts and hospitals appropriate and based on needs? Do districts in urban centres get more staff than districts in remote areas?	Don't know Less than 2:1 (1) More than 2:1 (0)	1
4				
5				
6				
7				
8				
9		Is there a mechanism to equitably distribute the budget for health or trauma care?	Don't know No (0) Yes (1)	1
10				
11				
12				
13				
14				
15	Scores			8
16				
17				
18				
19	Effectiveness and efficiency	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	Don't know No (0) Yes (1)	1
20				
21				
22				
23				
24		Are there national or provincial guidelines for in-service training of staff on trauma care?	Don't know No (0) Yes (1)	1
25				
26				
27				
28				
29		Is there a pre-hospital referral system (e.g: ambulance service)?	Don't know No (0) Yes (1)	1
30				
31				
32				
33				
34				
35		If pre-hospital referral systems are available, what has been the experience of patients regarding pre hospital referrals?	Don't know Poor (0) Fair (1) Good (2)	2
36				
37				
38				
39				
40				
41				
42		Are local transport operators (e.g: taxis) involved in transporting people to hospital?	Don't know No (0) Yes (1)	1
43				
44				
45				
46				
47				
48	Scores			6
49				
50				
51	Accountability	Are there mechanisms to report failing trauma services to policy makers or regulatory authorities	Don't know No (0) Yes (1)	1
52				
53				
54				
55				
56		Are there any mechanisms of correcting under performance of trauma services?	Don't know No mechanisms (0)	2
57				
58				
59				
60				

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

		Mechanisms of reporting but no onwards mechanisms to improve quality (1)	
		Mechanisms of reporting and mechanisms to improve quality (2)	
Scores			3
Intelligence/Information	Do staff providing trauma services understand what data needs to be captured and do they have the right data capturing tools to enable them do this?	Don't know No understanding and no tools (0) Understanding but no or limited tools (1) Understanding and useful tools (2)	2
Scores			2
Ethics	Is there any policy available for regulating trauma related research?	Don't know No (0) Yes (1)	1
	Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	Don't know No (0) Yes (1)	1
	Are there mechanisms in place in institutes for enforcing high ethical standards in the treatment of trauma patients	Don't know No (0) Yes (1)	1
Scores			3
Overall maximum score			56

Appendix 2 Investigator score for each question and percentage score for each principle and overall for Rwanda, Ghana and South Africa respectively

Principle	Questions	Maximum score for question	Rwanda score	Ghana score	South Africa score
Strategic vision	Is there specific mention of trauma in the national health plan or policy? Or are there specific national health policies around trauma care?	1	1	1	1
	Is there a national trauma strategy?	1	1	0	0
	What percentage of the country's public health budget goes to trauma care?	2	0	0	2
	Is public sector trauma care provided free of charge?	2	1	1	1
	Is there a national insurance scheme that covers trauma care?	2	2	1	1
	Is there a department within the National Ministry of Health dedicated for trauma?	2	1	1	1
	If the National health plan mentions trauma, or if there are national health policies for trauma care, are there specific objectives relating to trauma and timelines to achieve them?	1	1	0	0
	If you have answered yes to question 7, have any of those specific trauma objectives been implemented?	1	1	0	0
Score for Principle (% of total possible)		12	8 (67%)	4 (33%)	6 (50%)
Participation and consensus	Are stakeholders (e.g: NGOs, private companies) involved in	2	2	2	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

	What is the level of stakeholder engagement/community participation at the national and	1	1	1	1
Score for Principle (% of total possible)		3	3 (100%)	3 (100%)	3 (100%)
Rule of law	Are there guidelines for accreditation of trauma care	2	2	2	1
	Are there laws to enforce a duty of care by hospitals to treat uninsured	2	0	2	2
	Are there laws to protect against trauma? Example Seat belt laws?	2	2	1	2
Score for Principle (% of total possible)		6	4 (67%)	5 (83%)	5 (83%)
Transparency	Is information readily available on financial commitments or allocated budget to trauma care in the public sector at either national or provincial level?	1	1	0	0
	Are managers (District Directors of Health, Medical Superintendents of hospitals) evaluated on their health facility or facilities reaching specific targets for trauma care? And if so, are the results of these evaluations available and accessible?	2	2	0	0
Score for Principle (% of total possible)		3	3 (100%)	0 (0%)	0 (0%)
Responsiveness of institutions	Is there mandatory reporting of health facility trauma data and is	2	2	1	1
	Are these data used to inform national or provincial policy?	1	1	1	1
	Are data on clinical post-injury outcomes captured routinely by	2	2	1	0
	Are data on post-injury care patient satisfaction routinely captured?	2	0	0	0
	Are these trauma data used in planning services?	1	1	1	1
	What is the level of responsiveness of the health system to non-medical needs of injured people (social needs, mental health needs etc)?	2	2	1	2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Score for Principle (% of total possible)		10	8 (80%)	5 (50%)	5 (50%)
Equity	Are there national level financial schemes to ensure the poor who are injured do not have to pay out	2	2	1	2
	Are there health policies in place to address inequality in access to care for trauma?	2	1	1	1
	Are there data which show whether access is equitable or not? And do those data show that access is equitable?	2	0	0	0
	Is the allocation of trauma care staff to districts and hospitals appropriate and based on needs? Do districts in urban centres get more staff than districts in remote areas?	1	0	0	0
	Is there a mechanism to equitably distribute the budget for health or trauma care?	1	0	0	0
Score for Principle (% of total possible)		8	3 (38%)	2 (25%)	3 (38%)
Effectiveness and efficacy	Is there a national trauma registry (information management for trauma care)? Is it used? In both private and public?	1	1	0	0
	Are there national or provincial guidelines for in-service training of staff on trauma care?	1	1	1	1
	Is there a pre-hospital referral system (e.g: ambulance service)?	1	1	1	1
	If pre-hospital referral systems are available, what has been the experience of patients regarding pre-hospital referrals?	2	1	1	2
	Are local transport operators (e.g: taxis) involved in transporting	1	1	1	0
Score for Principle (% of total possible)		6	5 (83%)	4 (67%)	4 (67%)

3	Accountability	Are there mechanisms to report failing trauma services to policy	1	0	1	1
4		Are there any mechanisms of correcting under performance of	2	1	0	2
5						
6						
7						
8	Score for Principle (% of total possible)		3	1 (33.3%)	1 (33.3%)	3 (100%)
9						
10	Intelligence/information	Do staff providing trauma services understand what data needs to be captured and do they have the right	3	1	1	1
11						
12						
13						
14	Score for Principle (% of total possible)		3	1 (33%)	1 (33%)	1 (33%)
15						
16	Ethics	Is there any policy available for regulating trauma related research?	1	1	1	1
17						
18						
19						
20		Are there any standard operating procedures in place to ensure quality and ethical trauma care for injured people?	1	1	0	1
21						
22						
23						
24						
25						
26		Are there mechanisms in place in institutes for enforcing high ethical standards in the treatment of trauma patients?	1	1	1	1
27						
28						
29						
30						
31						
32	Score for Principle (% of total possible)		3	3 (100%)	2 (67%)	3 (100%)
33						
34						
35	Overall Total (% maximum overall score)		56	39 (70%)	27 (48%)	33 (59%)
36						
37						
38						
39						

Appendix table 3 Summary results by principle for each country individually including average score, investigator score, maximum score possible for each question and achieved percentage score (average score and investigator score).

		Rwanda				Ghana				South Africa			
Principle	Maximum scores	Respondent scores (n, average)	Investigator scores (n)	% achieved (Respondent scores)	% achieved (Investigator scores)	Respondent scores (n, average)	Investigator scores (n)	% achieved (Respondent scores)	% achieved (Investigator scores)	Respondent scores (n, average)	Investigator scores (n)	% achieved (Respondent scores)	% achieved (Investigator scores)
Strategic vision	12	8.05	8	67.1%	66.7%	2.07	4	17.30%	33.30%	4.67	6	38.9%	50.0%
Participation and consensus orientation	3	3	3	100.0%	100.0%	1.4	3	46.70%	100%	3	3	100.0%	100.0%
Rule of law	6	4.75	4	79.2%	66.7%	3.16	5	63.20%	83.30%	4.83	5	80.5%	83.3%
Transparency	3	1.8	3	60.0%	100.0%	0.49	0	16.30%	0%	0	0	0.0%	0.0%
Responsiveness of institutions	10	7.65	8	76.5%	80.0%	3.54	5	35.40%	50%	5.25	5	52.5%	50.0%
Equity	8	2.95	3	36.9%	37.5%	1.4	2	17.50%	25%	3.23	3	40.4%	37.5%
Effectiveness and efficiency	6	5.35	5	89.2%	83.3%	3.28	4	54.70%	66.70%	4	4	66.7%	66.7%
Accountability	3	2.1	1	70.0%	33.3%	0.86	1	28.70%	33.30%	2.67	3	89.0%	100.0%
Intelligence/information	2	1.6	1	80.0%	50.0%	0.73	1	36.50%	50%	0.75	1	37.5%	50.0%
Ethics	3	2.6	3	86.7%	100.0%	1.57	2	52.30%	66.70%	2.67	3	89.0%	100.0%
Overall score	56	39.85	39	71.2%	69.6%	18.5	27	33.00%	48.20%	31.07	33	55.5%	58.9%

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only