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Equitable access to quality trauma systems in low-income and middle-income countries

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BMJ Global Health

Equitable access to quality trauma systems in low-income and middle-income countries: assessing gaps and developing priorities in Ghana, Rwanda and South Africa

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ABSTRACT

Injuries in low-income and middle-income countries are prevalent and their number is expected to increase. Death and disability after injury can be reduced if people reach healthcare facilities in a timely manner. Knowledge of barriers to access to quality injury care is necessary to intervene to improve outcomes. We combined a four-delay framework with WHO Building Blocks and Institution of Medicine Quality Outcomes Frameworks to describe barriers to trauma care in three countries in sub-Saharan Africa: Ghana, South Africa and Rwanda. We used a parallel convergent mixed-methods research design, integrating the results to enable a holistic analysis of the barriers to access to quality injury care. Data were collected using surveys of patient experiences of injury care, interviews and focus group discussions with patients and community leaders, and a survey of policy-makers and healthcare leaders on the governance context for injury care. We identified 121 barriers across all three countries. Of these, 31 (25.6%) were shared across countries. More than half (18/31, 58%) were predominantly related to delay 3 ('Delays to receiving quality care'). The majority of the barriers were captured using just one of the multiple methods, emphasising the need to use multiple methods to identify all barriers. Given there are many barriers to access to quality care for people who have been injured in Rwanda, Ghana and South Africa, but few of these are shared across countries, solutions to overcome these barriers may also be contextually dependent. This suggests the need for rigorous assessments of contexts using multiple data collection methods before developing interventions to improve access to quality care.

SUMMARY BOX

⇒ Injury is a major cause of death globally, especially in low-income and middle-income countries.
⇒ For patients who have been injured, timely access to quality care is essential for reducing death and disability, but still people experience barriers causing delays in accessing healthcare with detrimental consequences.
⇒ By using a four-delays framework and multiple data collection methods, we uncovered 121 barriers to injury care access in Rwanda, South Africa and Ghana. Thirty-one barriers were common across all three countries, whilst many barriers were only present in one or two countries.
⇒ Most barriers were specific to individual countries suggesting they are context-specific. Solutions to improve access to injury care may therefore not necessarily be transferable across multiple countries.
⇒ To capture multiple barriers required the use of multiple data collections methods which indicates the importance of using mixed methods when assessing access to injury care.

INTRODUCTION

In low-income and middle-income countries (LMICs), injuries account for more deaths than tuberculosis, malaria and HIV combined; indeed 90% of injury deaths occur in LMICs.[1] Injury is currently the leading killer among people in the economically productive age.[2] Injury-associated mortality is expected to rise, with projections that road traffic accidents will be the third leading cause of death by 2030.[2] Non-fatal injuries are also important and common, with 1 billion people (15% of the global population) sustaining an injury in 2013 that warranted healthcare.[1] Reducing deaths from injury is a key Sustainable

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Development Goal (SDG 3.6) as is providing Universal Health Coverage (SDG 3.8).[3]

For patients who have been injured, timely access to quality care is essential for reducing death and disability. Access within the Golden Hour or the Lancet Commission on Global Surgery's 2-hour target have been accepted by many trauma experts as the appropriate window for injured patients to reach a healthcare facility that can treat them.[4 5] However, many injured people in LMICs take longer than 2 hours to reach a healthcare facility[6] and our study on external injury deaths in South Africa found 36% of deaths were avoidable if barriers to access to care were reduced.[6] We have also found that barriers to access to care are experienced at multiple stages throughout the healthcare journey.[7 8]

Developing healthcare systems that provide timely and quality care for the injured requires an acknowledgement that these are complex adaptive systems, with positive and negative interactions which may be context dependent.[9] These differences and interactions may vary depending on, for example, countries' development status; the political, governance and finance contexts for health; sociocultural contexts, individual factors (eg, personal wealth and education) and experiences (eg, previous interactions with the healthcare services); and healthcare service factors (eg, whether the necessary building blocks for health are present and whether quality care is provided).[10 11] To develop systems that match the needs of the injured patients requires a thorough understanding of the barriers to access to quality care. However, few studies have collected such data and even fewer have done so using multiple methods.[12]

Barriers to accessing quality care have been described using the four-delay framework, adapted from the three delays framework previously used to improve maternal healthcare.[13 14] Delay 1, seeking care, occurs from the point of injury to taking the decision to go to care; Delay 2, reaching care, is from the decision to seek care being made to arriving at formal healthcare; Delay 3, receiving care, is from arrival at the first formal healthcare facility to receiving definitive treatment; and Delay 4, remaining in quality care, is from discharge from acute care to rehabilitation to optimal function. In order to maximise ability to improve equitable access to quality trauma care, it is necessary to understand the barriers to access to quality care that occur at each and every delay stage. In addition, to assess whether barriers are shared across or experienced differently in countries with different sociocultural characteristics, healthcare systems, and levels of economic development, requires employing similar methods to assess barriers in different settings. Assessing barriers across multiple countries or contexts may suggest where these are shared and thus, where solutions might be transferable across settings. As far as we are aware, no studies have aimed to compare, across countries, the barriers to timely access to quality care after injury.

We combined the four-delay, the WHO building block, and the Institute of Medicine (IoM) Quality frameworks to describe barriers to trauma care in three countries in sub-Saharan Africa with differing levels of development, socio-cultural and healthcare contexts. We used a convergent parallel mixed-methods study design to appraise barriers to access to quality care after injury in these countries to enable holistic understanding within and across the countries.

APPROACH

Study countries

The study was conducted in Ghana, Rwanda and South Africa. One rural and one urban area in each country was purposively selected to allow feasibility while being as representative of the general population as possible.

Ghana is a lower-middle-income country, with an estimated population of 30.4 million people (2019), life expectancy of 63.8 years, and 7.56% of deaths and 7.24% of disability-adjusted life-years (DALYs) are estimated to be due to trauma.[15] Inequality in Ghana is high,[15] as is out of pocket (OOP) health expenditure (37.69% of total health expenditure is OOP).[15] Tamale Metropolitan Area and Yendi Municipal District were the urban and rural study areas chosen; both are in the north of Ghana.

Rwanda is a low income country of 12.6 million people, with a life expectancy of 68.7 years; 9% of all deaths and 10% of DALYs are due to trauma.[15] Community-Based Health Insurance was introduced in 1999/2000 to enable citizens in rural populations and the informal sector to access healthcare.[16] Despite this, the health system is still challenged with deficiencies and inequalities.[17] This study was conducted in the metropolitan area of the capital, Kigali, and the rural area of Burera.

South Africa is an upper-middle-income country, with a population of 60.1 million and a life expectancy of 62.0 years. Injuries are estimated to be responsible for 10% of deaths and 11% of DALYs.[18] Interpersonal violence is seven times higher and road traffic collisions are double the global rate. Access to healthcare is inequitable with 86% of the population served by the public sector which has a disproportionately low proportion of the human resources for health.[19]

Conceptual frameworks

On appraising the literature on frameworks for conceptualising access to quality healthcare, we did not find a developed framework that suited our aims exhaustively. However, three frameworks we considered would, in combination, comprehensively cover the dimensions of access to quality healthcare for injured people in LMICs. These were: the four-delay framework to access to care as described above,[14 20] the IoM framework for quality healthcare,[21] and the WHO health systems building blocks.[22] The IoM's framework for quality healthcare conceptualises quality of care as effective, safe, efficient, timely, patient centred, and equitable. The WHO building blocks include leadership/governance, financing, medicines and equipment, information, human resources,

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Table 1 A summary of methods for the study

Data sources	Setting	Achieved no of participants	Methodological approach	Analysis approach
Workshops to capture and prioritise existing barriers from multiple stakeholder groups.	Kigali, Rwanda; Tamale, Ghana; Cape Town, South Africa	Rwanda: 34 Ghana: 31 South Africa: 34	Consensus process with small working groups and plenary discussion	Identified priorities were de-duplicated by the whole investigator team and presented under each Delay.
Interviews and focus group discussions with injured persons to capture their experiences of barriers.	Both of an urban and a rural setting in each study country*	Around 10 interviews in rural and 10 in urban areas in each country, depending on saturation. Ghana=25 interviews South Africa=20 Interviews Rwanda=20 interviews Between 4 and 11 participants in each focus group	Qualitative	Thematic analysis
Focus group discussions with community leaders to capture their experiences and perceptions of barriers	Both of an urban and a rural setting in each study country*	Between 4 and 9 participants in each focus group)	Qualitative	Thematic analysis
I-PAHC and O-PAHC surveys with injured persons to capture their experiences of quality of care provided by in or outpatient facilities	Both of an urban and a rural setting in each study country*	Rwanda: I-PAHC 36 O-PAHC 24 Ghana: ► I- PAHC 13 ► O- PAHC 17 South Africa: ► I- PAHC 22 ► O-PAHC 28	Descriptive quantitative analysis	The percentage score for each question and experiential quality category was calculated.[24]
Governance survey with policy makers or trauma care providers or leaders to assess the policy and governance context for trauma	National surveys	Five from Rwanda, 5 from South Africa and 11 from Ghana	Descriptive qualitative analysis	Each of the 10 principles of governance developed by Siddiqi *et al* and related questions were assigned scores.[25]

*Urban and rural settings were: Kigali (urban) and Burera (rural) in Rwanda; Tamale (urban) and Yendi (rural) in Ghana; and Khayelitsha (urban) and Worcester (rural) in South Africa.
I-PAHC, Inpatient Assessment of Healthcare; O-PAHC, Outpatient Users Assessment of Healthcare.

and service delivery. Data collection and analyses were based on the domains in these frameworks.

Parallel convergent research design

The same methodologies were employed in each country. Data on barriers to equitable access of quality care were collected between June 2020 and May 2021 by trained local researchers. Desired numbers of participants for each methodology were determined by previous experience of numbers required to produce reliable results.[20 23] Due to COVID-19, these numbers were not achieved for all methodologies, and the actual numbers recruited are seen in table 1. For the workshops, up to 30 participants were desired; slightly more were invited with the expectation of drop-outs. For the qualitative interviews, in each country we aimed to recruit 10 participants in both the urban and rural areas. We used a purposeful sampling strategy to ensure a relatively equal number of patients from each area in each study country. Our approach aimed to gain rich understandings of participants' experiences of injury, with the interview schedule designed to be in-depth with open-ended questions.

We also aimed to undertake one focus group discussion in both the urban and rural areas, with up to eight participants desired for each discussion. Ideal numbers for the Inpatient Assessment of Healthcare and Outpatient Users Assessment of Healthcare surveys are larger than our sample size, but this was not feasible to achieve in our study.[24] Nevertheless, the IQR of responses was narrow even with our smaller sample size. Likewise, fewer participants were invited to complete the governance survey than in other studies, and the results from this should be taken as indicative only.[25]

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Data were analysed separately by in-country research teams, with support from the central investigator team (JCB, JD, MLO, AI and AMAL). The results were then discussed, compared and integrated during a 2-day investigator meeting held in Tamale, Ghana in May 2021. A summary of the methods for this study is presented in table 1 and the full description is available in online supplemental appendix 1.

Patient and public involvement

Participants were not directly involved in planning the study methodologies in all countries. However, the design of the study was based on prior stakeholder engagement in Rwanda.[20] Additionally, community leaders were consulted prior to the study and agreed to research being done in their community and results will be disseminated to communities via community leaders.

Synthesis of results

The results were presented, discussed and integrated during the 2 day investigator's meeting in Ghana in May 2021, with the aims of identifying barriers shared across all countries, those unique to individual countries, and the delay stages (all and predominant) at which barriers act.

First, the results from each of the methods for each country were presented to generate a list of all barriers found using all methods in all countries, categorised by the IoM quality and health system building block domains. Barriers were captured as yes (y) if present; no (n) if it was mentioned but described as not a barrier; and silent (s) if it was not mentioned at all. We included the 'no—not a barrier' responses, for completeness, given that in the qualitative work, some respondents actively stated that some issues that they are aware of in other countries are not an issue in their own. In each individual country, where there was a discordance between methods in whether a barrier was present or not, these barriers were assigned both 'y and n'.

In the next stage, all barriers assigned 'y' were collated to show where barriers were shared across all three countries. The investigators then divided into three country-based teams to discuss which delay stage or stages these barriers affected, and the predominant delay stage. These results were presented in the plenary discussion among the investigators until consensus was reached on all the delay stages that barriers affected, and the predominant delay that they affected across all countries.

In total, using all data collection methods in the three countries, 121 barriers in accessing injury care were identified across all countries (online supplemental appendix 2). The domains with the largest number of barriers were the WHO building block of service delivery (37/121=30.6%) and leadership and governance (21/121=17.4%).

In Ghana, 83 out of the 121 barriers (68.6%) were identified ('y'). Out of these, 58 (58/83=69.9%) barriers were identified using one method, 22 (22/83=26.5%) using two methods, and one (1/83=1.2%) using three methods. For two barriers, there was disagreement ("y and n") between methods. Thirty (30/121=24.8%) barriers were not mentioned using any method in Ghana and were given an 's'. In South Africa, 74 barriers (71/121=58.7%) were identified; 51 (51/74=68.9%) using one method, 20 (20/74=27.0%) using two methods and three barriers (3/74=4.1%) using three different methods. Thirty-six barriers (36/121=29.8%) were not identified using any method in South Africa and given a 's'. In Rwanda, 62 (62/121=51.2%) barriers were identified with disagreement for five barriers ('y' and 'n'). Forty-three barriers (43/62=69.4%) were identified using one method, 13 barriers (13/62=21.0%) were identified using two different methods and one of the barriers (1/62=1.6%) using three methods. Forty-one barriers (41/121=33.9%) were not identified using any method in Rwanda and noted as 's'.

Out of all the 121 barriers identified, 31 (31/121=25.6%) were present in all three study countries using at least one data collection method (table 2), 49 (49/121=40.5%) were present in only two countries and 41 (41/121=33.9%) were only present in one. Figure 1 shows the number of consensus barriers (n=31) in each delay and overlapping delays. The majority of the shared barriers came under the WHO building blocks of governance (n=7) and service delivery (n=8).

Out of the barriers shared across all countries, 7 (23%) were related to all four delays, 12 (39%) were related to three delays and 9 (29%) were related to two delays. Only three (9%) barriers were related to only one delay. More than half of the shared barriers (18/31=58%) were classified as predominantly related to delay 3 ('Delays to receiving quality care'), while five (16%) were predominately related to delay 1 ('Delays in seeking care') and five (16%) barriers were predominately related to delay 2 ('Delays in reaching care'), respectively. There were three barriers (10%) that were predominantly related to delay 4 ('Delays in remaining in care').

For almost all shared barriers, we achieved consensus on which was the predominant delay to which the barrier belonged. However, for one barrier 'Poor follow-up care', this was difficult. The Ghana team felt very strongly this would affect delay 1 (seeking care) just as much or possibly more than delay 4 (remaining in care).

Reflections

In this mixed-method, multicountry study, we found several barriers to accessing quality injury care across multiple domains of delays, quality, outcomes and health system building blocks. Our findings show that access to quality trauma care is a complex health system problem and indicate that understanding the issue in a holistic manner is likely to be a prerequisite to improving access to quality care. Moreover, we collected data from three different countries in Sub-Saharan Africa with different income and development status and found only a small proportion of the total number of barriers identified in all countries were shared across countries. This indicates

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Table 2 Barriers present in all three study countries (n=31)

Original framework	Category of barrier	Institute of medicine domain if relevant	Barrier	Consensus	
WHO Building blocks				Consensus—all delays	Consensus predominant delay
	Leadership/ Governance		Information on equitable access to trauma care collected	1,2,3,4	3
			Road infrastructure.	1, 2, 3, 4	2
			The 'right' hospital location. The 'right' acute care facility location—near to patients.	1, 2, 3, 4	3
			Rehabilitation services —available and near to patients.	4	4
			Ambulance transport availability	1,2,3,	2
			Geographical coverage of ambulance services	1,2,3	2
			Facility infrastructure	1, 2,3,4	3
	Health system finance	Equity	Budget equitably allocated	1, 2, 3, 4	3
			Cost of transport to get to hospital and between hospitals. (Cost of accessing ambulances)	1,2,4	2
			Costs of getting to and receiving care at follow-up	4	4
	Service delivery	Timely	Traditional healers and their interface with the health system.	1,2,3	1
			Available health facility targets for trauma care	3, 4	3
			Organisation of facilities	1,3,4	3
			Wait time at facilities	1,3,4	3
			Clear referral processes (within facilities, between facilities and including discharge)	1,3,4	3
			Follow-up system	4	4
			Appropriate provision of services for the level of demand.	1, 2, 3, 4	3
			Resources (beds, equipment, intensive care unit)	1, 3, 4	3
		Patient centred	Pain control	1, 3, 4	3
			Data collected on patient outcomes or satisfaction	1,3	3
			Respectful care/attitudes of staff towards patients	1,3,4	1
		Effective	Complications after injuries	1,4	1
			Interfacility transfer	1,2,3,4	3
	Information systems		Patient education—when to seek care.	1, 4	1
			Patient education—where to seek care.	1,2	1
			staff understanding of data to be collected and tools to do so	3,4	3
			Ambulance divert systems	2,3	3
	Workforce		Staff supervision	2,3,4	3
	Medicine and equipment		Available medications/other treatment	1,3,4	3
			Available equipment.	3,4	3
Miscellaneous	Bystander help		Bystander fear of injury	1,2	2

The darker shade of green the more delays the barrier influences.
Delay 1 yellow, delay 2 darker yellow, delay 3 lighter green and delay 4 darker green.

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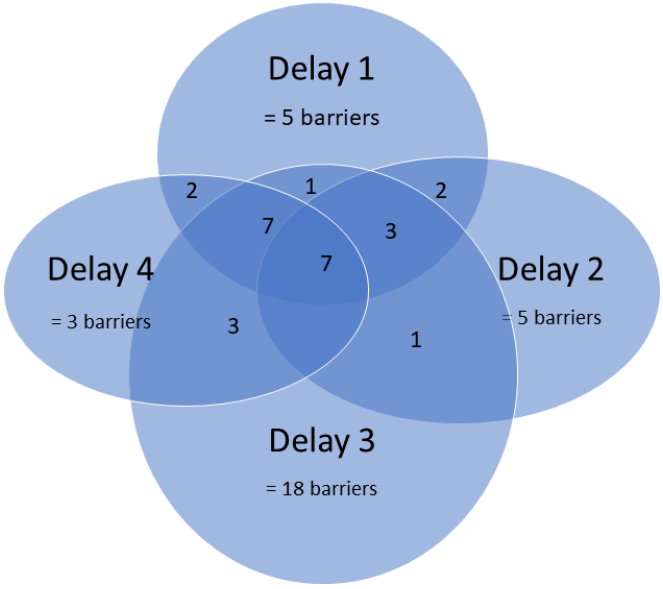

Figure 1 Number of consensus barriers in each delay and overlapping delays.

that these barriers may transcend contexts and that solutions for them might be transferable to other countries in this region. However, our findings on the large numbers of barriers that are limited to just one or two countries also indicate that issues limiting access to quality injury care are likely to be highly contextually dependent and it cannot be taken for granted that solutions developed in one country, or context, will be transferable to another. Of particular note were the barriers that were only experienced in one country, and which were likely therefore to be the most contextually determined. These were barriers related to violence and alcohol abuse in South Africa, seeking and receiving care from traditional healers in Ghana, and issues related to seeking care when injuries occur at night in Rwanda.

We also found that while some barriers were seen using multiple data collection methods, many barriers were captured using just one of the data collection methods, showing the need to use a number of different methods when undertaking data collection to holistically understand access to quality injury care in LMICs. Most previous studies have addressed only one or two of the delay stages and used single methods, and are likely to have missed important barriers in access to care.[12] Using different methods, we have shown some divergence in response regarding whether barriers are present or not, which adds to the understanding that single method studies or those with a focus on only one delay stage may not give a reliable picture of barriers in access to care. In a recent literature review by Whitaker *et al*[12] Forty out of the 111 (40.5%) identified studies focused solely on barriers in delay 3, and only 3 studies (2.7%) focused on all three delays in access to care. Moreover, most of the studies were conducted in one country.[12] We have found, as have others, that the majority of the shared barriers were related to delay 3,[8 12 20] receiving care. However, using multiple methods, as we did in this study, ensures a broader array of barriers can be identified, and barriers occurring at delay 1 and delay 2 can also be seen as substantial contributors to delays in timely access of quality care for the injured. Similar findings have been seen in South Africa, where delays 1 and 2 contributed around 36% of avoidable mortality after injury.[7] As our results show, barriers were not only around processes that would lead to effective clinical care, but also around the other quality outcomes of safety, timeliness, and patient-centred care; all issues that have been neglected in the global health agenda until recently.[11]

We have also shown that many barriers were experienced at multiple delay stages, exposing the intricacy of the effects of barriers on care-access. This is reflective of our previous findings in Rwanda[20] which highlighted the complex and interconnected nature of barriers to health system access post injury.[12] While this may make provision of solutions seem daunting, it could also be considered that improving one barrier that acts at multiple delays could improve several other delays, with a potentially synergistic or reinforcing effect.[26 27] The same reasoning holds for multi-country interventions. For example, "Ambulance transport availability" is a barrier that was prioritised across all three countries in our study and which was found to act across multiple delays. This barrier influences the service user's decision to seek care (delay 1) and their possibility to reach care (delay 2). Also, it influences delay 3 as we have defined interfacility transport as a third delay barrier after the patient has reached care. Additionally, this barrier influences patient's decision to remain in care (delay 4). Hence improving ambulance transport availability is likely to have a substantial impact on timely access to quality care.

Ability to improve outcomes after injury in the countries included in this study and other LMICs will be limited if this is not a political priority. According to Shiffman and Smith there are four key components to achieving political priority in global health: actor power (the strengths of individuals and organisations concerned with the issue), ideas (the ways in which those involved with the issue understand and portray it), political context (the environments in which actors operate), and issue characteristics (features of the problem).[28] We have found through our governance survey that some of these components are present in each country. For example, in Rwanda there is actor power and strong political commitment. The Rwanda Surgical Society made trauma a priority at their last general meeting in November 2019, which has hosted a national symposium on trauma care, and Rwanda has an Emergency Medical Services Strategic Plan,[29] and a trauma registry capturing information on all trauma cases admitted to major referral hospitals in the country.[30 31] However, without knowledge of issue characteristics, here, the barriers in accessing quality care for injuries, political will risks being poorly directed.

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CONCLUSION

This mixed method multicountry study is one of the first of its kind showing there are multiple barriers in access to care for injuries in Rwanda, Ghana and South Africa. These three countries which have different development status and income levels had multiple barriers in access to injury care which shows that the issue is complex. Only a quarter of the barriers were shared across all three countries, suggesting the need for rigorous assessment in individual contexts using multiple data collection methods before developing interventions for improving access to quality care for injured patients.

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Contributors JID and JCB led the overall study; JID, JCB and JW developed the concept for the study. JCB, AB, KC and ST—led each country component; PN, MY, SW, BAO, A-MA-L, KF, SMPK, EOO—conducted the data collection in each country; BA, EB, AH, A-MA-L, MLO, AI and all authors contributed to the analysis of results and the discussion meeting in Ghana; MLO, AI and JID led the write up of the manuscript; all other authors commented on iterations of the manuscript and agreed to its submission for publication. JD is the guarantor of this manuscript or JD accepts full responsibility for the conduct of this study and controlled the decision to publish.

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Appendix 1. Detailed methods

Setting

The study was conducted in Ghana, Rwanda and South Africa. One rural and one urban area in each country was purposively selected to allow feasibility whilst being as representative of the general population as possible.

Ghana is a lower middle income country, it has an estimated population of 30.4 million people (2019), life expectancy is 63.8 years, and 7.56% of deaths and 7.24% of disability-adjusted life years (DALYs) are estimated to be due to trauma.[15] While health service delivery is largely provided by government, private institutions provide substantial health services to the population.[16] The National Ambulance Service (NAS) provides 24-hour prehospital care for accidents and emergencies. [16] Until 2020, the NAS had only 55 active ambulances serving the entire nation. Recently, 307 new ambulances and a new hotline for emergency services to support the operations of the NAS have been added.[17] Inequality in Ghana is high,[15] as is out of pocket (OOP) health expenditure (37.69% of total health expenditure is OOP).[15] Tamale Metropolitan Area and Yendi Municipal District were the urban and rural study areas chosen; both are in the north of Ghana.

Rwanda is a low income country of 12.6 million people, with a life expectancy of 68.7 years; 9% of all deaths are due to trauma.[15] Community-Based Health Insurance (CBHI) was introduced in 1999/2000 to enable citizens in rural populations and the informal sector to access healthcare.[18] Despite this, the health system is still challenged with deficiencies and inequalities.[19] In Rwanda's national plan, the government has recognised the need to strengthen health systems to reduce the burden of avoidable mortality and morbidity after trauma.[20] The ambulance system has an emergency free call number and over 300

ambulances are in operation throughout the country. This study was conducted in the metropolitan area of the capital, Kigali, and the rural area of Burera.

South Africa is an upper middle-income country, with a population of 60.1 million and a life expectancy of 62.0 years. Injuries are estimated to be responsible for 10% of deaths and 11% of DALYs.[21] Interpersonal violence is seven times higher and road traffic collisions are double the global rate. South Africa has the third biggest economy in Africa, although it is one of the most unequal societies in the world.[15] Access to health care is also inequitable with 86% of the population served by the public sector which has a disproportionately low proportion of the human resources for health.[22] Prehospital emergency care is delivered by both government-funded and private emergency medical services (EMS). Government-funded EMS service is available to everyone, reached via a toll-free national emergency number, and free of charge to all those earning below a threshold.[23] An air medical service with helicopter evacuation is available if needed.[24] This study was conducted in the urban township of Khayelitsha and the rural area of Worcester, both located in the Western Cape province.

Conceptual frameworks

On appraising the literature on frameworks for conceptualising access to quality healthcare, we did not find a developed framework that suited our aims exhaustively. However, three we considered would, in combination, comprehensively cover the dimensions of access to quality healthcare for injured people in LMICs. These were the four-delay framework to access to care as described above,[14 25] the IoM framework for quality healthcare,[26] and the WHO health systems building blocks.[27] The IoM's framework for quality healthcare conceptualises quality of care as effective, safe, efficient, timely, patient centred, and equitable. The WHO building blocks include leadership/governance, financing, medicines

and equipment, information, human resources, and service delivery. Data collection and analysis were based on the domains in these frameworks.

Study design

The same methodologies were employed in each country. Data on barriers to equitable access of quality care were collected between June 2020 and May 2021 by trained local researchers. Data were analysed separately by in-country research teams, with support from the central investigator team (JC, JD, MLO, AI, AMAL). The results were then discussed, compared and integrated during a two-day investigator meeting held in Tamale, Ghana in May 2021. A summary of the methods for this study is presented in Table 1.

Data sources

1) Workshops with policy makers, infrastructure providers, service users, and healthcare workers to identify barriers to access to quality injury care and prioritise solutions to overcome these barriers.

We conducted a two-day workshop in each of the study countries. The workshops were designed as round table workshops (5-8 people per table) and plenary discussions. Methods are described for the Rwanda workshop in more detail elsewhere.[25] In brief, the process was informed by the four-delay framework with small working groups discussing and listing barriers occurring at each delay stage before presenting and discussing results in plenary and agreeing on the barriers. Working groups were formed of participants of similar backgrounds to prevent hierarchies limiting expression of opinions; participants were seated at tables relevant to their delay. Discussions were facilitated by study team members and

translators were used when needed. Outputs were captured as listed barriers. At the end of each workshop, barriers were prioritised by participant voting to identify the top prioritised barriers in each country.

2) Qualitative interviews and focus groups discussions with injured patients and community leaders

In each country, individual interviews (IDIs) and focus groups discussions (FGDs) were undertaken each with rural and urban residents who had accessed injury care for themselves in the past 6 months. Numbers of interviews continued until saturation of themes occurred. Two focus group discussions with community leaders and prominent members of the communities, one in urban and one in rural area, were also undertaken.

The IDIs and FGDs were undertaken by trained bilingual researchers in the appropriate languages. A topic guide was developed in English with questions structured around the four-delay framework, and open questions were asked with prompts given when necessary to explore replies of interest. Interviews and FGDs were audio recorded, transcribed and translated into English for analysis.

Data from each country were analysed thematically using Nvivo qualitative data analysis Software (2015, QSR International Pty Ltd). Coding was done deductively focusing on the domains of the four delays, IoM, and WHO building block frameworks and inductively, allowing additional themes to emerge from the data. A sample of interview transcripts was first read to identify the initial set of codes by local investigators and investigators from the

UK team. This generated a coding framework that was discussed between the data collectors, relevant country team members and investigators, and then used to code all remaining interview and focus group transcripts. Codes were gradually built into broader categories and themes through comparison across transcripts. The same process was repeated for all countries, generating three coding frameworks. Findings were written as a narrative summary. From that, an overall list of barriers across three countries was created. Key themes for each country can be found in appendices.

3) Surveys about experiences with the healthcare services, either as inpatients (the Inpatient Assessment of Health Care (I-PAHC)) or outpatients (the Outpatient Users Assessment of Health Care (O-PAHC)).

The I-PAHC and O-PAHC are brief (25 or 23 question, respectively) survey tools that have been developed and validated to explore experiences of care in low-income settings.[28] They were administered in each country to the persons who took part in the interviews or focus group discussions with the choice of tool dependent on whether participants had been in or outpatient users, or both. Surveys were administered in the local language by trained bilingual investigators after ensuring that the surveys were contextually appropriate. Most responses were captured as a four-part Likert scale from strongly agree (4 points) to strongly disagree (1 point), others were captured as a binary response, yes (2 points) or no, with each response given a score (1 point). We categorised questions into the following domains, based upon previous research and investigator discussions:[28] respectful care, communication, patients would recommend services, cleanliness of facilities, and pain control (captured in the I-PAHC survey only). Scores for each category were created by

dividing the total score achieved for all questions in each category by the total possible score for that category, and presented as a percentage. We selected a threshold of below 80% to indicate presence of a barrier to quality injury care, based upon the median score for the survey responses.

4) Survey for assessing the governance of the health system, based on the framework for healthcare governance developed by Siddiqi et al.[29]

We adapted Siddiqi et al's survey for the injury care context on discussion between authors. The resultant survey contained 37 questions about presence or absence of a structure or function within 10 domains that reflect the health system context for injury care (Appendix 5). Domains were: strategic vision; participation and consensus orientation; rule of law; transparency; responsiveness; equity and inclusiveness; effectiveness and efficiency; accountability; intelligence and information; and ethics.

The survey was sent to policy makers, trauma opinion leaders, and lead trauma care providers. Initial participants were selected based upon investigator contacts and snowball sampling used to identify further participants. Questions from each domain were scored based on a pre-agreed scoring system, deriving an investigator assessed score calculated independently by two investigators (AMAL, MLO) and considering the participant's original score, their background, investigator knowledge, and evidence available. For example, if a trauma care provider stated that a policy was not available, but a policymaker stated that it

was, or the investigators had seen a copy of the policy, we prioritised the policymaker's response. Where investigators disagreed, cases were arbitrated by a third investigator (AI).

Appendix 2. List of the 121 barriers identified in Ghana, Rwanda and South Africa, and the number of methods used to identify them

Original framework	Category of barrier	Institute of Medicine Domain if relevant	Barrier	Ghana		South Africa		Rwanda	
				Present	Number of methods	Present	Number of methods	Present	Number of methods
WHO Building blocks	Leadership /Governance		Health policy or department in MoH for trauma	n	1	n	1	n	1
			Implementation of health policy for trauma	y	1	y	1	n	1
			Transparency of information on financial commitments/assessment of care provision	y	1	y	1	n	1
			Use of data on injuries to inform service provision or policy	n	1	n	1	n	1

			Information on equitable access to trauma care collected	y	1	y	1	y	1
			Mechanisms to report failing services	n	1	n	1	y	1
			Regulations to enforce high ethical standards in treatment of trauma patients	n	1	n	1	n	1
			Leader awareness of trauma issues	s	0	s	0	y	1
			Laws for bystanders (protecting them from costs or blame/arrest).	y	2	s	0	y	1
			Road infrastructure.	y	2	y	1	y	2

			Traffic density.	y	1	s	0	y	2
			Ambulance given priority	y	1	s	0	y	1
			The “right” hospital location. The “right” acute care facility location – near to patients.	y	2	y	2	y	2
			Rehabilitation services – available and near to patients.	y	1	y	1	y and n	2y and 1n
			Ambulance transport availability	y	2	y	2	y and n	2y and 1n
			Private investment in ambulances	s	0	s	0	y	1
			Ambulance fleet maintenance	y	1	s	0	y	1
			Geographical coverage of ambulance services	y	1	y	2	y	2

			Network for Ambulance deployment	y	1	s	0	s	0
			Facility infrastructure	y	1	y	1	y	1
			Safety en route to the facility	s	0	y	2	s	0
	Health system finance		Budget equitably allocated	y	1	y	1	y	1
			Funding for trauma in the health budget	y	1	n	1	y	1
			Free trauma care or pro poor policies	y	1	n	1	n	0
			Out of pocket payments	y	2	n	1	y and n	1y and 1n
			Absence of personal insurance	y	2	s	0	y	1
			Insurance system availability per se	y	1	y	1	y and n	1y and 2n
			Presence of mandatory insurance	y	1	s	0	y	1

			Costs of insurance	s	0	s	0	y	1
			Comprehensiveness of insurance system (persons covered, diseases covered, treatment items covered, and health facilities covered).	y	2	s	0	y	2
			Insurance renewal reminders	y	1	s	0	s	
	Service delivery		Traditional healers and their interface with the health system.	y	2	y	2	y	2y
			Available health facility targets for trauma care	y	1	y	2	n	1
		Timely	Opening hours of facilities.	s	0	y	2	y	1
			Organisation of facilities	y	1	y	1	y	1
			Wait time at facilities	y	2	y	2	y	1

			Clear referral processes (within facilities, between facilities and including discharge)	y	1	y	2	y	1
			Triage at tertiary facilities	s	0	y	1	s	0
			Bureaucracy ie Paper work	y	1	s	0	s	0
			Necessity to provide insurance documentation.	y	2	s	0	y	1
			Follow up system	y	1	y	1	y	1
			Appropriate provision of services for the level of demand.	y	2	y	3	y	3
			Time taken for ambulance to reach trauma victim	y	1	s	0	s	0
			Reporting results	y	1	s	0	s	0

			Wait times for care post discharge for initial episode	y	1	y	1	s	0
		Patient centred	Availability of guidelines/SOPs	y	1	y	2	n	1
			Definitive care at health centres and district hospitals	s	0	y	1	s	0
			Resources (beds, equipment, ICU)	y	1	y	1	y	1
			Theatre availability	y	1	s	0	s	0
			ICU function	y	1	s	0	s	0
			Pain control	y	1	y	1	n	1
			Patient would recommend services	s	0	y	1	n	1
			Ambulance call centre coordination	y	1	s	0	s	0
			Health services respond to non-medical needs of patients	s	0	n	1	n	1

			Health system are patient focussed	s	0	y	1	s	0
			Data collected on patient outcomes or satisfaction	y	1	y	1	y	1
			Respectful care/attitudes of staff towards patients	y	2	y	2	n	1
			Perceptions of health workers attitude	s	0	y	1	s	0
			Cleanliness of facilities	y	1	y	1	n	1
			Trust in services	y and n	2	y	2	y	0
			Power dynamics between patients and providers	s	0	y	1	s	0
			Communication including explanation) between health workers and patients	y	2	y	2	s	1

		Effective	Health issues related to injury are still present a long time after the injury.	y	1	s	0	y	1
			Complications after injuries	s	0	y	2	y	0
			Laws to enforce a duty of care	s	0	n	1	y	2
			Distance to facility	y	1	y	1	s	0
			Interfacility transfer	y	3	y	3	y	2
	Information systems		Non-ambulance transport	y	1	y	1	s	0
			Patient education – when to seek care.	y	2	y	2	y	1
			Patient education – where to seek care.	y	2	y	2	y	2
			Patient education costs of care	s	0	y	1	s	0

			Awareness of on how to access ambulance	y	1	s	0	y	1
			Information on follow up care	s	0	y	1	y	1
			Existence of a national trauma registry	y	1	y	1	n	1
			Data on injuries collected in facilities	y	1	y	1	n	1
			Data on injury outcomes collected in facilities	y	1	y	1	n	1
			Staff understanding of data to be collected and tools to do so	y	1	y	1	y	1
			Availability of a functioning e-health system	s	0	s	0	y	1
			Ambulance divert systems	y	1	y	1	y	1

	Workforce		Available specialist staff.	y	2	s	0	y	2
			Outpatient personnel	s	0	y	1	s	0
			Effective communication between EMS and hospital	y	1	y	1	s	0
			Accreditation of providers	n	1	y	1	n	1
			Trained staff	y and n	2	y	3	y	2
			Staff supervision	y	1	s	0	y	1
			Professionalism	y	1	s	0	s	0
			Cost of capacity building (both health service and individual)	s	0	s	0	y	1
	Medicine and equipment		Available medications/other treatment	y	2	y	1	y	1
			Maintenance of medical equipment	y	1	s	0	y	1

			Available equipment.	y	2	y	2	y	2
Institute of Medicine Quality of Care	Equity		Cost of transport to get to hospital and between hospitals. (Cost of accessing ambulances)	y	2	y	2	y	1
			Costs of getting to and receiving care at follow up	y	2	y	1	y	2
			Loss of earnings due to entering or remaining in care (indirect costs).	y	2	n	1	y	1
			Poverty	y	1	s	0	s	0
			Timely communication with those who are marginalised	s	0	s	0	y	1
			Ability to call for help (phones)	s	0	y	2	y	1
			Gender	y	1	s	0	s	0
Other	Time of day		Injuries at night	s	1	y	2	y	1

			Timing of injury occurrence	s	1	y	1	s	0
	Location of injury		Geographical location (isolation in some areas, difficult to reach some area due to rivers and bad roads)	y	1	y	1	s	0
			Hot spots, red zones*	y	1	y	1	s	0
	Socio -Cultural		Necessity to ask community leaders/head of family if care can be taken (pertains to going to care, having treatment, and having rehab)	y	1	s	0	s	0

			Prioritisation of community and of non medical expenses i.e. Wedding/Funeral	y	1	s	0	s	0
			Religious beliefs	y	1	s	0	s	0
	Poor attitudes to care		Patient compliance	y	1	y	1	s	0
			Attitudes to follow up	y	2	y	1	s	0
	Bystander help		Inadequate awareness of bystander responsibilities	s	0	y	1	y	1
			Bystander concern of having to pay for treatment if they help	y	1	s	0	s	0
			Bystanders influencing choice of facility to attend	y	1	s	0	s	0

			Bystander fear of injury	s	0	y	1	y	1
			bystanders providing help per se	s	0	y	1	y and n	1y and 1n
	COVID		COVID related delays	s	0	y	1	y	1
	Stigma		Stigma around rehabilitation and mental health**	s	0	y	1	s	0
			Community understanding of mental health issues in regards to injury	s	0	y	1	s	0
	Miscellaniou s		Fear of ambulance and unfamiliar surrounding	y	1	s	0	s	0
			Community/family members to encourage health seeking	y	1	y	1	s	0
			Patient agency to take ownership of continued care	s	0	y	1	s	0

			Violence (Gang violence, interpersonal violence)	y	1	y	1	s	0
			Personal security at certain time/places	s	0	y	1	y	1
	Trauma prevention		Trauma prevention laws	y	1	n	1	n	1
	Mitigating factors		Alcohol/substance abuse	y	1	y	1	s	0

*Areas too dangerous to enter without police because of crime

**Stigma around rehabilitation and mental health (I think this should read "stigma around rehabilitation for mental health". The barrier is related to those who require mental health services following injury. They may be reluctant to go for this follow-up due to the fear of being stigmatised)

Green indicates that the barrier is present in a country and the shade of green indicates using how many methods
Dark grey indicates that the barrier is not present in the country and shade of green indicates using how many methods

Light grey indicates the barrier has not been mentioned using any of the data collection methods in the country

Appendix 3 List of all the 121 barriers identified in all three study countries and the methods used to identify them

				Ghana		Methods				South Africa		Methods				Rwanda		Methods			
Basis	**category**	**IoM domain if relevant**	**Barrier/component**	**Reported**	**Number of methods**	**Barriers workshop**	**IDI or FGD**	**governance survey**	**quant survey**	**Reported**	**Number of methods**	**Barriers workshop**	**IDI or FGD**	**governance survey**	**quant survey)**	**Reported**	**Number of methods**	**Barriers workshop**	**IDI or FGD**	**governance survey**	**quant survey)**
WHO BB	**Leadership/governance/infrastructure**		Health policy or department in MoH for trauma	N	1	s	s	n	s	n	1	s	s	n	s	n	1	**s**	**s**	**n**	**s**
			Implementation of health policy for trauma	Y	2	Y	s	y	s	y	1	s	s	y	s	n	1	**s**	**s**	**n**	**s**
			Transparency of information on financial commitments/assessment of care provision	Y	1	s	s	y	s	y	1	s	s	y	s	n	1	**s**	**s**	**n**	**s**
			Use of data on injuries to inform service provision or policy	N	1	s	s	n	s	n	1	s	s	n	s	n	1	s	**s**	n	s
			Information on equitable access to trauma care collected	Y	1	s	s	y	s	y	1	s	s	y	s	y	1	s	**s**	y	s

			Mechanisms to report failing services	N	1	s	s	n	s	n	1	s	s	n	s	y	1	**s**	**s**	**y**	**s**
			Regulations to enforce high ethical standards in treatment of trauma patients	N	1	s	s	n	s	n	1	s	s	n	s	n	1	**s**	**s**	**n**	**s**
			Leader lack of awareness of trauma issues	s	0	s	s	s	s	s	0	s	s	s	s	y	1	**y**	**s**	**s**	**s**
			Laws for bystanders (protecting them from costs or blame/arrest)	y	2	Y	y	s	s	s	0	s	s	s	s	y	1	y	**s**	s	s
			Road infrastructure	y	2	Y	y	s	s	y	1	y	s	s	s	y	2	y	y	s	s
			Traffic density	y	1	s	y	s	s	s	0	s	s	s	s	y	2	y	y	s	s
			Ambulance priority	Y	1	Y	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
			The “right” hospital location. The “right” acute care facility location – near to patients.	y	2	Y	y	s	s	y	2	y	y	s	s	y	2	y	y	s	s

			Rehabilitation services – available and near to patients.	Y	1	Y	s	s	s	y	1	y	s	s	s	2y and n	3	y	y	n	s
			Ambulance transport availability	y	3	Y	y	n	s	y	2	y	y	n	s	2y and n	3	y	y	n	s
			Lack of private investment in ambulances	s	0	s	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
			Ambulance fleet maintenance	Y	1	Y	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
			Geographical coverage of ambulance services	Y	1	Y	s	s	s	y	2	y	y	s	s	y	2	y	y	s	s
			Network for Ambulance deployment	Y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Facility infrastructure	Y	1	Y	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
			Safety en route to the facility	s	0	s	s	s	s	y	2	y	y	s	s	s		s	s	s	s
	Health system finance (covers funding of		Budget equitably allocated	y	1	s	s	y	s	y	1	s	s	y	s	y	1	s	s	y	s

	health services, i.e: medical direct costs)		Funding for trauma in budget	y	1	s	s	y	s	n	**1**	**s**	**s**	**n**	s	y	1	**s**	s	**y**	s
			Free trauma care or pro poor policies	y	1	s	s	y	s	n	1	s	s	n	s	n	0	s	s	n	s
			Out of pocket payments	y	2	s	y	y	s	n	1	s	s	n	s	y and n	2	s	y	n	s
			Absence of personal insurance	y	2	Y	y	s	s	s	0	s	s	s	s	y	1	s	y	s	s
			Insurance system availability per se.	y	1	s	s	y	s	y	1	s	s	y	s	y and 2n	3	n	y	n	s
			Mandatory insurance	y	1	s	y	s	s	s	0	s	s	s	s	y	1	y	s	s	s
			Costs of insurance	s	0	s	s	s	s	s	0	s	s	s	s	y	1	n	y		s
			Comprehensiveness of insurance system (persons covered, diseases covered, treatment items covered, and health facilities covered).	y	2	Y	y	s	s	s	0	s	s	s	s	y	2	y	y	s	s
			Insurance renewal reminders	y	1	s	y	s	s	s	0	s	s	s	s	s		s	s	s	s

	Service delivery (is care delivered well/according to guidelines)		Traditional healers and their interface with the health system.	y	2	Y	y	s	s	y	2	y	y	s	s	y	2	y	y	s	s
			Available health facility targets for trauma care	y	1	s	s	y	s	y	2	y	s	y	s	n	1	s	s	n	s
			Opening hours of facilities.	s	0	s	s	s	s	y	2	y	y	s	s	y	1	s	y	s	s
			Organisation of facilities	y	1	Y	s	s	s	y	1	y	s	s	s	y	1	s	y		s
			Wait time at facilities	y	2	Y	y	s	s	y	2	y	y	s	s	y	1	s	y	s	s
			Clear referral processes (within facilities, between facilities and including discharge)	y	1	s	y	s	s	y	2	y	y	s	s	y	1	s	y	s	s
			Triage at tertiary facilities	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Bureaucracy ie Paper work	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Necessity to provide insurance	y	2	Y	y	s	s	s	0	s	s	s	s	y	1	s	y	s	s

			documentation.																		
			Follow up system	y	1	Y	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
			Appropriate provision of services for the level of demand.	y	2	Y	s	y	s	y	3	y	y	y	s	y	3	y	y	y	s
			Reporting results	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Availability of guidelines/SOPs	y	1	Y	s	y	s	y	2	y	y	n	s	n	1	s	s	n	s
			Definitive care at health centres and district hospitals	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Resources (beds, equipment, ICU)	y	1	Y	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
			Theatre availability	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			ICU function	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Pain control	y	1	s	s	s	y	y	1	s	s	s	y	n	1	s	s	s	n
			Patients would recommend services	s	0	s	s	s	n	y	1	s	s	s	y	n	1	s	s	s	n
			Ambulance call centre coordination	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Time taken for	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s

			ambulance to reach trauma victim																		
		Patient centred	Health services respond to non-medical needs of patients	s	0	s	s	y	s	n	1	s	s	n	s	n	1	s	s	n	s
			Health system are patient focussed	s	0	s	s	s	s	y	1	Y	s	s	s	s	0	s	s	s	s
			Data collected on patient outcomes or satisfaction	y	1	s	s	y	s	y	1	s	s	y	s	y	1	s	s	y	s
			Respectful care/poor attitudes of staff towards patients	y	2	Y	y	s	n	y	2	y	s	s	y	n	1	s	s	s	n
			Perceptions of health workers attitude	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Cleanliness of facilities	y	1	s	s	s	y	y	1	s	s	s	y	n	1	s	s	s	n
			Trust in services	Y	2	Y	n	s	s	y	2	y	y	s	s	y	0	y	s	s	s
			Power dynamics between patients and providers	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s

			Communication including explanation) between health workers and patients	y	2	Y	s	s	y	y	2	y	s	s	y	s	1	s	s	s	y
		Effective	Health issues related to injury are still present a long time after the injury	y	1	s	y	s	s	s	0	s	s	s	s	y	1	s	y	s	s
			Complications after injuries	s	0	s	s	s	s	y	2	y	y	s	s	y	0	s	y	s	s
		Safe	Laws to enforce a duty of care	s	0	s	s	y	s	n	1	s	s	n	s	y	2	y	s	y	s
		Timely	wait times for care post discharge for initial episode	y	1	s	y	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Distance to facility	Y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Non-ambulance transport	Y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Interfacility transfers	y	2	Y	y	s	s	y	2	y	y	s	s	y	2	y	y	s	s
	Information systems		Patient education – when to seek care.	y	2	Y	y	s	s	y	2	y	y	s	s	y	1	y	s	s	s

(health system and beyond)		Patient education – where to seek care.	y	2	Y	y	s	s	y	2	y	y	s	s	y	2	y	y	s	s
		Patient education costs of care	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Awareness of on how to access ambulance	y	1	Y	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
		Information on follow up care	s	0	s	s	s	s	y	1	y	s	s	s	y	1	Y	s	s	s
		Existence of a national trauma registry	y	1	s	s	y	s	y	1	s	s	y	s	n	1	s	s	n	s
		Data on injuries collected in facilities	y	1	s	s	y	s	y	1	s	s	y	s	n	1	s	s	n	s
		Data on injury outcomes collected in facilities	y	1	s	s	y	s	y	1	s	s	y	s	n	1	s	s	n	s
		Staff understanding of data to be collected and tools to do so	y	1	s	s	y	s	y	1	s	s	y	s	y	1	s	s	y	s
		Availability of a functioning e-health system	s	0	s	s	s	s	s	0	s	s	s	s	y	1	s	y	s	s

		Ambulance divert systems	y	1	Y	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
	Workforce (e.g. trained, available, competent)	Available specialist staff.	y	2	Y	y	s	s	s	0	s	s	s	s	y	2	y	y	s	s
		Outpatient personnel	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Interpersonal conflict between EMS and hospital	y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Accreditation of providers	n	1	s	s	n	s	y	1	s	s	y	s	n	1	s	s	n	s
		Trained staff.	Y and N	2	Y	s	n	s	y	3	y	y	y	s	y	2	y	y	n	s
		Staff supervision	y	1	Y	s	s	s	s	0	s	s	s	s	y	1	s	y		s
		Professionalism	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
		Cost of capacity building	s	0	s	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
	Medicine and equipment (e.g. available)	Available medications /other treatment	y	2	Y	y	s	s	y	1	y	s	s	s	y	1	s	y	s	s
		Maintenance of medical equipment	Y	1	Y	s	s	s	s	0	s	s	s	s	y	1	s	Y	s	s
		Available equipment.	y	2	Y	y	s	s	y	2	y	y	s	s	y	2	y	y	s	s

Io M quality	**Equity (covers individual available funds for non-medical directs and indirects)**		Cost of transport to get to hospital and between hospitals. (Cost of accessing ambulances)	y	2	Y	y	s	s	y	2	y	y	s	s	y	1	y	s	s	s
			Costs of getting to and receiving care at follow up	y	2	Y	y	s	s	y	1	y	s		s	y	2	y	y	s	s
			Loss of earnings due to entering or remaining in care (indirect costs).	y	2	Y	y	s	s	n	1	n	s	s	s	y	1	y	s	s	s
			Poverty	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Timely communication with those who are marginalised	s	0	s	s	s	s	s	0	s	s	s	s	y	1	y	s	s	s
			Ability to call for help (phones)	s	0	s	s	s	s	y	2	y	y	s	s	y	1	y	s	s	s
			Gender	y	1	s	y	s	s	s	0	s	s	s	s	s	0	s	s	s	s
Other	**Time of day**		Injuries at night	s	1	Y	s	s	s	y	2	y	y	s	s	y	1	s	y	s	s

		Timing of injury occurrence	s	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
	Location of injury	Geographical location (isolated and unable to reach)	Y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Hot spots, red zones	y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
	Socio-Cultural	necessity to ask community leaders/head of family if care can be taken (pertains to going to care, having treatment, and having rehab)		1	y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
		Prioritisation of community and of non medical expenses i.e. Wedding/Funeral	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
		Religious beliefs	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
	Patient attitudes to care	Poor Patient compliance	y	1	Y	s	s	s	y	1	s	s	s	s	s	0	s	s	s	s
		Attitudes to follow up	y	2	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s

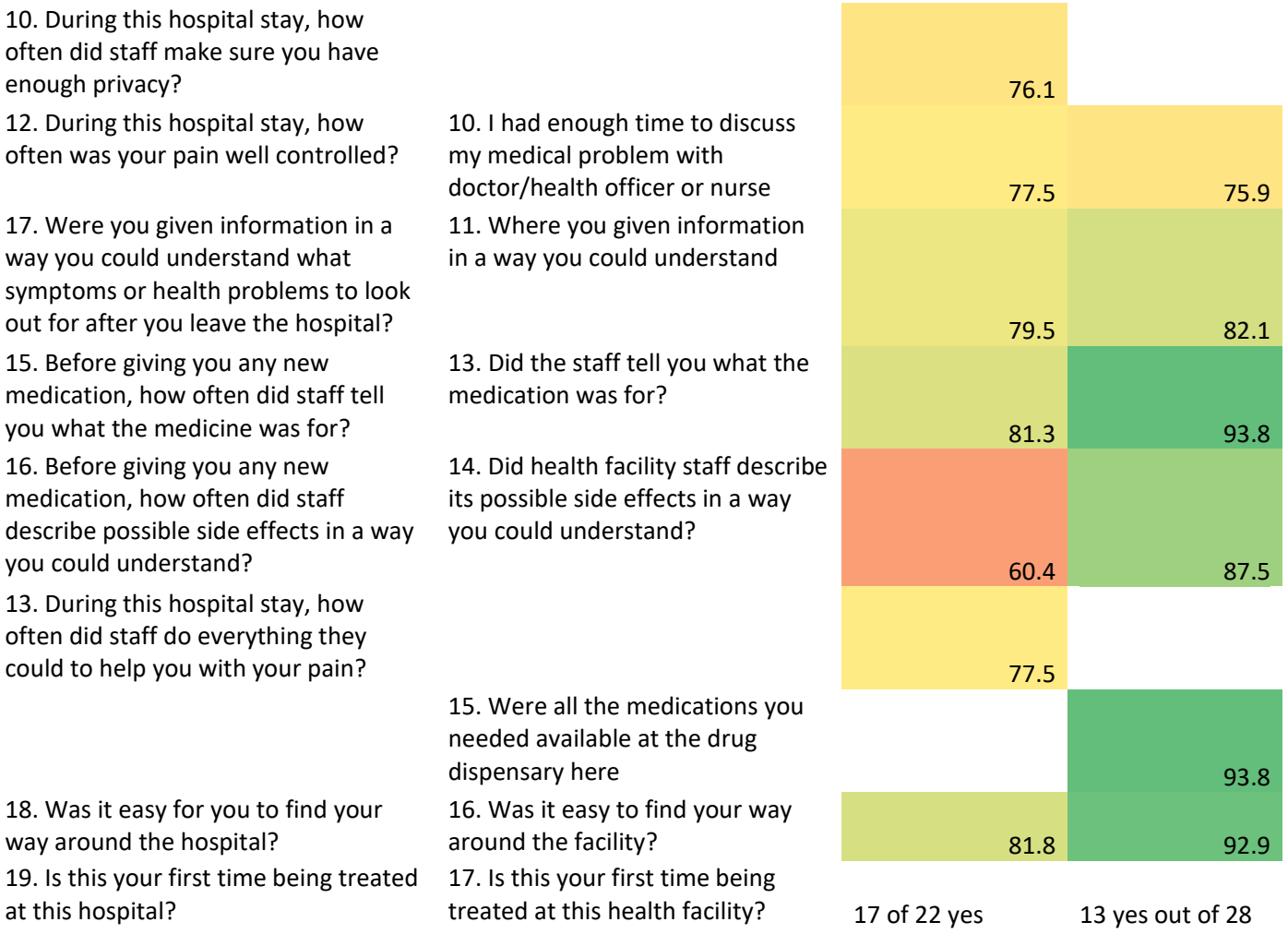
	Bystander help		Inadequate awareness of bystander responsibilities	s	0	s	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
			Expectation that bystanders will need to pay for treatment help with registration	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Bystanders influencing choice of facility to attend	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
			Bystander fear of injury	s	0	s	s	s	s	y	1	s	y	s	s	y	1	y	s	s	s
			bystanders providing help per se	s	0	s	s	s	s	y	1	y	**s**	s	s	y and n	2	y	n	s	s
	COVID		COVID related delays	s	0	s	s	s	s	y	1	y	s	s	s	y	1	s	y	s	s
	Stigma		Stigma around rehabilitation and mental health	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
			Community understanding of mental health issues in	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s

		regards to injury																		
	Misc	Fear of ambulance and unfamiliar surrounding	y	1	Y	s	s	s	s	0	s	s	s	s	s	0	s	s	s	s
		Community /family members to encourage health seeking	y	1	Y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Patient agency to take ownership of continued care	s	0	s	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
		Personal security at certain time/places	s	0	s	s	s	s	y	1	y	s	s	s	y	1	y	s	s	s
		Violence (Gang violence, interpersonal violence)	y	1	y	s	s	s	y	1	y	s	s	s	s	0	s	s	s	s
	Trauma prevention	Trauma prevention laws	y	1	s	s	y	s	n	1	s	s	n	s	n	1	s	s	n	s
	Mitigating factors	Alcohol/substance abuse	y	1	s	s	s	s	y	1	y	y	s	s	s	0	s	s	s	s

Yes is a barrier, no is not a barrier, or silent is not mentioned

Appendix 4a Percentage scores from I-PAHC and O-PAHC from South Africa

Question I-PAHC	Question	Percentage score I-PAHC	Percentage score O-PAHC
1. During this hospital stay, how often did nurses treat you with courtesy and respect?	1. During this visit, nurses treated me with courtesy and respect?	78.4	75.0
2. During this hospital stay, how often did the nurses listen carefully to you?	2. During this visit nurses listened carefully to me?	81.8	72.2
3. During this visit hospital stay, how often did nurses explain things in a way you could understand?	3. During this visit nurses explained things in a way I could understand?	71.6	67.6
4. During this hospital stay, how often did doctors/health officers treat you with courtesy and respect?	4. During this visit, doctors/health officers treated me with courtesy and respect?	92.0	72.2
5. During this hospital stay, how often did doctors/health officers listen carefully to you?	5. During this visit doctors/health officers listened carefully to me?	79.5	68.5
6. During this hospital stay, how often did doctors/health officers explain things in a way you could understand	6. During visit doctors/health officers explained things in a way I could understand	77.3	66.7
7. I could distinguish between doctors/health officers and nurses	7. I could distinguish between doctors/health officers and nurses	81.8	83.3
8. During this hospital stay, how often was the room you were sleeping in kept clean?	8. The outpatient department was clean	89.8	48.1
9. During this hospital stay, how often was the area around you quiet at night?	9. The bathrooms/latrines were clean	81.8	75.9


10. During this hospital stay, how often did staff make sure you have enough privacy?
76.1
12. During this hospital stay, how often was your pain well controlled?
10. I had enough time to discuss my medical problem with doctor/health officer or nurse
77.5
75.9
17. Were you given information in a way you could understand what symptoms or health problems to look out for after you leave the hospital?
11. Where you given information in a way you could understand
79.5
82.1
15. Before giving you any new medication, how often did staff tell you what the medicine was for?
13. Did the staff tell you what the medication was for?
81.3
93.8
16. Before giving you any new medication, how often did staff describe possible side effects in a way you could understand?
14. Did health facility staff describe its possible side effects in a way you could understand?
60.4
87.5
13. During this hospital stay, how often did staff do everything they could to help you with your pain?
77.5
15. Were all the medications you needed available at the drug dispensary here
93.8
18. Was it easy for you to find your way around the hospital?
16. Was it easy to find your way around the facility?
81.8
92.9
19. Is this your first time being treated at this hospital?
17. Is this your first time being treated at this health facility?
17 of 22 yes
13 yes out of 28

20. On a scale 0-10 (0 being the worst hospital, 10 being the best hospital), how would you rate this hospital?	18. On a scale of 0-10, how would you rate this facility?	72.7 / 56.1
21. Would you recommend this hospital to your friends and family?	19. Would you recommend this outpatient department/clinic to your friends and family?	76.1 / 64.3
22. Did you have to pay for this hospital stay? (if 1 skip 23)	20. Did you have to pay for this outpatient visit? (if not skip 21)	7 yes skip pattern Q / 4 yes out of 28
23. Do you consider this hospital stay too expensive?	21. Do you consider this outpatient visit too expensive?	85.7 / 87.5

Appendix 4b Percentage scores from I-PAHC and O-PAHC from Ghana

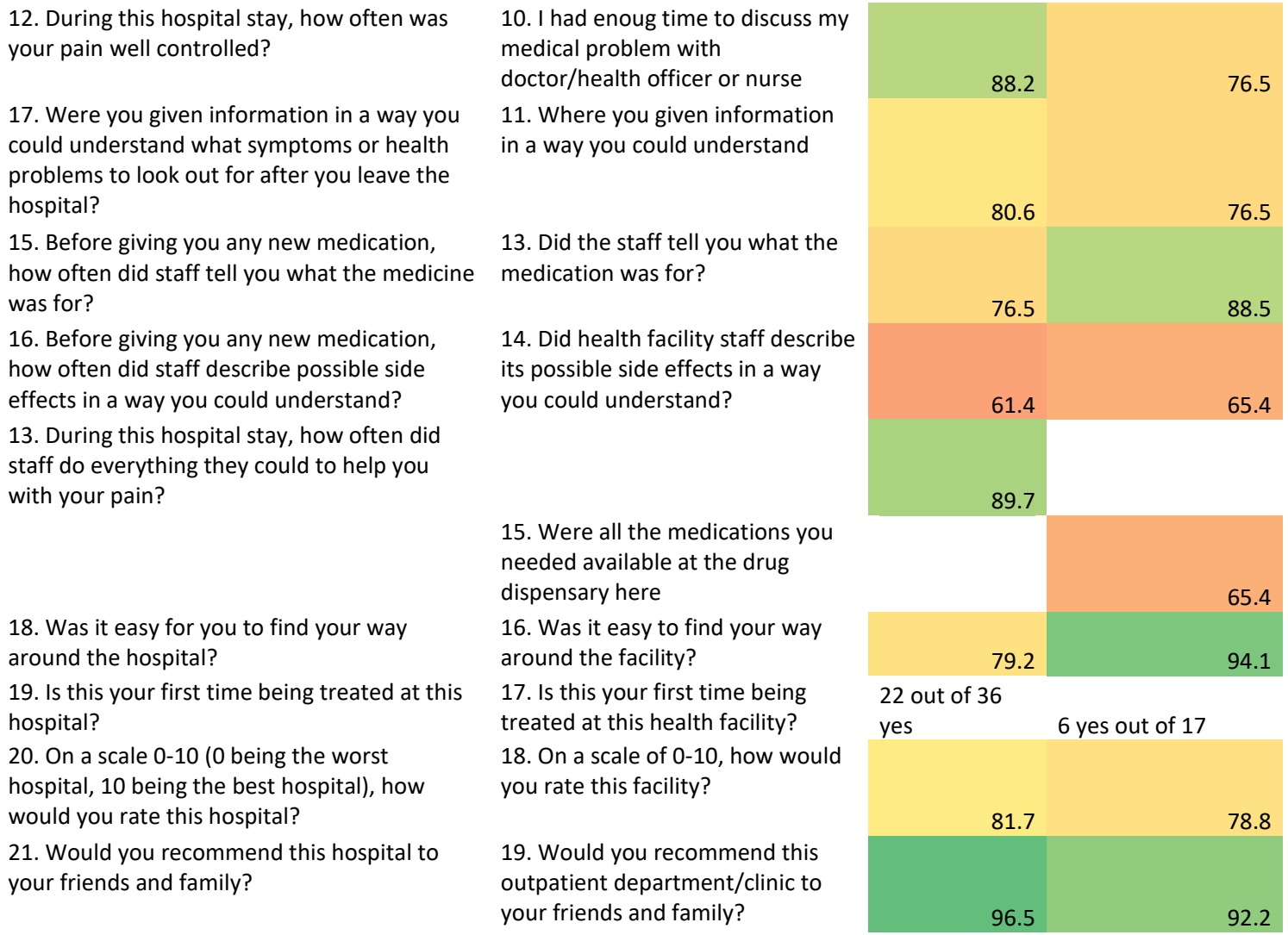
Question I-PAHC	Question O-PAHC	Percentage score I-PAHC	Percentage score O-PAHC
1. During this hospital stay, how often did nurses treat you with courtesy and respect?	1. During this visit, nurses treated me with courtesy and respect?	78.8	92.6
2. During this hospital stay, how often did the nurses listen carefully to you?	2. During this visit nurses listened carefully to me?	78.8	95.6
3. During this visit hospital stay, how often did nurses explain things in a way you could understand?	3. During this visit nurses explained things in a way I could understand?	59.6	83.8
4. During this hospital stay, how often did doctors/health officers treat you with courtesy and respect?	4. During this visit, doctors/health officers treated me with courtesy and respect?	76.9	91.2
5. During this hospital stay, how often did doctors/health officers listen carefully to you?	5. During this visit doctors/health officers listened carefully to me?	76.9	92.6
6. During this hospital stay, how often did doctors/health officers explain things in a way you could understand	6. During visit doctors/health officers explained things in a way I could understand	63.5	83.8
7. I could distinguish between doctors/health officers and nurses	7. I could distinguish between doctors/health officers and nurses	75.0	67.6

8. During this hospital stay, how often was the room you were sleeping in kept clean?	8. The outpatient department was clean	78.8	79.4
9. During this hospital stay, how often was the area around you quiet at night?	9. The bathrooms/latrines were clean	80.8	45.6
10. During this hospital stay, how often did staff make sure you have enough privacy?		78.8	
12. During this hospital stay, how often was your pain well controlled?	10. I had enough time to discuss my medical problem with doctor/health officer or nurse	77.1	76.5
17. Were you given information in a way you could understand what symptoms or health problems to look out for after you leave the hospital?	11. Where you given information in a way you could understand	61.5	76.5
15. Before giving you any new medication, how often did staff tell you what the medicine was for?	13. Did the staff tell you what the medication was for?	58.3	88.5
16. Before giving you any new medication, how often did staff describe possible side effects in a way you could understand?	14. Did health facility staff describe its possible side effects in a way you could understand?	36.1	65.4
13. During this hospital stay, how often did staff do everything they could to help you with your pain?		72.9	

	15. Were all the medications you needed available at the drug dispensary here		65.4
18. Was it easy for you to find your way around the hospital?	16. Was it easy to find your way around the facility?	91.7	94.1
19. Is this your first time being treated at this hospital?	17. Is this your first time being treated at this health facility?	7 out of 13 yes	6 yes out of 17
20. On a scale 0-10 (0 being the worst hospital, 10 being the best hospital), how would you rate this hospital?	18. On a scale of 0-10, how would you rate this facility?	76.2	78.8
21. Would you recommend this hospital to your friends and family?	19. Would you recommend this outpatient department/clinic to your friends and family?	82.7	92.2
22. Did you have to pay for this hospital stay? (if 1 skip 23)	20. Did you have to pay for this outpatient visit? (if not skip 21)	9 Yes skip pattern	8 Yes skip pattern
23. Do you consider this hospital stay too expensive?	21. Do you consider this outpatient visit too expensive?	55.6	75.0

Appendix 4c Percentage scores from I-PAHC and O-PAHC from Rwanda

Question I-PAHC	Question O-PAHC	Percentage score I-PAHC	Percentage score O-PAHC
1. During this hospital stay, how often did nurses treat you with courtesy and respect?	1. During this visit, nurses treated me with courtesy and respect?	79.5	92.6
2. During this hospital stay, how often did the nurses listen carefully to you?	2. During this visit nurses listened carefully to me?	82.1	95.6
3. During this visit hospital stay, how often did nurses explain things in a way you could understand?	3. During this visit nurses explained things in a way I could understand?	76.3	83.8
4. During this hospital stay, how often did doctors/health officers treat you with courtesy and respect?	4. During this visit, doctors/health officers treated me with courtesy and respect?	81.4	91.2
5. During this hospital stay, how often did doctors/health officers listen carefully to you?	5. During this visit doctors/health officers listened carefully to me?	84.0	92.6
6. During this hospital stay, how often did doctors/health officers explain things in a way you could understand	6. During visit doctors/health officers explained things in a way I could understand	75.6	83.8
7. I could distinguish between doctors/health officers and nurses	7. I could distinguish between doctors/health officers and nurses	69.9	67.6
8. During this hospital stay, how often was the room you were sleeping in kept clean?	8. The outpatient department was clean	88.5	79.4
9. During this hospital stay, how often was the area around you quiet at night?	9. The bathrooms/latrines were clean	81.4	45.6
10. During this hospital stay, how often did staff make sure you have enough privacy?		85.9	

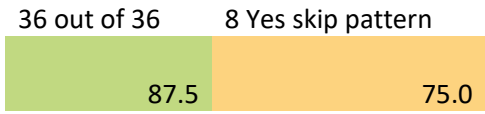

12. During this hospital stay, how often was your pain well controlled?
17. Were you given information in a way you could understand what symptoms or health problems to look out for after you leave the hospital?
15. Before giving you any new medication, how often did staff tell you what the medicine was for?
16. Before giving you any new medication, how often did staff describe possible side effects in a way you could understand?
13. During this hospital stay, how often did staff do everything they could to help you with your pain?
18. Was it easy for you to find your way around the hospital?
19. Is this your first time being treated at this hospital?
20. On a scale 0-10 (0 being the worst hospital, 10 being the best hospital), how would you rate this hospital?
21. Would you recommend this hospital to your friends and family?
10. I had enoug time to discuss my medical problem with doctor/health officer or nurse
11. Where you given information in a way you could understand
13. Did the staff tell you what the medication was for?
14. Did health facility staff describe its possible side effects in a way you could understand?
15. Were all the medications you needed available at the drug dispensary here
16. Was it easy to find your way around the facility?
17. Is this your first time being treated at this health facility?
18. On a scale of 0-10, how would you rate this facility?
19. Would you recommend this outpatient department/clinic to your friends and family?
88.2
76.5
80.6
76.5
76.5
88.5
61.4
65.4
89.7
65.4
79.2
94.1
22 out of 36 yes
6 yes out of 17
81.7
78.8
96.5
92.2

22. Did you have to pay for this hospital stay? (if 1 skip 23)

23. Do you consider this hospital stay too expensive?

20. Did you have to pay for this outpatient visit? (if not skip 21)

21. Do you consider this outpatient visit too expensive?



Appendix 5. List of authors in the EquiTrauma collaborative in random order

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