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Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

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Title: Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

Short Title: Access measures of emergency care in LMICs

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Abstract

Objectives: Estimates suggest that over 50% of annual deaths in low and middle-income countries (LMICs) could be averted by implementation of high-quality emergency care systems. In order to better understand and address relevant barriers to accessible emergency care, we performed a scoping review of all English language, peer-reviewed publications related to measures of access and emergency care in LMICs.

Participants: 68 full text articles

Interventions: A search of PubMed, Embase, Web of Science, and the gray literature were queried. English language studies describing one or more measure(s) of access to emergency or acute care health services in LMICs were included.

Outcomes: A structured data extraction tool was used to identify and classify access measures into one of five categories: affordability, availability, accessibility, accommodation, and acceptability. Quantitative outcomes related to various components of emergency care access were summated and reference ranges provided.

Results: A total of 2865 articles were screened with 68 meeting full study inclusion criteria. Articles were uniformly descriptive (n=68, 100%), but heterogenous in their definitions of access, reporting a total of 131 unique measures. The majority of total measures studied (n=306; with many unique measures studied more than once) described availability (n=107, 35.0%) most often. Unique and total measures of affordability were the least reported (n=17, 13.0%; n=30, 9.8%, respectively). While measures of accessibility made up 17 (13.0%) of unique measures, these measures were disproportionately studied in total (n=63, 20.6%).

Conclusions: Numerous measures of emergency care access are described in the literature, but most studies on access are limited in scope, address only the availability of and/or the accessibility to emergency care. Development and standardization of key measures to best understand and address these gaps and allow comparison across systems is essential in efforts to achieve meaningful, universal access to high-quality emergency care in all settings.

Strengths and Limitations

- Globally, more than 8 million people die each year from preventable causes with 40% attributable to a lack of healthcare access.
- Implementation of and access to high quality emergency care could lead to significant reductions in death in low- and middle-income countries (LMICs).
- The available literature on access to emergency care is significant, but measures are limited in scope and not previously studied in detail.
- Though multiple measures were revealed through this review, several measures such as patient proximity to emergency units, are overly studied and may not actually guarantee access to emergency care.
- Development and standardization of key measures to best understand and address gaps in the current literature on emergency care access will allow for comparison across systems and allow for meaningful approaches to ensuring universal access to high-quality emergency care in all settings.

Introduction

The past 20 years have been called a golden age of public health. (1) A dramatic increase in global health funding has expanded health care resources in low- and middle-income countries (LMICs). (2-4) As a result, significant reductions in infectious disease-related, neonatal, and maternal mortality have been achieved in line with the United Nations Millennium Development Goals. (5) Further reductions in global mortality attributable to non-communicable diseases and trauma has been far less substantial. (6) While a shift from disease specific programs to health system strengthening, equity, and social protection has been an important first step, progress on current Sustainable Development Goals remains lacking and has been further hampered by existing health inequities made worse by the COVID-19 pandemic. (7)

Improvements in both prehospital and facility-based emergency care have the potential to impact many of the SDGs, lead to marked improvements in healthcare systems, and reduce deaths across multiple disease categories.(8) Estimates suggest that 54% of annual deaths in LMICs could be averted by the implementation of quality emergency care systems. (9-12) The increasing mortality burden of non-communicable diseases, including injury and chronic conditions, coupled with the acute medical needs of emerging pandemics, such as SARS-CoV-2, requires the integration of emergency care, with longitudinal care services, to treat exacerbations of chronic disease.(1, 13, 14) Unfortunately many who live in resource-limited settings lack access to quality emergency care.

Previous descriptions of known measures of emergency care quality (15, 16) and barriers to emergency care access (17, 18) have highlighted gaps in emergency

care in LMICs, but no comprehensive review on measures of emergency care access in LMICs has been completed to date.

The term “access” is often used as shorthand for distance, leading to a focus on individual patient proximity, either spatial or temporal, to a given health service. (19) While vital, proximity is but one component of accessibility and may not correlate with the true ability to receive quality emergency care. For this scoping review of all English language peer-reviewed literature related to access and emergency care in LMICs, we revert back to a more expansive definition of access, one rooted in a rights-based approach to emergency care and reflecting the spectrum of fit between user and service and inclusive of five dimensions of access—availability, accessibility, accommodation, affordability, and acceptability—as described by Penchansky and Thomas.(Table 1; 20-22)

Table 1. Proposed Emergency Care Access Measures for Monitoring, Evaluation and Comparative Analysis by Access Type

Access Type	Definition from Penchansky and Thomas	Proposed sample emergency care access measures
Availability	The relationship of the volume and type of existing services to the clients' volume and types of needs	Number of emergency care beds per (patient catchment) population Presence of drug, technology, or interventions specific to EU care Presence of emergency care facility designation Presence of emergency care clinicians 24 hours a day Percent of clinicians with emergency care training (as per local authority)
Accessibility	The relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost	Distance to closest emergency care facility Time to closest emergency care facility Available transport Time associated with transport Cost of transport to emergency care
Affordability	The relationship of prices of services and providers' insurance or deposit requirements to the clients' income, ability to pay, and existing health insurance.	Cost to access emergency care service (co-pay) Cost of individual services specific to emergency care (specific to individual care type) Overall emergency care cost per visit

Accommodation	The relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of operation, walk-in facilities, telephone services) and the clients' ability to accommodate to these factors and the clients' perception of their appropriateness	Hours of operation of emergency unit Number of transfers per patient Average wait time Training provided per specific task(s)
Acceptability	The relationship of clients' attitudes about personal and practice characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients	Understanding of how to navigate emergency medicine system Acceptability of emergency unit care Acceptability of provider conduct or attitudes Acceptability of ambulance use

Materials and Methods:

Search Strategy

A rigorous search strategy was employed with the goal of identifying all peer-reviewed studies that described measures of access to emergency care in LMICs. We performed a scoping review using the following databases: PubMed, Embase, and Web of Science. A subsequent gray literature search was conducted via Google, with searches targeted towards organizations thought to publish global emergency care literature.

The initial search strategy (Supplementary Material: Appendix 1) was developed within PubMed and adapted for the remaining databases. Search terms included various iterations of access, emergency care, and LMICs. Free text terms and standardized MeSH headings/subheadings were utilized to optimize sensitivity for relevant literature while minimizing excess search results. The reference lists of relevant primary studies and reviews likely to meet inclusion criteria were also reviewed manually to both verify search sensitivity and identify other potentially relevant studies that were not identified by the electronic search.

Studies published between January 1, 1990, and December 30, 2020, English-language, and describing at least one measure of access to emergency care

services in an LMIC (by World Bank economic definitions) were included. Articles were excluded that were clearly irrelevant to the topic, did not involve emergency care, did not describe a measure of access or measurable barrier to emergency care, or did not include data from at least one LMIC. For the purposes of this review, we did not include data on care seeking in the setting emergency obstetric and newborn care (EmONC; we anticipate a separate forthcoming review on the subject). This review was exempt from ethics review based on the corresponding author's IRB.

Patient and Public Involvement

Given the nature of this study it was not possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Data Processing

Citations meeting initial broad search criteria were imported into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Initial title and abstract review were performed by two independent authors (SH, JD). Disagreements were resolved by a third reviewer (CB). The same procedure was followed for full text review.

Data from included manuscripts were extracted by the primary author and included the following: author(s) and full citation, publication date and study timeframe, location, study type, setting, methodology, access measure(s) reported, and the primary outcome(s). Countries under study were categorized by World Bank income-level, WHO region, whether the study was local, regional, national or multinational in scale, and whether the populations under study were rural or urban.

Data Analysis

Individual access measures were aggregated and categorized by access type as defined by Penchansky and Thomas into the following five groupings: affordability, availability, accessibility, accommodation, and acceptability. (20) In Penchansky and Thomas' framework, access is examined through the "fit" of the patient with the health care system. For example, a health care facility may be available (that is, it exists), but not accessible because of transportation barriers. In addition, the health care facility may not have necessary measures to accommodate a patient (such as 24-hour-access or childcare), may be unaffordable, or may be unacceptable (i.e., due to poor quality or corruption). We further analyzed measures of access via the 'Three Delay' model and the World Health Organization's Emergency Care Systems framework and categorized measures as addressing the process of patient's seeking, reaching, or receiving care. (9, 24)

All total extracted access measures were collected, with similar measures collapsed into singular unique measures. We report the number of unique measures and the total number of times a measure is reported as a number and percent. Given the heterogeneity of study methods and types, a qualitative analysis and narrative synthesis was undertaken. Thematic analyses focused on the number and general quality of the measures used. Trends and ranges among studies with comparable numeric measures are reported where appropriate. We did not perform a grading of the literature given the overall observational nature of most studies. Criteria proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews statement were adhered to in reporting.(25)

Results

A total of 2865 articles were identified for screening via database searches, and 29 were included from the gray literature and hand searches of relevant literature (**Figure 1**). After removal of 865 duplicates, 1860 articles were screened by title and abstract, 176 articles met criteria for full text screening, after which 108 articles were excluded. In sum, 68 articles met full criteria for inclusion. (Supplementary Material, eTable 1)

[Insert] Figure 1. Prisma Flow Diagram for review of literature on access to emergency care measures in LMICs.

All 68 studies were published in peer-reviewed journals. The majority (n=39, 57.4%) of studies examined access related to routine emergency care, 20 (29.4%) were relevant to prehospital care, eight (11.8%) were specific to trauma care, and one (1.5%) article focused on pediatric patients. (**Table 2)** Geographically, publications included data from all six WHO regions, with the majority from the African Region (n=35, 51.5%). The majority of included studies originated from lower-middle income countries (n=34, 50.0%), with additional studies from upper-middle income countries (n=13, 19.1%) and low-income countries (n=11, 16.2%). Ten articles (14.7%) included data from multiple income groups.

Table 2. Characteristics of manuscripts for study inclusion

Characteristic	N (%) N=68
Country	
Multinational	10 (14.7)
Ghana	7 (10.3)
Pakistan	6 (8.8)
Kenya	5 (7.4)
India	5 (7.4)
South Africa	4 (5.9)
Brazil	3 (4.4)
Other*	27 (39.7)
WHO Region	

Africa	35 (51.5)
Americas	7 (10.3)
Eastern Mediterranean	4 (5.9)
European	1 (1.5)
South-East Asia	16 (23.5)
Western Pacific	1 (1.5)
Multiple WHO Regions	4 (5.9)
Income level	
Low	11 (16.2)
Lower-middle	34 (50.0)
Upper-middle	13 (19.1)
Multiple	10 (14.7)
Settings	
Local	8 (11.8)
Regional	31 (45.6)
National	19 (27.9)
Multinational	10 (14.7)
Setting if Local or Regional**	
Urban	6 (8.8)
Rural	31 (45.6)
Both	2 (2.9)
Article Type	
Quantitative	19 (27.9)
Qualitative	49 (72.1)
Methodology	
Descriptive (Survey)	9 (13.2)
Descriptive (Interview)	13 (19.1)
Cross sectional	41 (60.3)
Mixed methods	5 (7.4)
Observational pre/post; Cohort, RCT	0 (0.0)
Population focus	
General EM care	39 (57.4)
Prehospital care	20 (29.4)
Trauma care	8 (11.8)
Pediatrics	1 (1.5)
Number of study participants	
0-50	5 (7.4)
51-100	2 (2.9)
101-500	7 (10.3)
501-2000	1 (1.5)
>2000	6 (8.8)
Not reported	47 (69.1)

*At least one study from the following countries including Bangladesh, Cambodia, Cameroon, China, Eswatini, Ethiopia, Guinea-Bissau, Haiti, Honduras, Iran, Nigeria, Rwanda, Sierra Leone, Sudan, Tanzania, Thailand, Vietnam, Yugoslavia, Zambia, Zimbabwe

**N= 39

Methodologically, all studies were descriptive and relied on surveys (n=9, 13.2%), interviews (n=13, 19.1%), or cross-sectional (n=41, 60.3%) data. No manuscript reported a comparator group, and the majority of studies were qualitative in nature (n=49, 72.1%). Studies varied in the number and type (patients, clinical providers, administrators) of participants. The majority of studies (n=41, 60%) used cross-sectional data and did not specify the number of participants. Participant enrollment ranged from 11 to 32,774 individuals. The types of health facilities under study also varied, and included emergency care as accessed at clinics, district hospitals, referral hospitals (with access to intensive care), and more formal emergency departments.

Measures by access type

In sum, 131 unique measures of access were described in the 68 studies (**Table 3**). Of the 68 total studies, most (n=49, 72.1%) reported more than one unique measure. Based on Penchansky and Thomas' categories of access, the most unique number of measures reported were those describing accommodation (n=41, 31.3%) followed by availability (n=39, 29.8%). In many instances, a single unique measure was studied or reported more than once leading to a total of 306 total measures cited. Among the total measures, availability (n=63, 20.6%) represented a disproportionate number as compared to the overall unique measures of availability reported (n=17, 13.0%).

Table 3. Unique and total number of access measure categorized by access type

Access category	N (%) of unique measures N=131	N (%) of total measures N=306

Availability	39 (29.8)	107 (35.0)
Accessibility	17 (13.0)	63 (20.6)
Accommodation	41 (31.3)	58 (19.0)
Affordability	17 (13.0)	30 (9.8)
Acceptability	17 (13.0)	48 (15.7)

Availability

A total of 39 unique measures on availability were reported in the studies included in this review. Total measures of affordability were studied most often (n=107, 35.0%, **Table 4**). Of the unique measures, most (n=28, 71.8%) focused on receiving care. Measurements on receiving care often measured the presence or lack of basic emergency health facilities and resources relevant to emergency care. There was heterogeneity when describing resource service availability, such as the availability of emergency radiologic services (e.g., CT and MRI) and emergency laboratory service (e.g., blood smears for malaria). Measures owing to the presence or absence of clinical providers with qualifications relevant to emergency care were described in 9 of the 68 studies (13.2%).

Table 4. Unique access measures categorized by access type and process of care.

	Availability N=39	Accessibility N=17	Accommodation N=41	Affordability N=17	Acceptability N=17
Seeking N=22	**N=2**	**N=3**	**N=5**	**N=1**	**N=11**
	Presence of community (lay) responders (56) Presence of dispatchers (62)	Patient access to a telephone (5, 10, 57) Presence of a national universal toll-free emergency number (5, 8, 9, 12, 13, 26, 41, 56, 66) Median time from onset of patient symptoms to contact with provider (12, 53)	Ability to get through on phone lines on first attempt (5) Concerns over personal safety in seeking care (23) Patients and families responsible for arranging their transportation to the higher-level facility (13) Presence of adequate child care (9) Required paperwork filled out before emergency care (12)	Inability to miss work/secondary to cost (9)	Acceptability of EU care: by sex (19); by education level (21); age (Age<15, 21; Age >40, 44); economic/financial status (49); social status (12); insurance (12); appearance (12); ethnicity (55); religion (55, 66), proximity to health facility (49) Awareness of emergency care systems and services (10, 48) Community accepts and utilizes EMS care (56) Fear of emergency dental treatment (44) Knowledge of emergency number (20, 25, 48, 53, 66) Knowledge of where the closest EU facility is located (48) Personally knew a healthcare provider (12, 55) Preference of traditional methods of care (e.g., bonesetters) over EU care (7) Social and family disapproval (49) Understanding of how to navigate emergency care systems: general (5, 13, 21, 54) Understanding of what qualifies as an emergency condition/perception that condition is severe enough to seek care (7, 21, 48, 49, 66)
Reaching N=45	**N=9**	**N=12**	**N=12**	**N=8**	**N=4**
	Basic building (i.e., structural) resources specific to emergency care (24) EU radio/communication devices available for EMS handoff (28) Fuel available for ambulances (13) Fuel for general (non-ambulance) transport (13) Presence of any healthcare facility (13) Presence and number of ambulances for interfacility transport (18) Presence and number of ambulances with basic life support capabilities (43) Presence and number of ambulances without medical capabilities/transport only (48) Presence and number of helicopters for transport (62)	Dispatcher training provided (5) Geography limits access: rural locations (1); mountainous terrain (9) Calculated accessibility by 2SFCA method (22) Calculated accessibility by 2SFCA method (22) Percent of patients who sought care or made it to a facility within 60 minutes of onset of symptoms (54) Percent of patients who sought care or made it to a facility within 60 minutes of onset of symptoms (54) Response time from initial call to scene (3, 6, 13, 20, 33, 57, 64) Roadways limits access: traffic (1); poor or narrow roads (10, 13, 18, 48) Transport time from a location to a facility with specific EU capabilities (i.e., PCI-capable hospital, trauma center, obstetric emergencies, tertiary hospital; 34, 42, 45, 51) Transport time from home to hospital (2, 34, 43, 45, 47, 50) Transport time from scene to hospital (11, 27, 31, 33, 67) Travel distance (in km; 12, 13, 19, 20, 21, 25, 30, 47, 53, 54, 60, 65, 66) Travel time from home to national ambulance service station (61) Weather/Climate limits access: rainy season (10)	EMS delays: general (23); due to referrals (54) Existence of a coordinated emergency response system (8, 26, 65, 66, 41) Equitable (plan for) distribution of ambulance stations (57) Facilities are notified in advance of patients arriving (14) General maintenance issues with vehicles (10) Number of separate modes of transportation (per patient) to reach care at facility (18) Patients taken to the police station before taking them to the hospital (12, 13) Percent of missed or prolonged pick-ups due to prehospital provider misunderstanding of location (5) Percent of missed or prolonged pick-ups due to prehospital provider misunderstanding of location (5) Presence of drivers willing to respond to patient request (10) Private ambulance services control rooms linked to cellular networks (62) Regulations governing EMS (41) Transfer to a facility that has the capability to handle the case (18)	Ambulance fee (25, 58) Ambulance fee by ambulance-type (48) Ambulance referral fee (25) Cost of transport (10, 13, 17, 20, 44, 66) Payment required before treatment (32) Preauthorization fee (58) Preauthorization fee/care equitable (by sex; 58) Private vehicle transport fees (25)	Ambulances acceptable based on: language (57), if police involved/transport (57), slow response time (48) Patient preference of ambulance care over other forms of transport (48) Prehospital care acceptable to: those taking government ambulance (52), those taking taxis (52), road traffic accident victims (52), those being transferred for medico-legal reasons (52) Previous ambulance use and willingness to use ambulances in the future (57)
Receiving N=45	**N=28**	**N=2**	**N=24**	**N=8**	**N=2**

N=64	Absolute number of EU providers (stratified by type: physicians, nurses, and EMS providers; 5, 9, 12, 13, 16, 28) Advanced cardiac life support or resuscitation equipment available in ambulances or number of ACLS ambulances (26, 28, 43, 52) Availability of basic EU medications available (12, 14, 44, 46) Availability of basic EU resources/equipment (8, 12, 13, 16, 18, 24, 28, 46, 65, 66) Availability of EU infection control materials (24) Availability of EU procedures: Needle thoracostomy (14); chest tube (14); pelvic binding (14), defibrillation (14), cardioversion (14), pericardiocentesis (14); external cardiac pacing (14); Blood transfusions (14, 30) Availability of EU specific supplies and equipment: Suture and wound care supplies (14); Gloves (14); Oxygen (14); Stethoscopes (18); Glucometer (14); Pulse oximetry; ECG machine (14); Resuscitation equipment (7) Availability of imaging (Xray: 14; CT: (28,62), ultrasound, MRI: 28) Availability of laboratory/diagnostic testing material (general blood/urine tests: 28, 30, 53; malaria smears: 30) Availability of potable (sterile) water (18) Availability of pre-hospital providers with standardized training (8, 20, 26, 48, 52) Availability of specified care: trauma care (4); orthopedic (fracture) care (7, 14, 14); obstetrical emergencies (18); HIV care (18); cholera (18); tuberculosis care (18); general surgical services (18); dental care (18); critical care (18); ophthalmological care (18) Electricity available (18, 24) Emergency equipment list available (18) First aid received on scene by lay providers (i.e., members of the public, other motorists, or the less injured casualties; 32) First aid received on scene by trained providers (32) Number of doctors staffing EU (appropriate for size; 62) Number of EU-specific area beds (18) Number of hospital-facility (non-EU specific) rooms or beds (9, 17, 53) Presence of EU resuscitation bed/zone (46) Presence of EU (within facility; 2, 62) Presence of EU dedicated nursing personnel (16) Presence of facility burn unit (2) Presence of triage (12, 13, 46) Staff qualified to utilize EU equipment (24) Staff qualified to treat EU conditions (25) Staff with EC training: ACLS or BLS training (28, 65, 66); ATLS, PALS (28, 66) Staff with specialized training relevant to EC: adult critical care (16); continuing education (16); EU equipment use (18); neonatal care (46)	Number of (trauma) fatalities within and outside the first hour (64) Fatality rate per patient kilometer from facility (64)	Additional staffing for disasters (62) Availability of 24-hour ambulance care (no night hours, 48) Availability of 24-hour emergency care (12, 24, 53) Availability of 24-hour staff availability (18) Care provided during transport (13) Care provided at lower-level facility before transfer (13) Legal protections for ambulance providers distributing and providing care (26) Miscommunication or mis-triage of patient acuity (5) Number of transfers per patient (5) Number and Percent mis-triage (5) Percent of hospitals with out-of-hours clinician coverage (16) Physician comfort in adequately performing EU-specific procedures (28,46) Presence of a standardized EMR (12) Protocols for patient transfers (18) Protocols specific to trauma care (14) Safe passage for health providers to the hospital at night (66) Staff comfort in treating EU conditions (30, 32) Training for community members and police: First aid and triage (66) Training for providers: adult triage (16) Training for providers: EU-specific (12, 13, 25, 43, 65) Training for providers: pediatric triage-specific (16) Time to lab tests (68); by patient GCS (68) Time to provider (e.g., wait time; 23, 68) Utilization and access to standardized clinical care guidelines: general approach (14); condition specific (sepsis, DKA, anemia, 14)	Absolute cost of EC treatment (12, 19, 21, 32, 44, 49, 65, 66) Copayment for care (69) Cost of facility treatment (17) Cost of medical investigations and radiography (17) Cost of medicines (21) Cost of treatment by a bonesetter (7) Hospital costs beyond scope of patient (e.g., proportion of cost to individual finances) (32) Payment required in cash for imaging (32)	Acceptable providers conduct and attitudes towards patients (12, 13, 53) Providers/percent of providers deemed corrupt (12)

Accessibility

Unique measures of accessibility totaled 17 (13.0%), with a disproportionate number of measures studied more than once, leading to 63 total measurements (20.6%). The majority of the unique measures of accessibility corresponded to the process of reaching care (n=12, 70.6%) with most measures on the distance or time to a health service (n=11, 64.7%). Among the 13 studies reporting time, travel times to emergency care ranged from 5 minutes to 2 hours. The range of distances to health facilities demonstrated similar variability, though most (n=13) measurements were in kilometers. An additional study (n=1) reported on the percentage of the population living within a given distance or time, while other studies (n=4) reported on a range of distances or times to specific EU care (e.g., trauma, referral, cardiac). Other qualitative barriers to accessibility were also provided, including the effects of terrain, weather, and road quality.

Accommodation

Measures of accommodation made up the greatest number of unique measures (n=41, 31.3%), but they were rarely studied more than once (total n=58, 18.6%). Adequacy of child care, concerns over personal safety, and difficulties in getting through to prehospital providers were described as significant barriers in the process of seeking emergency care. The majority of unique measures on accommodation dealt with the process of receiving care (n=24, 58.5%). Among measures categorized as receiving care, facility-based measures (n=10) included measures of provider timeliness and availability, provider training, and of protocols for care. Among the unique measures of accommodation, four (8.9%) described the use standardized protocols (three related to prehospital care and one on facility-based care).

Affordability

Measures of affordability were the least studied. While the 17 (13.0%) unique measures were similar to accessibility and acceptance, measures were rarely studied more than once (n=30, 9.8%). Of the unique metrics reported, most reported on different aspects of the cost of transportation in reaching care (n=8, 47.1%) and the cost of receiving treatment (n=5, 29.4%). Types of costs varied, including cost of an ambulance ride, cost of deposit before treatment, and total hospital bills. A single study described the lack of emergency care affordability based on lost wages from missing work.

Acceptability

Seventeen (13.0%) unique measures of acceptability were described in the literature. The majority were related to the process of care seeking (n=11, 64.7%). Measures largely described patient's understanding, acceptability, willingness, and fears in activating and navigating emergency care systems.

Access measures by frameworks of emergency care

Individual metrics were mapped to the Three Delay model, and categorized as either, seeking, reaching, or receiving care. Based on this framework, the majority of access measures described the processes of receiving care (n=64, 48.9%). Measures were also mapped to the WHO emergency care systems framework. Roughly equal proportions of measures were focused on prehospital (n=61, 46.6%) and facility-based emergency care (n=63, 48.1%). A total of 8 (6.1%) unique measures were neither specific to prehospital nor facility-based care.

Discussion

Increased global access to quality emergency care has the potential to reduce mortality associated with non-communicable illness and trauma as well as infectious disease and pregnancy related complications.(9-12) Analyzing emergency care access measures in detail has the potential to elucidate gaps in health system—made worse by the Covid-19 pandemic—that can guide strategies to address existing inequities in care. To date, this is the first review of access measures specific to emergency care in LMICs.

This review revealed several common themes. The majority of unique emergency care access indicators focus on availability and accommodation, but total measures of accessibility appear to be more frequently described in the literature. This has led to the disproportionate emphasis on distance and time to a health facility as demonstrative of emergency care access. In reality, upon arrival to a health facility with an emergency condition, most patients are met with limited, ineffective, or non-existent emergency care provision. Relative to other categories of access reviewed, measures of affordability were the least studied in the literature. These measures often lacked information to contextualize data relative to the gross domestic product of the study population's cost of living. Cost is known to play a significant role in patient's overall healthcare access in LMICs (26), and costs associated with emergency health services are known to vary widely across health systems.(27, 28) Moreover, cost-effectiveness is a widely used method to inform resource allocation, yet evidence on the cost-effectiveness of emergency care interventions and emergency care systems in LMICs remains limited. (27) Measures of access included in this study included both direct (user fees, medication costs, laboratory and imaging tests) and indirect (lost wages, travel costs). Further research

Further consensus led efforts to determine measures most important for system comparison are necessary.

The WHO Emergency Care System Framework provides another structured approach with which to understand the current gaps in emergency care access measures. Prehospital and facility-based measures of access were equally represented on the literature, though significant gaps remained in both domains. Among prehospital care, most measures focused on the transfer process, with less focus on dispatch and provider response.

Considerably fewer studies described measures related to the EU reception process (e.g., registration, screening, and triage) or the transfer of care between prehospital and facility-based providers. Additionally, no measures described the process of EU disposition or transfer of care to the inpatient ward. Though disposition, transfer, referrals, and transition of care from one provider to another are often cited as times of higher risk to patients, measures of this risk were not adequately described in this study.(29)

This study makes an initial attempt to describe measures of access to emergency care, but it is restricted in scope and possesses several limitations. First, there was no attempt made to rank-order measures based on importance or the degree to which they relate to specific patient outcomes. We recognize that not all measures have equal utility, with some better reflecting access to care issues and serving as more significant correlates of patient outcome. Second, though the actual corresponding outcome measures were collected (and described in Supplementary Material, eTable 2), given the heterogeneity of measures and limitations of the search strategy we were unable to

provide reference standards for any of the access measures described. Other fields have attempted, at times with similar difficulty, to establish reference (e.g., the Lancet Commission on Global Surgery has recommended a maximum two-hour travel time to surgical services), but very few agreed upon standards exist for measuring access to emergency care globally. (30) As an example, the historical reference to the 'golden hour' concept remains controversial.(31) Third, the global emergency care access literature has yet to widely adopt a standard list of measures. The lack of consensus on what measures could or should be instituted makes facility, regional, and national comparisons difficult. Limited resources and a lack of clarity around important metrics limits effective understanding of care. (32) Similar to previous consensus work on measures of emergency care quality in LMICs, future efforts should aim to define a core list of indicators of access to emergency care.(16)

Conclusion

Increasing access to quality emergency care is a key step in strengthening heath systems in LMICs. This scoping review demonstrates that while existing literature examines a wide breadth of access metrics, many gaps remain in our understanding of emergency care access in LMICs. As researchers continue to examine access and barriers to emergency care, special attention should be paid to those dimensions of access less commonly examined, such as affordability. Standardized, consensus-based measures of emergency care access should be developed to allow for more universal comparisons of healthcare functions.

Author Contributions

- CB, ECH, and SH contributed to the conception and design of the work
- SH and JD contributed to data collection.
- SH and CB contributed to data analysis and interpretation and drafting of the article.
- MB, MR, and ECH contributed to critical revisions of the article.
- All named authors have approved of the version to be published and agreed to be accountable for all aspects of the work.

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Ethics: Ethical approval for this type of study is not required by our institution.

References

1. Neilson M, Leatherman S, Syed S. The quality-of-care agenda in fragile, conflict-affected and vulnerable settings. Bull World Health Organ. 2021 Mar 1;99(3):170-170A. doi: 10.2471/BLT.21.285627. PMID: 33716335; PMCID: PMC7941104.

2. Leatherman S, Berwick DM. Accelerating Global Improvements in Health Care Quality. JAMA. 2020 Dec 22;324(24):2479-2480. doi: 10.1001/jama.2020.17628. PMID: 33351051.

3. World Health Organization. Delivering quality health services: a global imperative for universal health coverage. Geneva: World Health Organization, Organization for Economic Co-operation and Development, and The World Bank; 2018.

4. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Adeyi O, Barker P, Daelmans B, Doubova SV, English M, García-Elorrio E, Guanais F, Gureje O, Hirschhorn LR, Jiang L, Kelley E, Lemango ET, Liljestrand J, Malata A, Marchant T, Matsoso MP, Meara JG, Mohanan M, Ndiaye Y, Norheim OF, Reddy KS, Rowe AK, Salomon JA, Thapa G, Twum-Danso NAY, Pate M. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018 Nov;6(11):e1196-e1252. doi: 10.1016/S2214-109X(18)30386-3.

5. United Nations Millennium Development Goals 2008 [Available from: https://www.un.org/millenniumgoals/.] Accessed: June 27, 2022.

6. Zeid S, Bustreo F, Barakat MT, Maurer P, Gilmore K. For every woman, every child, everywhere: a universal agenda for the health of women, children, and adolescents.

Lancet. 2015 May 16;385(9981):1919-20. doi: 10.1016/S0140-6736(15)60766-8. PMID: 26090626.

7. United Nations. The Sustainable Development Goals Report 2021. 2021, United Nations, New York. [Available from: https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf]. Accessed: June 27, 2022

8. Calvello EJ, Broccoli M, Risko N, Theodosis C, Totten VY, Radeos MS, Seidenberg P, Wallis L. Emergency care and health systems: consensus-based recommendations and future research priorities. Acad Emerg Med. 2013 Dec;20(12):1278-88. doi: 10.1111/acem.12266. PMID: 24341583.

9. Reynolds T, Sawe H, Rubiano A, Shin S, Wallis L, Mock C. Strengthening Health Systems to Provide Emergency Care. Disease Control Priorities: Improving Health and Reducing Poverty. 3 ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017. pp 247-65.

10. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? Bull World Health Organ. 2002;80(11):900-5. Epub 2002 Dec 3. PMID: 12481213; PMCID: PMC2567674.

11. Chang CY, Abujaber S, Reynolds TA, Camargo CA Jr, Obermeyer Z. Burden of emergency conditions and emergency care usage: new estimates from 40 countries. Emerg Med J. 2016 Nov;33(11):794-800. doi: 10.1136/emermed-2016-205709. Epub 2016 Jun 22. PMID: 27334758; PMCID: PMC5179323.

12. Razzak J, Usmani M, Bhutta Z. Global, regional and national burden of emergency medical diseases using specific emergency disease indicators: Analysis of the 2015 Global Burden of Disease Study. BMJ Global Health. 2019;4.

13. Reynolds TA, Guisset AL, Dalil S, Relan P, Barkley S, Kelley E. Emergency, critical and operative care services for effective primary care. Bull World Health Organ. 2020 Nov 1;98(11):728-728A. doi: 10.2471/BLT.20.280016. PMID: 33177766; PMCID: PMC7607458.13.

14. Calvello Hynes EJ, Bills CB. Emergency Care Systems: The Missing Link for Effective Treatment of COVID-19 in Africa. Disaster Med Public Health Prep. 2020 Aug;14(4):e11-e12. doi: 10.1017/dmp.2020.239. Epub 2020 Jul 14. PMID: 32660671; PMCID: PMC7450233.

15. Aaronson EL, Marsh RH, Guha M, Schuur JD, Rouhani SA. Emergency department quality and safety indicators in resource-limited settings: an environmental survey. Int J Emerg Med. 2015 Dec;8(1):39. doi: 10.1186/s12245-015-0088-x. Epub 2015 Oct 31. PMID: 26520848; PMCID: PMC4628609.

16. Broccoli MC, Moresky R, Dixon J, Muya I, Taubman C, Wallis LA, Calvello Hynes EJ. Defining quality indicators for emergency care delivery: findings of an expert consensus process by emergency care practitioners in Africa. BMJ Glob Health. 2018 Feb 15;3(1):e000479. doi: 10.1136/bmjgh-2017-000479. PMID: 29527337; PMCID: PMC5841514.

17. Cannoodt L, Mock C, Bucagu M. Identifying barriers to emergency care services. Int J Health Plann Manage. 2012 Apr-Jun;27(2):e104-20. doi: 10.1002/hpm.1098. PMID: 22674816.

18. Kironji AG, Hodkinson P, de Ramirez SS, Anest T, Wallis L, Razzak J, Jenson A, Hansoti B. Identifying barriers for out of hospital emergency care in low and low-middle

income countries: a systematic review. BMC Health Serv Res. 2018 Apr 19;18(1):291. doi: 10.1186/s12913-018-3091-0. PMID: 29673360; PMCID: PMC5907770.

19.Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, Okiro EA, Snow RW. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018 Mar;6(3):e342-e350. doi: 10.1016/S2214-109X(17)30488-6. Epub 2018 Jan 26. PMID: 29396220; PMCID: PMC5809715.

20. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. Med Care. 1981 Feb;19(2):127-40. doi: 10.1097/00005650-198102000-00001. PMID: 7206846.

21. Burkholder TW, Hill K, Calvello Hynes EJ. Developing emergency care systems: a human rights-based approach. Bull World Health Organ. 2019 Sep 1;97(9):612-619. doi: 10.2471/BLT.18.226605. Epub 2019 Jun 19. PMID: 31474774; PMCID: PMC6705504.

22. Geduld H, Hynes EJC, Wallis LA, Reynolds T. Hospital proximity does not guarantee access to emergency care. Lancet Glob Health. 2018 Jul;6(7):e731. doi: 10.1016/S2214-109X(18)30235-3. PMID: 29903374.

23. Barnes-Josiah D, Myntti C, Augustin A. The "three delays" as a framework for examining maternal mortality in Haiti. Soc Sci Med. 1998 Apr;46(8):981-93. doi: 10.1016/s0277-9536(97)10018-1. PMID: 9579750.

24. Calvello EJ, Skog AP, Tenner AG, Wallis LA. Applying the lessons of maternal mortality reduction to global emergency health. Bull World Health Organ. 2015 Jun

1;93(6):417-23. doi: 10.2471/BLT.14.146571. Epub 2015 Mar 16. PMID: 26240463; PMCID: PMC4450708.

25. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467-473. doi: 10.7326/M18-0850. Epub 2018 Sep 4. PMID: 30178033.

26. Lagarde M, Palmer N. The impact of health financing strategies on access to health services in low and middle income countries. Cochrane Database Syst Rev. 2018 Apr 11;2018(4):CD006092. doi: 10.1002/14651858.CD006092.pub2. PMCID: PMC6494435.

27. Werner K, Risko N, Burkholder T, Munge K, Wallis L, Reynolds T. Cost-effectiveness of emergency care interventions in low and middle-income countries: a systematic review. Bull World Health Organ. 2020 May 1;98(5):341-352. doi: 10.2471/BLT.19.241158. Epub 2020 Feb 25. PMID: 32514199; PMCID: PMC7265944.

28. Risko N, Chandra A, Burkholder TW, Wallis LA, Reynolds T, Calvello Hynes EJ, Razzak J. Advancing research on the economic value of emergency care. BMJ Glob Health. 2019 Jul 29;4(Suppl 6):e001768. doi: 10.1136/bmjgh-2019-001768. PMID: 31406603; PMCID: PMC6666808.

29. Sentinel events statistics for 2011. Joint Commission Perspectives. 2012;32(5):5.

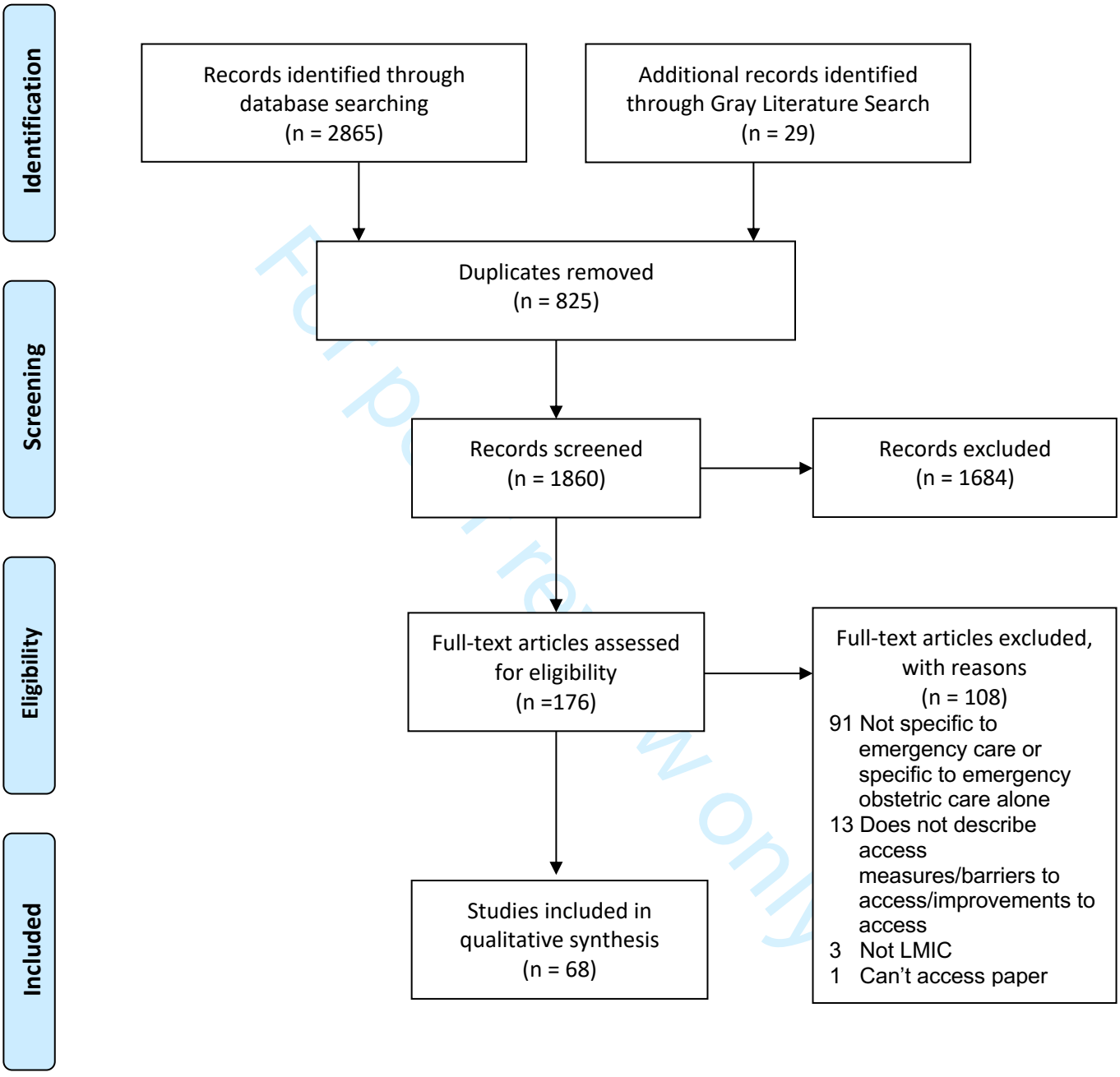
30.Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, Bickler SW, Conteh L, Dare AJ, Davies J, Mérisier ED, El-Halabi S, Farmer PE, Gawande A, Gillies R, Greenberg SL, Grimes CE, Gruen RL, Ismail EA, Kamara TB, Lavy C, Lundeg G,

Mkandawire NC, Raykar NP, Riesel JN, Rodas E, Rose J, Roy N, Shrime MG, Sullivan R, Verguet S, Watters D, Weiser TG, Wilson IH, Yamey G, Yip W. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. Int J Obstet Anesth. 2016 Feb;25:75-8. doi: 10.1016/j.ijoa.2015.09.006. Epub 2015 Sep 30. PMID: 26597405.

31. Lerner EB, Moscati RM. The golden hour: scientific fact or medical "urban legend"? Acad Emerg Med. 2001 Jul;8(7):758-60. doi: 10.1111/j.1553-2712.2001.tb00201.x. PMID: 11435197.

32. Graff L, Stevens C, Spaite D, Foody J. Measuring and improving quality in emergency medicine. Acad Emerg Med. 2002 Nov;9(11):1091-107. doi: 10.1111/j.1553-2712.2002.tb01563.x. PMID: 12414457.

Figure 1. Prisma flow diagram for review of literature on measures of access to emergency and acute care in low- and middle-income countries.



Supplementary Material 2
eTable 1. Baseline information on included articles.

Reference No	Primary Author	Citation	Country	WHO Region*	World Bank**	Location	Setting type*	Setting*	Article type	Methodology	Study year(s)	Participant numbers	Participant type
1	Adewole	Adewole OA, Fadeyibi IO, Kayode MO, Giwa SO, Shoga MO, Adejumo AO, Ademiluyi SA. Ambulance services of Lagos state, Nigeria: a six-year (2001-2006) audit. West Afr J Med. 2012;31:3–7.	Nigeria	African	low	Lagos State, Nigeria	Regional	Urban	qual	Cross sectional	2001-2006	32,774	cases
2	Ahmed	Ahmed S, Adams AM, Islam R, Hasan SM, Panciera R. Impact of traffic variability on geographic accessibility to 24/7 emergency healthcare for the Urban poor: A GIS study in Dhaka, Bangladesh. PLoS One. 2019;14(9):e0222488.	Bangladesh	South-East Asia	lower-middle	Dhaka, Bangladesh	Regional	Urban	quant	Cross sectional	2014	not specified	not specified
3	Ali	Ali M, Miyoshi C, Ushijima H. Emergency medical services in Islamabad, Pakistan: a public-private partnership. Public Health. 2006;120:50–7.	Pakistan	South-East Asia	lower-middle	Islamabad, Pakistan	Regional	Urban	qual	Mixed methods	2000-2001	not specified	not specified
4	Alibhai	Alibhai A, Hendrikse C, Bruijns SR. Poor access to acute care resources to treat major trauma in low- and middle-income settings: A self-reported survey of acute care providers. Afr J Emerg Med. 2019;9(Suppl):S38-S42.	Multinational	African	N/A	N/A	International	N/A	qual	Descriptive Survey	2016	392	conference delegates
5	Anest	Anest T, Stewart de Ramirez S, Balhara KS, Hodkinson P, Wallis L, Hansoti B. Defining and improving the role of emergency medical services in Cape Town, South Africa. Emerg Med J. 2016;33(8):557-61.	South Africa	African	upper-middle	Cape Town, South Africa	Regional	Urban	qual	Descriptive Interview	2013	24	interviewed individuals
6	Anyumba	Anyumba G. Thohoyandou's central business district and the hypothetical accessibility challenges for emergency services. Jamba. 2019;11(2):681.	South Africa	African	upper-middle	Thohoyandou, South Africa	Regional	Urban	qual	Cross sectional	2019	not specified	not specified
7	Aries	Ariës M, Joosten H, Wegdam H, van der Geest S. 2007. Fracture treatment by bonesetters in central Ghana: patients explain their choices and experiences. Tropical Medicine & InterNational Health 12(4): 564–574.	Ghana	African	low	Brong Ahafo Region, central Ghana	Local	Urban	qual	Mixed methods	2005	46	patients
8	Bachani	Bachani AM, Botchey I, Paruk F, Wako D, Saidi H, Aliwa B, et al. Nine-point plan to improve care of the injured patient: A case study from Kenya. Surgery. 2017;162(6S):S32-S44.	Kenya	African	lower-middle	Kenya	National	N/A	qual	Cross sectional	2011	not specified	not specified
9	Bast	Bast HE, Jenkins JL. Challenges to Prehospital Care in Honduras. Prehosp Disaster Med. 2018;33(6):637-9.	Honduras	Americas	lower-middle	Honduras	National	N/A	qual	Descriptive Interview	2018	not specified	not specified
10	Bhopal	Bhopal SS, Halpin SJ, Gerein N. Emergency obstetric referral in Rural Sierra Leone: what can motorbike ambulances contribute? A mixed-methods study. Matern Child Health J. 2013;17:1038–43.	Sierra Leone	African	low	Kambia region, Sierra Leone	Regional	Rural	qual	Mixed methods	2013	not specified	not specified
11	Bigdeli	Bigdeli M, Khorasani-Zavareh D, Mohammadi R. Pre-hospital care time intervals among victims of road traffic injuries in Iran. A cross-sectional study. Bmc Public Health. 2010;10.	Iran	Eastern Mediterranean	upper-middle	Urmia, Iran	Regional	Urban	quant	Cross sectional	2005-2007	not specified	not specified
12	Broccoli	Broccoli MC, Calvello EJ, Skog AP, Wachira B, Wallis LA. Perceptions of emergency care in Kenyan communities lacking access to formalised emergency medical systems: a qualitative study. BMJ Open. 2015;5(11):e009208.	Kenya	African	lower-middle	Kenya	National	N/A	qual	Descriptive Interview	2015	528	focus group members

13	Broccoli	Broccoli MC, Cunningham C, Twomey M, Wallis LA. Community-based perceptions of emergency care in Zambian communities lacking formalised emergency medicine systems. Emerg Med J. 2016;33(12):870-5.	Zambia	African	lower-middle	Zambia	National	N/A	qual	Descriptive Interview	2016	183	focus group members
14	Burke	Burke TF, Hines R, Ahn R, Walters M, Young D, Anderson RE, et al. Emergency and urgent care capacity in a resource-limited setting: an assessment of health facilities in western Kenya. BMJ Open. 2014;4(9):e006132.	Kenya	African	lower-middle	Western Kenya	Regional	Both	qual	Descriptive Interview	2013-2014	60	key informants
15	Chunga	Chunga R, Bruijns SR, Hendrikse C. Access to acute care resources in various income settings to treat new-onset stroke: A survey of acute care providers. Afr J Emerg Med. 2019;9(2):77-80.	Multinational	N/A	N/A	N/A	International	N/A	qual	Descriptive Survey	2016	382	delegates
16	Coyle	Coyle RM, Harrison HL. Emergency care capacity in Freetown, Sierra Leone: a service evaluation. BMC Emerg Med. 2015;15(1):2	Sierra Leone	African	low	Freetown, Sierra Leone	Regional	Urban	qual	Cross sectional	2015	not specified	not specified
17	De Wulf	DeWulf A, Otchi EH, Soghoian S. Identifying priorities for quality improvement at an emergency Department in Ghana. BMC Emerg Med. 2017;17(1):28.	Ghana	African	lower-middle	Urban Ghana.	Local	Urban	qual	Descriptive Survey	5-Jul	18	EU staff members
18	De Wulf	De Wulf A, Aluisio AR, Muhlfelder D, Bloem C. Emergency Care Capabilities in North East Haiti: A Cross-sectional Observational Study. Prehosp Disaster Med. 2015;30(6):553-9.	Haiti	Americas	low	the Fort Liberté district, Haiti	Regional	Rural	qual	Cross sectional	2012	not specified	not specified
19	El Tayeb	El Tayeb S, Abdalla S, Van den Bergh G, Heuch I. Use of healthcare services by injured people in Khartoum State, Sudan. InterNational Health. 2015;7(3):183-9.	Sudan	Eastern Mediterranean	lower-middle	Sudan	Regional	Urban	qual	Descriptive Survey	2010	not specified	not specified
20	Elbashir	Elbashir K, Gore RJ, Abuaaraki T, Roblin P, Botha M, Yousif M, Ostrovskiys G, Bloem C, James SA. Prehospital emergency care and injury prevention in Sudan. Afr J Emerg Med. 2014;4:170–3.	Sudan	African	low	Sudan	National	N/A	qual	Cross sectional	2008 - 2014	not specified	not specified
21	Emerick	Emmerick IC, Luiza VL, Camacho LA, Ross-Degnan D. Access to medicines for acute illness in middle income countries in Central America. Rev Saude Publica. 2013;47(6):1069-79.	Multinational	Americas	N/A	Central American Countries	International	Both	qual	Cross sectional	2013	2,761	interviewed households
22	Hashtarkhani	Hashtarkhani S, Kiani B, Bergquist R, Bagheri N, VafaeiNejad R, Tara M. An age-integrated approach to improve measurement of potential spatial accessibility to emergency medical services for Urban areas. Int J Health Plann Manage. 2020;35(3):788-98.	Iran	Eastern Mediterranean	upper-middle	Mashhad City, Iran	Regional	Urban	quant	Cross sectional	2016	not specified	not specified
23	Hodkinson	Hodkinson PW, Pigoga JL, Wallis L. Emergency healthcare needs in the Lavender Hill suburb of Cape Town, South Africa: a cross-sectional, community-based household survey. BMJ Open. 2020;10(1):e033643.	South Africa	African	upper-middle	Lavender Hill suburb of Cape Town, South Africa	Regional	Urban	qual	Descriptive Survey	2018	2754	interviewed individuals
24	Hsia	Hsia RY, Mbembati N/A, Macfarlane S, Kruk ME. Access to emergency and surgical care in sub-Saharan Africa: the infrastructure gap. Health Policy Plan. 2012;27(3):234-44.	Multinational	African	N/A	Ghana, Kenya, Rwanda, Tanzania and Uganda	International	N/A	qual	Cross sectional	2012	not specified	not specified

25	Jacobs	Jacobs B, Men C, Sam OS, Postma S. Ambulance services as part of the district health system in low-income countries: a feasibility study from Cambodia. InterNational Journal of Health Planning and Management. 2016;31(4):414-29.	Cambodia	South-East Asia	lower-middle	Cambodia	National	N/A	qual	Descriptive Interview	2013	not specified	not specified
26	Khan	Khan AN, Rubin DH. 2003. InterNational pediatric emergency care: establishment of a new specialty in a developing country. Pediatric Emergency Care 19(3): 0181	Yugoslavia	European Region	upper-middle	Kosovo	Local	Urban	qual	Cross sectional	2002	not specified	not specified
27	Khan	Khan A, Zafar H, Naeem SN, Raza SA. Transfer delay and in-hospital mortality of trauma patients in Pakistan. Int J Surg. 2010;8:155–8.	Pakistan	South-East Asia	lower-middle	Aga Khan University Hospital, Karachi, Pakistan	Local	Urban	quant	Cross sectional	1998-2005	not specified	not specified
28	Kirsch	Kirsch T, Hilwig W, Holder Y, Smith G, Pooran S, Edwards R. 1995. Epidemiology and practice of emergency medicine in a developing country. Annals of Emergency Medicine 26(3): 361–367.	Trinidad and Tobago	Americas	lower-middle	Port of Spain, Trinidad and Tobago	local	Urban	qual	Descriptive Interview	not specified	not specified	not specified
29	Kumar	Kumar S, Chaudhary S, Kumar A, Agarwal AK, Misra MC. Trauma care - a participant observer study of trauma centers at Delhi, Lucknow and Mumbai. Indian J Surg. 2009;71:133–41.	India	South-East Asia	lower-middle	Delhi, Lucknow and Mumbai, India	Regional	Urban	qual	Cross sectional	2009	not specified	not specified
30	Levine	Levine AC, Presser DZ, Rosborough S, Ghebreyesus TA, Davis MA. Understanding barriers to emergency care in low-income countries: view from the front line. Prehosp Disaster Med. 2007;22(5):467-70.	Ethiopia	African	low	Tigray, Ethiopia	Regional	Rural	qual	Descriptive Survey	2006	not specified	not specified
31	Luo	Luo W, Yao J, Mitchell R, Zhang X. Spatiotemporal access to emergency medical services in Wuhan, China: accounting for scene and transport time intervals. Int J Health Geogr. 2020;19(1):52	China	Western Pacific	upper-middle	Wuhan, China	Regional	Urban	quant	Cross sectional	2020	not specified	not specified
32	Macharia	Macharia WM, Njeru EK, Muli-Musiime F, Nantulya V. Severe road traffic injuries in Kenya, quality of care and access. Afr Health Sci. 2009;9(2):118-24.	Kenya	African Region	lower-middle	Kenya	National	N/A	qual	Cross sectional	1997-1998	not specified	not specified
33	Mahmood	Mahmood KT, Amin F, Ayub H, Yaqoob M, Zaka M. Management of the patient from the site of accident to the hospital/ pre-hospital care. J Pharm Sci Res. 2010;2:804–8.	Pakistan	South-East Asia	lower-middle	Pakistan	National	N/A	qual	Cross sectional	2010	not specified	not specified
34	Mathew	Mathew A, Abdullakutty J, Sebastian P, Viswanathan S, Mathew C, Nair V, et al. Population access to reperfusion services for ST-segment elevation myocardial infarction in Kerala, India. Indian Heart J. 2017;69 Suppl 1(Suppl 1):S51-S6.	India	South-East Asia	lower-middle	Kerala, India	Regional	Urban	quant	Cross sectional	2017	not specified	not specified
35	Mock	Mock C, nii-Amon-Kotei D, Maier R. 1997. Low utilization of formal medical services by injured persons in a developing nation: health service data underestimate the importance of trauma. The Journal of Trauma: Injury, Infection, nd Critical Care 42(3): 504–513.	Ghana	African	lower-middle	Ghana	National	N/A	qual	Descriptive Interview	1995	21105	interviewed individuals
36	Mock	Mock C, Ofosu A, Gish O. 2001. Utilization of district health services by injured persons in a Rural area of Ghana. The InterNational Journal of Health Planning and Management 16: 19–32.	Ghana	African	lower-middle	Ghana	National	N/A	qual	Descriptive Interview	1995	9442	interviewed individuals

37	Mock	Mock C, Nguyen S, Quansah R, Arreola-Risa C, Viradia R, Joshipura M. 2006. Evaluation of trauma care capabilities in four countries using the WHO-IATSIC Guidelines for essential trauma care. World Journal of Surgery 30: 946–956.	Multinational	N/A	N/A	Mexico, Vietnam, India, Ghana	interNational	N/A	qual	Descriptive Interview	2006	not specified	not specified
38	Mohan	Mohan B, Bansal R, Dogra N, Sharma S, Chopra A, Varma S, et al. Factors influencing prehospital delay in patients presenting with ST-elevation myocardial infarction and the impact of prehospital electrocardiogram. Indian Heart J. 2018;70 Suppl 3(Suppl 3):S194-S8.	India	South-East Asia	lower-middle	Punjab, India	Regional	Urban	quant	Cross sectional	2015	619	patients
39	Mould-Millman	Mould-Millman NK, Oteng R, Zakariah A, Osei-Ampofo M, Oduro G, Barsan W, et al. Assessment of Emergency Medical Services in the Ashanti Region of Ghana. Ghana Med J. 2015;49(3):125-35.	Ghana	African	lower-middle	Ashanti Region of Ghana	Regional	Urban	qual	Cross sectional	2012	not specified	not specified
40	Mould-Millman	Mould-Millman NK, Rominski SD, Bogus J, Ginde AA, Zakariah AN, Boatemaah CA, et al. Barriers to Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana. Glob Health Sci Pract. 2015;3(4):577-90.	Ghana	African	lower-middle	Accra, Ghana	Regional	N/A	qual	Cross sectional	2013	468	survey participants
41	Mould-Millman	Mould-Millman NK, Dixon JM, Sefa N, Yancey A, Hollong BG, Hagahmed M, et al. The State of Emergency Medical Services (EMS) Systems in Africa. Prehospital and Disaster Medicine. 2017;32(3):273-83	MutiNational	African	N/A	N/A	International	N/A	qual	Cross sectional	2013-2014	not specified	not specified
42	Nagata	Nagata T, Takamori A, Kimura Y, Kimura A, Hashizume M, Nakahara S. Trauma center accessibility for road traffic injuries in Hanoi, Vietnam. J Trauma Manag Outcomes. 2011;5:11.	Vietnam	South-East Asia	lower-middle	Hanoi, Vietnam	Regional	Urban	quant	Cross sectional	2006	not specified	not specified
43	Nielsen	Nielsen K, Mock C, Joshipura M, Rubiano AM, Zakariah A, Rivara F. Assessment of the status of prehospital care in 13 low- and middle-income countries. Prehosp Emerg Care. 2012;16:381–9.	Multinational	N/A	N/A	13 LMICs in Africa, Asia, and Latin America	International	N/A	qual	Descriptive Survey	2009–2010	not specified	not specified
44	Ntabaye	Ntabaye MK, Scheutz F, Poulsen S. 1998. Household survey of access to and utilization of emergency oral health care services in Rural Tanzania. East African Medical Journal 75(11): 649–653.	Tanzania	African	lower-middle	Rungwe district in Mbeya region in Tanzania	Regional	Rural	qual	Descriptive Survey	1998	1,106	interviewed individuals
45	Ouma	Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, et al. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018;6(3):e342-e50.	MutiNational	African	N/A	N/A	International	N/A	quant	Cross sectional	2018	not specified	not specified
46	Pigoga	Pigoga JL, Joiner AP, Chowa P, Luong J, Mhlanga M, Reynolds TA, et al. Evaluating capacity at three government referral hospital emergency units in the kingdom of Eswatini using the WHO Hospital Emergency Unit Assessment Tool. BMC Emerg Med. 2020;20(1):33.	Eswantini	African	lower-middle	Eswantini	National	N/A	qual	Cross sectional	2018	11`	key informants
47	Radjou	Radjou AN, Mahajan P, Baliga DK. Where do I go? A trauma victim's plea in an informal trauma system. J Emerg Trauma Shock. 2013;6:164–70.	India	South-East Asia	lower-middle	Puducherry territory, India	Regional	Urban	qual	Cross sectional	2009-2010	not specified	not specified

48	Razzak	Razzak J, Cone D, Rehmani R. 2001. Emergency medical services and cultural determinants of an emergency in Karachi, Pakistan. Prehospital Emergency Care 5(3): 312–316.	Pakistan	South-East Asia	lower-middle	Karachi, Pakistan	Regional	Urban	qual	Descriptive Interview	2001	not specified	not specified
49	Ro	Ro YS, Shin SD, Jeong J, Kim MJ, Jung YH, Kamgno J, et al. Evaluation of demands, usage and unmet needs for emergency care in Yaounde, Cameroon: a cross-sectional study. Bmj Open. 2017;7(2).	Cameroon	African	lower-middle	Yaoundé, Cameroon	Regional	Urban	qual	Cross sectional	2017	658	interviewed households
50	Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Addressing geographic access barriers to emergency care services: a National ecologic study of hospitals in Brazil. Int J Equity Health. 2017;16(1):149.	Brazil	Americas	upper-middle	Brazil	National	N/A	quant	Cross sectional	2017	not specified	not specified
51	Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Access to emergency care services: a transversal ecological study about Brazilian emergency health care network. Public Health. 2017;153:9-15.	Brazil	Americas	upper-middle	Brazil	National	N/A	quant	Cross sectional	2017	not specified	not specified
52	Roy	Roy N, Murlidhar V, Chowdhury R, Patil SB, Supe PA, Vaishnav PD, Vatkar A. Where there are no emergency medical services-prehospital care for the injured in Mumbai, India. Prehospital Disaster Med. 2010;25:145–51.	India	South-East Asia	lower-middle	Mumbai, India	Local	Urban	qual	Cross sectional	2005	170	patients
53	Scolari	Scolari GAS, Rissardo LK, Baldissera VDA, Carreira L. Emergency care units and dimensions of accessibility to health care for the elderly. Rev Bras Enferm. 2018;71 Suppl†2:811-7.	Brazil	Americas	upper-middle	Brazil	National	N/A	qual	Descriptive Survey	2018	not specified	not specified
54	Siddiqui	Siddiqui M, Siddiqui SR, Zafar A, Khan FS. Factors delaying hospital arrival of patients with acute stroke. J Pak Med Assoc. 2008;58:178–82.	Pakistan	South-East Asia	lower-middle	Karachi, Pakistan	Local	Urban	qual	Cross sectional	2006-2007	165	patients
55	Sodemann	Sodemann M, Biai S, Jakobsen MS, Aaby P. Knowing a medical doctor is associated with reduced mortality among sick children consulting a paediatric ward in Guinea-Bissau, West Africa. Trop Med Int Health. 2006;11(12):1868-77.	Guinea-Bissau	African	low	Guinea-Bissau	Local	Urban	quant	Descriptive Interview	2001	1572	children
56	Stein	Stein C, Mould-Millman NK, De Vries S, Wallis L. Access to out-of-hospital emergency care in Africa: Consensus conference recommendations. Afr J Emerg Med. 2016;6(3):158-61.	MutiNational	African	N/A	N/A	N/A	N/A	qual	Cross sectional	2015	not specified	not specified
57	Sultan	Sultan M, Abebe Y, Tsadik AW, Ababa A, Yesus AG, Mould-Millman NK. Trends and barriers of emergency medical service use in Addis Ababa; Ethiopia. BMC Emerg Med. 2019;19(1):28.	Ethiopia	African	low	Ethiopia	National	N/A	qual	Cross sectional	2017	429	survey participants
58	Suriyawongpaisal	Suriyawongpaisal P, Atiksawedparit P, Srithamrongsawad S, Thongtan T. Closing the Equity Gap of Access to Emergency Departments of Private Hospitals in Thailand. Emerg Med Int. 2018;2018:6470319.	Thailand	South-East Asia	upper-middle	Thailand	National	N/A	quant	Cross sectional	2017	20,206	patients
59	Suriyawongpaisal	Suriyawongpaisal P, Aekplakorn W, Srithamrongsawat S, Srithongchai C, Prasitsiriphon O, Tansirisithikul R. Copayment and recommended strategies to mitigate its impacts on access to emergency medical services under universal health coverage: a case study from Thailand. BMC Health Serv Res. 2016;16(1):606.	Thailand	South-East Asia	upper-middle	Thailand	National	N/A	qual	Mixed methods	2012	not specified	not specified

60	Tansley	Tansley G, Schuurman N, Amram O, Yanchar N. Spatial Access to Emergency Services in Low- and Middle-Income Countries: A GIS-Based Analysis. PLoS One. 2015;10(11):e0141113.	Multinational	N/A	N/A	N/A	International	N/A	quant	Cross sectional	2015	not specified	not specified
61	Tansley	Tansley G, Stewart B, Zakariah A, Boateng E, Achena C, Lewis D, et al. Population-level Spatial Access to Prehospital Care by the National Ambulance Service in Ghana. Prehosp Emerg Care. 2016;20(6):768-75.	Ghana	African	lower-middle	Ghana	National	N/A	quant	Cross sectional	2016	not specified	not specified
62	Thomson	Thomson N. Emergency medical services in Zimbabwe. Resuscitation. 2005;65(1):15-9.	Zimbabwe	African	lower-middle	Zimbabwe	National	N/A	qual	Cross sectional	2005	not specified	not specified
63	Treleaven	Treleaven E, Pham TN, Le DN, Brooks TN, Le HT, Partridge JC. Referral patterns, delays, and equity in access to advanced paediatric emergency care in Vietnam. Int J Equity Health. 2017;16(1):215.	Vietnam	South-East Asia	lower-middle	Hanoi, Vietnam.	Local	Urban	quant	Cross sectional	2013	557	patients
64	Vanderschuren	Vanderschuren M, McKune D. Emergency care facility access in Rural areas within the golden hour?: Western Cape case study. Int J Health Geogr. 2015;14:5.	South Africa	African	upper-middle	South Africa	Regional	Rural	quant	Cross sectional	2015	not specified	not specified
65	Wen	Wen LS, Char D. Existing infrastructure for the delivery of emergency care in post-conflict Rwanda: an initial descriptive study. Acad Emerg Med. 2011;18:S243.	Rwanda	African	low income	Kigali, Rwanda	Regional	Urban	qual	Mixed methods	2007	60	health care workers
66	Wesson	Wesson HK, Stevens KA, Bachani AM, Mogere S, Akungah D, Nyamari J, Masasabi Wekesa J, Hyder AA. Trauma Systems in Kenya: a qualitative analysis at the district level. Qual Health Res. 2015;	Kenya	African	lower-middle	Kenya	Regional	Urban	qual	Descriptive Interview	2011	not specified	not specified
67	Zaidi	Zaidi SM, Labrique AB, Khowaja S, Lotia-Farrukh I, Irani J, Salahuddin N, et al. Geographic variation in access to dog-bite care in Pakistan and risk of dog-bite exposure in Karachi: prospective surveillance using a low-cost mobile phone system. PLoS Negl Trop Dis. 2013;7(12):e2574.	Pakistan	Eastern Mediterranean	lower-middle	Karachi, Pakistan	Regional	Urban	quant	Cross sectional	2009-2011	not specified	not specified
68	Zimmerman	Zimmerman A, Fox S, Griffin R, Nelp T, Thomaz E, Mvungi M, et al. An analysis of emergency care delays experienced by traumatic brain injury patients presenting to a Regional referral hospital in a low-income country. PLoS One. 2020;15(10):e0240528.	Tanzania	African	low	Tanzania	Regional	Urban	quant	Cross sectional	2013-2017	3209	patients

*Local (single hospital), Regional (town, city or multiple hospitals) vs National (throughout the country) vs International (multilple countries included)
**If local or Regional what is the (Rural vs Urban)

eTable 2. Individual access measures and outcomes by article.

Reference	Author (year)	Measures	Outcomes
1	Adewole	1. Geographic barriers	1. Rural population has less access, traffic impedes access
2	Ahmed	Percent of slums that have 1. 1 EU per 50,000 population 2. 1 burn unit per 50,000 population Percent of population that lives 3. Within 60 minutes of EU 4. Within 60 minutes of burn unit	Percent of slums that have 1. 12% 2. 0% Percent of population that lives 3. 63% 4. 32%
3	Ali	1. Average response time to accident	1. 10 min
4	Alibhai	1. Resource issues	1. LMICs have less resources for trauma care
5	Anest	1. Training issues 2. Staffing issues 3. Hospital system issues 4. Pre-hospital system issues 5. Communication issues 6. Barriers to reaching care	1. Dispatchers lack training 2. Shortages of physicians and EMS providers 3. Errors in triage, lack of childcare for other children in the household and restrictive hours of clinic operations, multiple transfers 4. Lack of transportation, Lack of telephone access and no universal emergency number. 5. Difficulty getting through on phone lines, miscommunication regarding the acuity of the patient, misunderstanding of geography and distance 6. Community understanding of how to navigate the health system and emergency conditions
6	Anyumba (2019)	1. Drive time from University of Venda Clinic to scene of accident 2. Drive time Tshilidzini Hospital to scene of accident 3. Drive time from Donald Frazer hospital to scene of accident	1. 5-7 minutes 2. 8-10 minutes 3. 30-45 minutes
7	Aries (2007)	1. Reason that patients do not seek hospital care 2. Barrier to prehospital care 3. Cost of treatment by a bonesetter 4. Cost of hospital treatment 5. Barrier to seeking care 6. Demographics associated with seeking hospital care	1. Lack of specialized fracture treatment 2. Lack of resuscitation equipment 3. Average 13 € (range 0–60 €) 4. 300 € (range 25–800 €). 5. Opinion that bonesetters have more expertise. 6. Patients with compound fractures are more likely to be treated in a hospital.
8	Bachani (2017)	1. Training issues 2. Resource issues 3. Pre-hospital system issues	1. Lack of training of pre-hospital and in-hospital providers 2. Lack of basic hospital equipment 3. There was no functioning emergency number or coordinated response system.
9	Bast (2018)	1. Staffing issues 2. Geographic issues 3. Secondary financial strain 4. Pre-hospital system issues	1. Lack of sufficient room and staffing 2. Access to facilities is limited by mountainous terrain. 3. Not having adequate child care, the inability to miss work, or being too ill to walk. 4. Lack of a universal EMS access code.
10	Bhopal (2013)	1. Barriers to seeking care 2. Pre-hospital system issues	1. Poor roads, rainy season inaccessibility, no mobile phone coverage, patient must buy petrol and pay driver, Awareness of ambulance service 2. Drivers willing to respond, maintenance issues
11	Bigdeli (2010)	1. Mean transport times from the scene to the hospital for interurban incidents compared to city areas	1. 17.1 vs. 6.3 minutes
12	Broccoli (2015)	1. Characteristics that made it easier for patients to access care 2. Barrier to care 3. Training issues 4. Transportation issues 5. Health system issues 6. Financial issues 7. Pre-hospital system issues 8. Communication issues 9. Staffing issues 10. Resource issues	1. When patients were dressed well, had a good attitude, showed patience, had personal financial resources or insurance or personally knew a healthcare provider 2. Many providers were unfriendly towards patients or unmotivated to provide care. Participants were also concerned about corruption. 3. Healthcare providers lack training in the basics of emergency care. 4. Difficulty obtaining transportation, long distances required for travel. 5. Lack of emergency care after business hours, required paperwork before emergency care is provided and poor medical records systems, lack of triage 6. High cost of treatment. 7. Officers take patients to the police station before taking them to the hospital, creating delays. 8. Unavailable emergency phone lines

		9. Lack of healthcare provider 10. Lack of resources and critical medications at facilities
Broccoli (2016)	1. Barrier to care 2. Communication issues 3. Resource issues 4. Health system issues 5. Staffing issues 6. Training issues 7. Barrier to reaching care 8. Transportation issues 9. Financial barriers 10. Systems issues that generate delays 11. Barriers to seeking care	1. Lack of accessible healthcare facilities 2. No functional emergency phone number 3. Lack of necessary equipment 4. No standard national protocols for mass casualty incidents, no triage 5. Staff shortages 6. Lack of specific training in emergency care 7. The distance to travel to reach a facility 8. The time it takes for transportation to arrive, lack of fuel for vehicles and poor road conditions 9. Money was a barrier when trying to obtain transportation 10. Certain patients are required to be seen at the police station prior to receiving healthcare, which creates delays. Transferring patients to a higher-level facility with no care or stabilisation at the lower-level facility or during transport. Patients and families are responsible for arranging their transportation to the higher-level facility. 11. Lack of community knowledge about medical emergencies and emergency care. Participants felt that facility staff had bad attitudes, and thought they should be quicker to provide emergency care.
Burke (2014)	Percent of Level 2 and 3 Trauma facilities that: 1. had a specific approach to a trauma patient 2. refer trauma immediately 3. provide first aid and then refer trauma patients 4. are poorly equipped to handle broken bones 5. had suture and wound care supplies 6. had gloves 7. had oxygen 8. had splinting/casting supplies 9. had blood for transfusion 10. refer patients with a possible heart attack 11. refer patients with a possible heart attack immediately 12. treat symptoms and then refer patients with a possible heart attack 13. check vitals and then refer patients with a possible heart attack 14. had sublingual nitroglycerine 15. are ill prepared to handle possible diabetic ketoacidosis (DKA) and must refer all cases 16. had a glucometer 17. had insulin 18. refer cases of potential sepsis immediately 19. provide treatment for cases of potential sepsis without referral 20. did not know an approach to sepsis 21. had antibiotics 22. had an organised approach to trauma 23. are notified in advance of patients arriving to the hospital Percent of Level 4 and 5 facilities that: 24. had gloves 25. had suture and wound care materials 26. had oxygen 27. did not have access to a trained provider who can administer general or Regional anaesthesia 28. had morphine 29. had a functioning ECG machine 30. had nitroglycerine 31. had a defibrillator 32. are well prepared to manage DKA 33. had a glucometer 34. had insulin 35. provided some treatment for sepsis 36. had standardised clinical care guidelines 37. do not have a standardised approach to trauma	Percent of Level 2 and 3 Trauma facilities that: 1. 0% 2. 87% 3. 13% 4. 70% 5. 87% 6. 90% 7. 23% 8. 10% 9. 0% 10. 100% 11. 60% 12. 27% 13. 13% 14. 3% 15. 93% 16. 20% 17. 17% 18. 50% 19. 37% 20. 13% 21. 80% 22. 30% 23. 13% Percent of Level 4 and 5 facilities that: 24. 97% 25. 93% 26. 83% 27. 57% 28. 50% 29. 20% 30. 20% 31. 13% 32. 33% 33. 93% 34. 80% 35. 97% 36. 0% 37. 70% 38. 20% 39. 13% Percent of Level 5 facilities that had: 40. 100% 41. 80%

		38. had nitroglycerine and a functioning ECG machine	42. 100%
		39. had a defibrillator	43. 100%
		Number of Level 5 facilities that:	44. 60%
		40. had chest tubes and X-ray capability	45. 40%
		41. had splinting and casting supplies	46. 20%
		42. had blood available for transfusion	47. 100%
		43. gave oxygen to patients with suspected AMI	48. 100%
		44. gave aspirin to patients with suspected AMI	Percent of Level 4 facilities that had:
		45. gave morphine to patients with suspected AMI	49. 12%
		46. gave epinephrine to patients with suspected AMI	50. 48%
		47. had vasopressor agents	51. 64%
		48. had antibiotics	52. 80%
		Number of Level 4 facilities that:	53. 44%
		49. had chest tubes	54. 30%
		50. had X-ray capability	55. 44%
		51. had blood available for transfusion	56. 92%
		52. refer someone presenting with a possible acute myocardial infarction immediately	
		53. stabilize and then refer someone presenting with a possible acute myocardial infarction	
		54. provides diagnostic and treatment services without referral to someone presenting with a possible AMI	
		55. had vasopressor agents	
		56. had antibiotics	
15 Chunga (2019)		Percent of respondents that reported	Percent of respondents that reported
		1. Access to a pre- hospital service in HIC	1. 4%
		2. Access to a pre- hospital service in LMIC	2. 21%
		3. Access to a national emergency number in HIC	3. 4%
		4. Access to a national emergency number in LMIC	4. 21%
16 Coyle (2015)		Percent of hospitals with	Percent of hospitals with
		1. adult triage training	1. 43%
		2. pediatric triage training	2. 57%
		3. formal training in adult critical care	3. 86%
		4. in-house acute care courses for continuing education	4. 14%
		5. a dedicated EC nurse	5. 71%
		6. out-of-hours clinician cover	6. 71%
		7. intravenous (IV) gentamicin	7. 100%
		8. IV penicillin and quinine	8. 86%
		9. Oral rehydration solution and IV fluids	9. 100%
		10. insulin	10. 29%
		11. equipment required to carry out IV procedures	11. 100%
		12. oxygen concentrators or cylinders available in the EC	12. 43%
		13. with light unsuitable for clinical examination	13. 57%
		14. a system in place to identify ward patients whose clinical condition was deteriorating	14. 29%
		15. guidelines for paediatric critical care	15. 71%
		16. guidelines for adult critical care	16. 57%
		17. Emergency care guidelines for children	17. 57%
		18. Emergency care guidelines for adults	18. 43%
		19. Paediatric triage guidelines	19. 43%
		20. adult triage guidelines	20. 29%
		21. guidelines for oxygen therapy	21. 29%
		22. facilities to check haemoglobin and blood glucose	22. 100%
		23. ability to measure renal function	23. 71%
		24. radiography	24. 57%
		25. had a system in place for delaying regis- tration and payment until after the receipt of emergency treatment for critically unwell adults	25. 29%
		26. had a system in place for delaying registration and payment until after the receipt of emergency treatment for critically unwell children	26. 43%
		Percent of public facilities with	Percent of public facilities with
		27. adult triage training	27. 0
		28. pediatric triage training	28. 2
		Percent of private facilities with	Percent of private facilities with
		29. resuscitation facilities for adults	29. 100%
		30. all of the six infrastructure indicators	30. 100%
		31. all 23 indicator drugs and all 34 equipment indicators	31. 100%
		For public facilities, average number of	For public facilities, average number of
			32. 1
			33. 16/21
			34. 21/34
			Percent of district hospital with
			35. 0

	32. infrastructure indicators 33. drug indicators 34. equipment indicators Percent of district hospital with 35. access to x-ray facilities 36. emergency blood transfusion	36. 0
De Wulf (2017)	1. Financial barriers 2. Health system issues	1. The inability to pay for transportation or medications, laboratory investigations, and radiography 2. Limited bed capacity
De Wulf (2015)	Percent of hospitals with 1. emergency care area beds 2. Supervisory level physicians consistently available during the entire 24 hours 3. with potable water 4. a list of emergency equipment 5. emergency equipment was available intermittently 6. no formal training of staff for the use of this equipment 7. surgical services and dental care 8. critical care or ophthalmological services 9. a protocol for the transfer of patients requiring a higher level of care Percent of clinics with 10. electricity 11. a list of emergency equipment 12. basic equipment to manage obstetrical emergencies or imminent deliveries 13. pulse oximetry and glucometers 14. stethoscopes 15. HIV care 16. cholera and tuberculosis care 17. a protocol for the transfer of patients requiring a higher level of care Percent of health facilities with 18. respiratory isolation area 19. maintenance of records for patients seen in the acute care setting 20. existence of an additional staffing resource list to be used in event of disaster or emergency situations 21. access to an ambulance for interfacility transport 22. use of a protocol or phones for the transfer of patient 23. Resource issues 24. Geographic barriers 25. Referral issues	Percent of hospitals with 1. 67% 2. 67% 3. 0% 4. 67% 5. 100% 6. 100% 7. 67% 8. 0% 9. 33% Percent of clinics with 10. 20% 11. 0% 12. 0% 13. 20% 14. 60% 15. 0% 16. 60% 17. 80% Percent of health facilities with 18. 0% 19. 100% 20. 13% 21. 13% 22. 0% 23. Hospitals had increased access to equipment, materials and medications compared to community clinics. No computed tomography existed in the region. 24. Some of the health centers required multiple modes of transportation, not being passable consistently by 4-wheeled vehicles. 25. Patients were referred to the closest hospital, regardless of whether that facility had the capability to handle the case.
El Tayeb (2015)	1. Demographics likely to use formal services 2. Financial barriers 3. Geographic barriers	1. Males were almost twice as likely as females 2. Affordability of the formal health service 3. Distance
Elbashir (2014)	1. Training issues 2. Average emergency response time 3. Geographic barriers 4. Pre-hospital issues 5. Financial barriers	1. No standardized training for EMS providers, dispatchers, or ambulance crew. 2. 45 minutes 3. Few citizens reside where services exist 4. Single emergency response number is not well publicized 5. ambulances are paid either by cash on a fee for service basis or via an insurance option
Emerick (2013)	1. Percent of individuals who perceived their condition as severe and sought health care in the formal system 2. Percent of individuals who perceived their condition as non-severe and sought health care in the formal system 3. Demographics associated with increased seeking of formal health care 4. Percent of individuals who received medicines free of charge 5. Financial barriers	1. 57.4% 2. 36.2% 3. Geographic location less than 30 minutes from a health facility, household head having a secondary school education, patient age under 15, and having health insurance 4. 26.1% in Guatemala, 29.1% in Honduras, and 34.2% in Nicaragua 5. “Do not have money” was the most frequent reason for not seeking care in Nicaragua and Honduras

Hashtarkhani (2020)	1. Calculated accessibility by 2SFCA method	1. Peripheral areas in Mashhad city have low access to EMS. Actual accessibility in the city center is low compared with potential accessibility.
Hodkinson (2020)	1. Barriers to seeking care 2. Percent of people reporting wait times at facilities as a barrier to seeking care 3. Percent of people reporting financial barriers 4. Pre-hospital issues	1. Concerns over personal safety 2. 23.1% 3. 5.1% 4. EMS delays
Hsia (2012)	Percent of hospitals 1. not equipped with basic building resources 2. had equipment and staff who could competently utilize the equipment at their facility 3. had adequate monitoring of medication inventory 4. with adequate infection control materials 5. with capacity to provide 24-hour emergency care 6. with basic infrastructure components such as water and electricity Percent of clinics 7. with basic infrastructure	Percent of hospitals 1. 78% in Tanzania 2. 41% in Tanzania to 61% in Kenya 3. 14% in health centres and 18% in hospitals in Tanzania 4. 0% in Tanzania 5. Fewer than half 6. less than 65% Percent of clinics 7. 7% to 35% of facilities.
Jacobs (2016)	Fee associated with 1. hospital ambulance 2. Ambulance referrals to the provincial hospital 3. transport by tuk-tuk 4. overall fee associated with transport 5. Pre-hospital system issues 6. Percent of people transported to health facility using their own means of transport 7. Percent of individuals who report the health system was too far 8. Training issues 9. Percent of health centre staff members who were insufficiently qualified to successfully deal with the condition	Fee associated with 1. KHR25 000 ($6.25) 2. KHR45 000 ($11.3) 3. KHR30 000 ($7.5) 4. KHR137 697 ($34.4) 5. General population did not have the contact number of the ambulance services. 6. 32% 7. 9% 8. Few health district staff received training in emergency medicine 9. 59%
Khan (2003)	1. Training issues 2. Equipment issues 3. Health system issues 4. Pre-hospital issues	1. Neither the ambulance driver nor the nurse has any formal training or certification in advanced life support. 2. Ambulances lack advanced cardiac life support equipment. 3. There is no physical location for advanced pediatric care or pediatric resuscitation. 4. An organized emergency medical response system does not exist, no emergency number
Khan (2010)	1. Mean time from occurrence of injury to arrival in the ER 2. Range of time from occurrence of injury to arrival in the ER 3. Patients who arrived in the ER after 1 hour of injury 4. Patients who reached the ER within 1 hour of injury	1. 4.7 h 2. Range 0.8–48 h 3. 675 (69%) 4. 303 (30.9%)
Kirsch (1995)	Percent of physicians who 1. had taken an Advanced Trauma Life Support course 2. had taken an Advanced Cardiac Life Support course or Advanced Pediatric Life Support training Percent of physicians how believed they could adequately perform 3. intubation 4. tube thoracostomy 5. venous cutdown 6. tracheostomy 7. Staffing issues 8. Resource issues 9. Health system issues 10. Communication issues.	Percent of physicians who 1. 30% 2. 0% Percent of physicians who believed they could perform 3. 18% 4. 15% 5. 15% 6. 5% 7. Nursing shortages reported in emergency departments. Trained staff were not available during many nights or weekends. IV line supplies, backboards, or cervical collars are not carried in ambulances. 8. Specialized blood tests are not easily obtained. Limited supplies of banked blood. Limited availability of CT, ultrasound, and MRI. 9. Lengthy delays in response from consulting specialities. Legal restrictions prevent ambulance drivers from starting IV lines or giving medication. 10. The EDs do not have radios.
Kumar (2009)	1. Pre-hospital system issues	1. Trained personnel as first responders were unavailable and pre-hospital care was lacking

Levine (2007)	1. Percent of patients that have access to motorized transport Percent of providers that 2. reported that their patients had to travel more than 10 km for surgical or obstetric services 3. had access to blood smears for malaria 4. lacked access to any laboratory diagnostic equipment 5. could offer blood transfusions 6. felt comfortable diagnosing the 7 emergency conditions assessed 7. felt comfortable diagnosing femur fracture or pneumonia 8. felt comfortable diagnosing obstructed labor 9. felt comfortable treating the 7 emergency conditions assessed 10. felt comfortable treating obstructed labor 11. felt comfortable treating gastroenteritis	1. 20% 2. 62.5% 3. Less than half 4. 44% 5. 0% 6. 63% 7. 56% 8. 75% 9. 19% 10. 0% 11. 64%
Luo (2020)	1. Standardized E-2SFCA access scores 2. Percent of shequs can be reached by an ambulance from the nearest EMS stations within 10 min	1. 75% of shequs having a value lower than 0.4 for single trip and 0.8 for the total trip. 2. Over 50% and again a patient can be transported from his/her shequ to the nearest hospital within 9 min. During peak periods, for over 75% of shequs, it takes less than 14 min to get an ambulance and less than 13 min to get to the nearest hospital, and the total jour- ney takes less than 25 min
Macharia (2009)	1. Health facilities demanded cash deposits or letters of guarantee of payment before providing treatment to road traffic injury patients 2. Cost of deposit before treatment 3. Percent of health facilities that rated themselves as being well prepared to handle road traffic crash emergencies Percent of respondents that 4. owed the hospitals more than of US $ 133. 5. were in a position to pay the bills 6. would approach relatives and friends for financial assistance 7. were transported to hospital by unknown persons 8. were transported to hospital by persons who were previously known to them 9. received any form of first aid at the crash site 10. received first aid from members of the public, other motorists or the less injured casualties	1. 14.6% 2. US $6.7-667 3. 40.8% Percent of respondents that 4. 22.3% 5. 19.7% 6. 58.7% 7. 19.7% 8. 76.5% 9. 16.0% 10. 74.0%
Mahmood (2010)	Percent of cases in which the ambulance response time was 1. less than 10 minutes 2. 15-20 minutes 3. 30-45 minutes Percent of cases in which the time from the site to the hospital was 4. 5 minutes 5. 10-15 minutes 6. 20-30 minutes	Percent of cases in which the ambulance response time was 1. 60% 2. 30% 3. 10% Percent of cases in which the time from the site to the hospital was 4. 32% 5. 48% 6. 20%
Mathew (2017)	Percent of districts that 1. had more than 80% of the population residing within half-an-hour travel distance of a PCI-capable hospital 2. had more than 90% population having timely (within 1h) access to some mode of reperfusion therapy for STEMI, either thrombolysis and/or primary PCI Percent of the population 3. residing within half-an-hour travel distance from a PCI-capable hospital 4. had access to a thrombolysis-capable hospital within 1h travel time 5. would have had to travel more than an hour to access a reperfusion-capable hospital	Percent of districts that 1. 36% 2. 57% Percent of the population 3. 69.84% 4. 21.87% 5. 8.28%
Mock (1997)	Percent of respondents reporting 1. distance to treatment is too far	Percent of respondents reporting 1. 8%

		2. preferences for other treatments	2. 37%
		3. Types of injuries more likely to receive formal medical care	3. Head or torso injuries, transportation related injuries and assaults
		4. Use of formal medical services for persons aged less than 20 years	4. 54%
		5. Use of formal medical services for persons aged more than 20 years	5. 61%
36	Mock (2001)	Percent of survey respondents reporting barriers to care:	Percent of survey respondents reporting barriers to care:
		1. preference for other treatments	1. 20%
		2. financial	2. 53%
		3. health care utilization when health care was available in the user's town	3. 59%
		4. health care utilization when health care was not available in the user's town	4. 41%
37	Mock (2006)	1. Training issues	1. Lack of training for trauma care, including in-service training for doctors, lack of training to use equipment
		2. Staffing issues	2. Lack of surgical coverage.
		3. Resources issues	3. Resources for acute resuscitation were limited. Difficulties in the procurement process exist. Lack of laboratory tests, imaging, oxygen, fluids, chest tube equipment, pulse oximetry, ventilators, prostheses for amputees, medications.
		4. Health system issues	4. Lack of trauma registry or quality improvement programs.
38	Mohan (2018)	1. Demographics associated with significant pre-hospital delay	1. Elderly, rural, and illiterate populations
		2. Barriers to seeking care	2. Recognizing symptoms as cardiac in origin
		3. Percent of hospitals with ECG availability	3. 96.4%
		4. Percent of outpatient facilities with ECG availability	4. 83%
		Percent of patients	Percent of patients
		5. to whom a hospital was the nearest medical aid	5. 54.8%
		6. to whom a clinic was the nearest medical aid	6. 45.2%
		7. presented with more than 6 hours of prehospital delay	7. 42%
39	Mould-Millman (2015) Assessment of Emergency Medical Services in the Ashanti Region of Ghana. Barriers to	Development of:	Development of:
		1. Tiers of Providers	1. Minimally developed
		2. Recruitment and Retention of providers	2. Mostly developed
		3. Continuing Education	3. Minimally developed
		4. Initial Education	4. Partially developed
		5. Team Training	5. Partially developed
		6. Equipment and Medication	6. Mostly developed
		7. Toll-free Number	7. Moderately developed
		8. Call processing and dispatch	8. Partially developed
		9. Primary Transportation and Inter-facility Transfers	9. Mostly developed
		10. Communication	10. Partially developed
		11. Community Integration	11. Minimally developed
		12. Healthcare System Integration	12. Partially developed
		13. EMS Legislature, Rules and Regulation	13. Mostly developed
		14. Sustainable Resources	14. Mostly developed
		15. Public Knowledge	15. Minimally developed
		16. Quality Assurance and Improvement	16. Minimally developed
40	Mould-Millman (2015) Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana.	Percent of survey respondents that:	Percent of survey respondents that believed that:
		1. believe EMTs offer high-quality care	1. 54.7%
		2. believe it is ''better'' to go by ambulance	2. 86.1%
		3. believe taxis are faster than ambulances in Accra	3. 78.0%
		4. believe government ambulances were free or affordable	4. 53.2%
		5. believe private ambulances were too expensive	5. 50.2%
			6. 43.8%
		6. knew the existence of a public access medical emergency telephone number	7. 37.1%
			8. 35.7%
		7. knew that the emergency number was a toll-free call	9. 45.5%
		8. would be more likely to call the emergency number if they knew the call was toll free	10. 35.3%
			11. 6.8%
		9. knew about the government ambulance service	
		10. indicated it would take a government ambulance 15 minutes or less to arrive at the location	
		11. indicated it would take 60 minutes or more	
41	Mould-Millman (2017)	Percent of systems that utilized:	Percent of systems that utilized:
		1. tier-one (layperson responders trained in first aid)	1. 48%
		2. tier-two (professional or medically-trained)	2. 96.0%
		3. Basic emergency medical technicians (EMTs)	3. 84%

	4. advanced providers more often	4. 60%
	5. basic providers more often	5. 84%
	6. prehospital nurses	6. 28%
	7. used only advanced providers	7. 4%
	8. EMS physicians	8. 40%
	9. quality assurance programs	9. 44%
	10. research	10. 12%
	11. Basic Life Support - capable vehicles	11. 84%
	12. Advanced Life Support -capable vehicles	12. 68%
	13. vehicles posted at ambulance stations	13. 72%
	14. vehicles posted at health care facilities	14. 56%
	15. motorcycle ambulances	15. 12%
	16. fixed wing air transport	16. 32%
	17. rotary wing (helicopter) ambulances	17. 32%
	18. water-craft	18. 12%
		19. 25
	19. Total number of EMS systems identified	
	Percent of countries in which	20. 29.6%
	20. EMS systems existed in Africa	21. 12.5%
	21. EMS systems existed in West Africa	22. 9.3%
	22. no EMS systems existed	23. 51.8%
	23. the questionnaire was not returned	24. 100%
	24. some form of regulations governing EMS or ambulance operations existed	25. 26%
	25. an established toll-free emergency telephone number existed	
Nagata (2011)	Median direct distances between injury sites and the trauma centers were	Median direct distances between injury sites and the trauma centers were
	1. Viet Duc Hospital	1. 5.65 (3.19 - 8.64) km
	2. Bach Mai Hospital	2. 5.31 (2.89 - 8.54) km
	3. Saint Paul Hospital	3. 5.11 (3.11 - 8.72) km
Nielsen (2012)	1. Access to emergency care services within 1 hour	1. 100 percent in Urban Brazil, Colombia, and Maharashtra State to very low in Kenya, Pakistan, Sri Lanka, and Vietnam
	2. To whom advanced life support capabilities during transport was available	2. A significant number of persons in two of the upper middle income sites
	3. To whom basic life support capabilities during transport was available	3. More than half of people only in South Africa and Gujarat State, India.
	4. Training issues	4. Varying levels of training of providers, including no emergency medicine training
Ntabaye (1998)	1. Resource issues	1. Lack of medicines
	2. Percent of respondents who did not have the ability to pay for health services	2. 45%
	3. Financial barriers	3. Fare for transportation
	4. Demographics more likely to seek care	4. Those who had a higher number of missing teeth, were educated and aged more than 40 years
	5. Percent of respondents who indicated fear of dental treatment	5. 6.5%
Ouma (2018)	1. Percent of people living within 2-hour travel time of the nearest public hospital	1. 71%
	2. Percent of women of child bearing age living within 2-hour travel time of the nearest public hospital	2. 71·8%
	3. Percent of people living more than 2-hour travel time of the nearest public hospital	3. 29%
	4. Percent of women of child bearing age living more than 2-hour travel time of the nearest public hospital	4. 28·2%
	5. Percent of the population within 2-hour travel time of a public hospital	5. Less than 25% in South Sudan to more than 90% in Nigeria, Kenya, Cape Verde, Swaziland, South Africa, Burundi, Comoros, São Tomé and Príncipe, and Zanzibar.
	6. Countries with less than 50% of the population within 2-hour travel time of a public emergency care hospital	6. South Sudan, Mauritania, Eritrea, Niger, Sudan, Madagascar, and Chad.
	7. Countries with more than 90% of their respective population living within 2-hour travel time of a hospital	7. Nigeria, Kenya, and South Africa
	8. Number of countries with more than 80% of the population within 2-hour travel time of a hospital	8. 16
Pigoga (2020)	1. Training issues	1. Training related to critical trauma and airway interventions, and neonatal care; issues with treating malnutrition or severe anaemia; inability to perform the following procedures: intraosseous access or venous cutdown, apply
	2. Health system issues	
	3. Resource issues	
	4. Quality issues	

		three-way dressings for sucking chest wounds or perform fasciotomies or escharotomies 2. Only one facility with a dedicated resuscitation area 3. Lack of medications, equipment, and tests, including: pulse oximetry, airway management, needle thoracostomy, chest tube, pelvic binders, ECG, ultrasound, thrombolytics, blood transfusion, defibrillation, cardioversion, pericardiocentesis, external cardiac pacing, procedural sedation, IV antibiotics, IV vasopressors, uterotonic drugs 4. Lack of: clinical protocols, protocols for communicating critical lab results for infection control infection, triage
Radjou (2013)	1. Mean distance and time travelled by direct group 2. Mean distance and time travelled by referred group 3. Percent of referred cases that clocked unnecessary distance to reach care 4. Percent of direct cases that clocked unnecessary distance to reach care 5. Median unnecessary distance clocked by referred cases to reach care 6. Median unnecessary distance clocked by direct cases to reach care	1. 31.4 km, 90 min 2. 52.81 km, 279 min 3. 54% 4. 14.2% 5. 24.49 km 6. 10.86 km
Razzak (2001)	1. Training issues 2. Percent of ambulance services that carry only a stretcher 3. Cost of transport for non-air-conditioned ambulances 4. Cost of transport for air-conditioned ambulances 5. Percent of ambulance services that operate only during day hours Percent of patients that said 6. the streets in their area were too narrow for an ambulance 7. they did not use ambulances due to high cost 8. they preferred using taxis or cars due to easy access 9. the patient was not sick enough to call an ambulance 10. they used a taxi because the patient was too sick to wait for anything else 11. patient was sick enough to come to the ED 12. they did not come to the ED because of the slow response of the ambulance service 13. they did not come to the ED because they did not know how to find one 14. they would call an ambulance only if they are unable to walk 15. they would call an ambulance only if they were very sick or near death 16. they were not sure when to call an ambulance 17. they knew of at least one ambulance service 18. they knew of two ambulance services 19. they did not know of any ambulance service 20. knew the phone number of any ambulance service	1. No ambulance driver had formal training in first aid or prehospital care 2. 71% 3. Pakistani rupee (PR) 7–10 ($0.12–0.17) per mile 4. PR 15–20 ($0.26–0.35) per mile 5. 8% Percent of patients that said 6. 3% 7. 8% 8. 38% 9. 26% 10. 20% 11. 45% 12. 23% 13. 11% 14. 44% 15. 22% 16. 21% 17. 57% 18. 21% 19. 14% 20. 0%
Ro (2017)	Percent of respondents that reported the primary reasons for not seeking health care were: 1. financial 2. use of complementary medicine 3. the that condition was not severe enough to visit hospital 4. limited accessibility to hospital 5. social and family disapproval 6. Those who were more likely to experience unmet needs in the previous year	Percent of respondents that reported the primary reasons for not seeking health care were: 1. 37.2% 2. 22.2% 3. 8.7% 4. 5.7% 5. 4.6% 6. People whose mean income was below moderate levels, those who lived far from a teaching hospital or close to a district hospital
Rocha (2017) Addressing geographic access barriers to emergency	1. States with high levels of accessibility 2. Number of municipalities that had high accessibility to small hospitals and low to high complexity center	1. Paraná, Goiás, Minas Gerais, Bahia, Piauí, Rio Grande do Norte, Ceará e Pernambuco 2. 1595 3. 74% 4. 824

	care services: a National ecologic study of hospitals in Brazil.	3. Percentage of municipalities with below average access to high complexity center that were covered by small hospitals 4. Number of municipalities that did not meet the criteria of maximum travel time of 2 hours	
51	Rocha (2017) Access to emergency care services: a transversal ecological study about Brazilian emergency health care network.	1. Percentage of small hospitals that were in municipalities that had also high complexity centers 2. Percentage of municipalities were located within less than 60 km from the closest city with a high complexity center with an adult ICU 3. Number of people that were at least 120 km away from a high complexity center with an adult ICU 4. Percent of the population who were more than 120 km away from a health facility with a neonatal ICU	1. 26% of small hospitals 2. 63% 3. 14 million 4. 12%
52	Roy (2010)	1. Training issues 2. Equipment issues Odds ratio of likelihood the following groups would receive prehospital care: 3. road traffic accident victims 4. arriving by government ambulance 5. arriving by taxi 6. being transferred from other medical facilities for "medico-legal reasons"	1. Lack of training of ambulance attendants 2. No resuscitation equipment in the ambulance Odds ratio of likelihood the following groups would receive prehospital care: 3. 2.3 4. 10.83 5. 0.54 6. 0.1
53	Scolari (2018)	1. Resource issues 2. Acceptability issues 3. Health systems issues 4. Geographic barriers	1. Lack of laboratory testing 2. Conduct of health professional does not meet the expectations of the patients 3. Hours of operation and bed limitations 4. Geographic relationship to care
54	Siddiqui (2008)	1. Mean distance from the residence to the hospital Percent of patients who 2. came late who were referred 3. presented within 60 minutes of onset of symptoms 4. were first taken to another hospital mainly cardiac hospital and then referred here 5. first opted for alternative medicines 6. thought stroke symptoms would resolve spontaneously 7. did not know a single symptom of stroke 8. knew at least one stroke symptom 9. hemiplegia was the most familiar stroke symptom 10. speech disturbance was the most familiar stroke symptom 11. Median time from onset of symptoms and contact with general practitioner	1. 56.75km±123km. 2. 63 % 3. 86.5% 4. 60.6% 5. 12.7% 6. 28% 7. 32% 8. 10.9% 9. 67% 10. 61% 11. 30 minutes
55	Sodemann (2006)	1. Odds ratio associated with mortality risk within 30 days of first consultation for those acquainted with a medical doctor 2. Those whom were less likely to present a severely ill child	1. 0.55 2. Mothers belonging to Muslim ethnic groups
56	Stein (2016)	1. Pre-hospital issues 2. Acceptability issues	1. Lack of a single toll-free emergency number, knowledge of the emergency number, available community first responders, 24-hour EMS availability, 2. Acceptability of EMS to the community
57	Sultan (2019)	1. Factors associated with increased likelihood of ambulance use 2. Odds ratio associated with the ambulance use and police as a patient companion 3. Pre-hospital issues	1. Amharic speaking, previous ambulance use 2. 1.53 3. Long arrival time for ambulance, not enough distribution of ambulance stations, and difficulty of accessing the phone
58	Suriyawongpaisal (2018)	1. Financial barriers 2. Demographics associated with financial barriers	1. Preauthorization 2. Females were less likely to have preauthorization
59	Suriyawongpaisal (2016)	1. Financial barriers	1. Copayment
60	Tansley (2015)	1. Percent of the population within 50km of road travel distance to tertiary care	1. 28%

		2. Proportion of a region's population within a 50-km service area of a Level C facility	2. 0% in the more remote regions to 95.4% in the most Urban region Haiti, 0% in the Nord Ouest department to 89.1% in the Ouest department
61	Tansley (2016)	1. Proportion of Ghana's landmass that is serviceable within 60-minutes of an National Ambulance Service station (from 2004 to 2014) 2. Proportion of the population within a 60-minute catchment area of a N/AS station (from 2004 to 2014) 3. Population within a 30-minute catchment area of a N/AS station 4. Ambulances per 100,000 Percent of facilities in Namibia found to be capable of providing care level: 5. A 6. B 7. C 8. X (unsuitable for providing emergency care) Percent of facilities in Haiti found to be capable of providing care level: 9. A 10. B 11. C 12. X	1. 8.7 to 59.4% 2. 37% to 79% 3. 26% to 61% 4. 0.05 in the Obuasi Municipal District to 2.4 in the Sissala West District Percent of facilities in Namibia found to be capable of providing level: 5. 12.4% 6. 7.3% 7. 1.2% 8. 88% Percent of facilities in Haiti found to be capable of providing care level 9. 18.9% 10. 1.7% 11. 0.9% 12. 81.1%
62	Thomson (2005)	1. Health system issue 2. Training issue 3. Staffing issue 4. Resource issues 5. Financial barriers 6. Pre-hospital system issues	1. Rural, district and small Urban hospitals have no emergency department 2. No emergency medicine training 3. EDs are staffed by only one doctor 4. Lack of CT availability after hours 5. Patients must pay cash for any imaging 6. Ambulances have to travel up to 200 miles, lack of helicopters, private ambulance services have tried to link their control rooms to cellular networks, which has delayed response to major accidents and incidents by the responsible authorities, lack of dispatchers
63	Treleaven (2017)	1. Demographics that demonstrated worse outcomes	1. Poorer, younger, rural, and children who were referred to another facility children
64	Vanderschuren (2015)	1. Percent of fatalities that were outside of the Golden Hour 2. Fatality rate within the service areas 3. Fatality rate within the service gaps	1. 53.1% 2. 2.25 fatalities/km 3. 2.91 fatalities/km
65	Wen (2011)	1. Financial barriers 2. Percent of individuals who were prevented from receiving treatment due to lack of payment 3. Pre-hospital system issues 4. Geographic barriers 5. Resource issues 6. Training issues	1. Payment is requested at the time of care 2. one-third 3. Lack of prehospital care 4. Hours of travel are required in remote areas 5. Lack of resources, including electricity and equipment 6. No emergency medicine training, one hospital provided specialised training at the basic life support (BLS) level and no hospital provided courses such as Advanced Cardiac Life Support (ACLS), Advanced Trauma Life Support (ATLS), or Paediatric Advanced Life Support (PALS) training.
66	Wesson (2015)	1. Training issues 2. Resource issues 3. Geographic barriers 4. Pre-hospital issues 5. Transportation issues 6. Staffing issues 7. Financial issues 8. Respondents' opinion on how to improve pre-hospital care 9. Factors affecting the decision to seek care	1. No formal or trauma-specific training, very few providers are trained in BLS or ACLS. 2. Lack of basic trauma equipment. 3. Distance to a facility 4. A publically available ambulance system did not exist, lack of community awareness of emergency phone number, lack of function of emergency phone number 5. Lack of transport to the health care facility. 6. It is not safe for the medical officers to report to the hospital at night 7. Inability to pay hospital fees and transport 8. Provide first aid and triage trauma training to community members and the police 9. Severity of the injury, traditional medicine and religion

Zaidi (2013)	1. Median travel time to ER 2. Odds ratio associated with patients likely to seek immediate health care at a non-medical facility or administer self- treatment compared to visiting a medical facility	1. From Hyderabad: (20 minutes), from Mansehra (120 minutes). 2. Peshawar: 144.45 , Bahawalpur: 131.36, Abbottabad - 5.12, Hyderabad - 6.87
Zimmerman (2020)	Percent of patients who waited the following times to evaluated by a physician in the ED 1. 0.0 to 15.0 minutes 2. 15.1 to 30.0 3. more than 45.0 minutes 4. 30.1 to 45.0 minutes 5. Percent of patients who waited the 0.0 to 1.0 hours to receive lab tests 6. Percent of severe GCS patients who received lab tests within 1.0 hours of physician evaluation 7. Percent of mild GCS patients who received lab tests within 1.0 hours of physician evaluation 8. Percent of moderate GCS patients who received lab tests within 1.0 hours of physician evaluation	Percent of patients who waited the following times to evaluated by a physician in the ED 1. 69.2% 2. 19.0% 3. 7.8% 4. 4.1% 5. 48.4% 6. 56.1% 7. 52.0% 8. 53.0%

Appendix 1

Search Strategy: PUBMED
Initial Search: Feb 4 2020; Follow up search date: 11/22/2020; Second Follow up search date: 11/30/2020
Emergency med terms
"emergency responder"[tw] OR "emergency responders"[tw] OR "emergency doctor"[tw] OR "emergency doctors"[tw] OR "emergency clinician"[tw] OR "emergency clinicians"[tw] OR "emergency physician"[tw] OR "emergency physicians"[tw] OR "emergency personnel"[tw] OR "emergency medical personnel"[tw] OR "emergency service"[tw] OR "emergency services"[tw] OR "emergency medical service"[tw] OR "emergency medical services"[tw] OR "emergency medicine"[tw] OR "emergency health service"[tw] OR "emergency health services"[tw] OR "emergency care"[tw] OR "emergency healthcare"[tw] OR "emergency treatment"[tw] OR "emergency treatments"[tw] OR "emergency department"[tw] OR "emergency departments"[tw] OR "emergency room"[tw] OR "emergency rooms"[tw] OR "emergency ward"[tw] OR "emergency wards"[tw] OR "emergency unit"[tw] OR "emergency units"[tw] OR "emergency hospital"[tw] OR "emergency hospitals"[tw] OR "emergency clinic"[tw] OR "emergency clinics"[tw] OR "emergency setting"[tw] OR "emergency staff"[tw] OR "emergency response"[tw] OR "emergency medical technician"[tw] OR "emergency medical technicians"[tw] OR "paramedic"[tw] OR "paramedics"[tw] OR "ambulance"[tw] OR "ambulances"[tw] OR "ER"[tw] OR "first responder"[tw] OR "first responders"[tw] OR "rescue work"[tw] OR "rescue worker"[tw] OR "rescue workers"[tw] OR "relief work"[tw] OR "relief worker"[tw] OR "relief workers"[tw] OR "firefighter"[tw] OR "firefighters"[tw] OR "fire fighter"[tw] OR "fire fighters"[tw] OR "trauma center"[tw] OR "trauma centers"[tw] OR "trauma unit"[tw] OR "trauma units"[tw] OR "critical care"[tw] OR "critical illness"[tw] OR "critical illnesses"[tw] OR "resuscitation"[tw] OR "shock"[tw] OR "sepsis"[tw] OR "septicemia"[tw] OR "septicaemia"[tw] OR "acute care"[tw] OR "acute disease"[tw] OR "acute diseases"[tw] OR "prehospital"[tw] OR "pre hospital"[tw] OR "wound"[tw] OR "wounds"[tw] OR "triage"[tw] OR "pregnancy complication"[tw] OR "pregnancy complications"[tw] OR "obstetric complication"[tw] OR "obstetric complications"[tw] OR "obstetric emergency"[tw] OR "obstetric emergencies"[tw]
("Access"[tw]) AND ("availability" OR "availabl*" OR "affordab*" OR "cost" OR "distance" OR "spatial" OR "barrier" OR "barriers" OR "quality") AND

LMIC: based on Cochrane Foundation PubMed Filter
("developing country"[tw] OR "developing countries"[tw] OR "developing nation"[tw] OR "developing nations"[tw] OR "developing population"[tw] OR "developing populations"[tw] OR "developing world"[tw] OR "less developed country"[tw] OR "less developed countries"[tw] OR "less developed nation"[tw] OR "less developed nations"[tw] OR "less developed population"[tw] OR "less developed populations"[tw] OR "less developed world"[tw] OR "lesser developed country"[tw] OR "lesser developed countries"[tw] OR "lesser developed nation"[tw] OR "lesser developed nations"[tw] OR "lesser developed population"[tw] OR "lesser developed populations"[tw] OR "lesser developed world"[tw] OR "least developed country"[tw] OR "least developed countries"[tw] OR "least developed nation"[tw] OR "least developed nations"[tw] OR "least developed population"[tw] OR "least developed populations"[tw] OR "least developed world"[tw] OR "under developed country"[tw] OR "under developed countries"[tw] OR "under developed nation"[tw] OR "under developed nations"[tw] OR "under developed population"[tw] OR "under developed populations"[tw] OR "under developed world"[tw] OR "underdeveloped country"[tw] OR "underdeveloped countries"[tw] OR "underdeveloped nation"[tw] OR "underdeveloped nations"[tw] OR "underdeveloped population"[tw] OR "underdeveloped populations"[tw] OR "underdeveloped world"[tw] OR "middle income country"[tw] OR "middle

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Used Identical terms as Embase

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Date of Search: Feb 6 2020
Access terms

('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies')
AND 'Access' AND ('availability' OR 'availabl*' OR 'affordab*' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') AND ('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies') AND ('developing country' OR 'middle income country' OR 'middle income countr*' OR 'low income country' OR 'global medicine' OR 'third world' OR 'underserved countr*' OR 'resource limited country' OR 'lmic*' OR 'low income economy' OR 'middle income economy' OR 'underdeveloped countr*' OR 'underdeveloped economy' OR 'poor countr*' OR 'poor nation' OR 'world health' OR 'middle-income countr*' OR 'transitional countr*' OR 'lower middle income

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Web of Science:
Date of Initial Search: Feb 6, 2020; Date of second search: Nov 30 2020
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TS=(Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response"

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Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Rhodesia OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR Navigator Island OR Navigator Islands OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe))

Global Index Medicus:
Search results: 526
Initial Search Date: Feb 6, 2020
Updated search: 18
Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response" OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "fire fighter" OR "fire fighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies")

Dr. Alexandra Hartman

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	5-6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	5-6, Supplement
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7-8
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	8-9
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	9-12
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	9-12
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	12-13
Limitations	20	Discuss the limitations of the scoping review process.	14
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	15
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	1

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

BMJ Open

Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

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Article Type:	Original research
Date Submitted by the Author:	15-Dec-2022
Complete List of Authors:	Hirner, Sarah; University of Colorado Denver School of Medicine Dhakal, Jyotshila; University of Colorado Denver Broccoli, Morgan; Brigham and Women's Hospital, Emergency Medicine Ross, Madeline; University of Colorado Denver School of Medicine, Department of Emergency Medicine Calvello Hynes, Emilie; University of Colorado Denver School of Medicine, Emergency Medicine Bills, Corey; University of Colorado Denver School of Medicine, Department of Emergency Medicine
Primary Subject Heading:	Emergency medicine
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Title: Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

Short Title: Access measures of emergency care in LMICs

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Abstract

Objectives: Over 50% of annual deaths in low and middle-income countries (LMICs) could be averted through access to high-quality emergency care. In order to understand and address relevant barriers to emergency care systems, we performed a scoping review of all English language literature that described at least one measure of emergency care access in LMICs.

Methods: We searched PubMed, Embase, Web of Science, CINAHL, and the gray literature for English language studies published between January 1, 1990, and December 30, 2020 that described one or more discrete measure(s) of access to emergency or acute care health services in LMICs. A structured data extraction tool was used to identify and classify the number of 'unique' measures, and the number of times each unique measure was studied in the literature ('total' measures). Measures of access were categorized by access type, defined by Thomas and Penchansky, with further categorization according to the 'Three Delay' model of seeking, reaching, and receiving care, and the World Health Organization's Emergency Care Systems Framework (ECSF).

Results: A total of 3103 articles were screened. 75 met full study inclusion. Articles were uniformly descriptive (n=75, 100%). 137 discrete measures of access were reported. Unique measures of accommodation (n=42, 30.7%) and availability (n=40, 29.2%) were most common. Measures of seeking, reaching, and receiving care were 22 (16.0%), 46 (33.6%), and 69 (50.4%), respectively. According to the ECSF slightly more measures focused on prehospital care—inclusive of care at the scene and through transport to a facility (n=76, 55.4%) as compared to facility-based care (n=57, 41.6%).

Conclusions: Numerous measures of emergency care access are described in the literature, but many measures are over addressed. Development of a core set of access measures with associated minimum standards are necessary to aid in ensuring universal access to high-quality emergency care in all settings.

Strengths and Limitations

- This is the first study to synthesize available measures of emergency healthcare access in low and middle-income countries.
- The large volume of work on indicators of emergency care access shows substantial gaps and may help to future work on how to ensure universal access to high-quality emergency care in all settings.
- This study is limited to the available English-language literature.
- Given limitations in the data, we cannot comment on the feasibility of implementing the categorized access measures, provide consensus on which measures correspond to more likely improvements in patient outcomes, nor provide minimum standards for measures.

Introduction

The past 20 years have been called a golden age of public health. (1) A dramatic increase in global health funding has expanded health care resources in low- and middle-income countries (LMICs). (2-4) As a result, significant reductions in infectious disease-related, neonatal, and maternal mortality have been achieved in line with the United Nations Millennium Development Goals. (5) Further reductions in global mortality attributable to non-communicable diseases and trauma has been far

less substantial. (6) While a shift from disease specific programs to health system strengthening, equity, and social protection has been an important first step, progress on current Sustainable Development Goals remains lacking and has been further hampered by existing health inequities made worse by the COVID-19 pandemic. (7)

Improvements in both prehospital and facility-based emergency care have the potential to impact many of the SDGs, lead to marked improvements in healthcare systems, and reduce deaths across multiple disease categories.(8) Estimates suggest that over 50% of annual deaths in LMICs could be averted by the implementation of quality emergency care systems. (9-12) The increasing mortality burden of non-communicable diseases, including injury and chronic conditions, coupled with the acute medical needs of emerging pandemics, such as SARS-CoV-2, requires the development of robust emergency care systems.(1, 13, 14)

In 2018, the World Health Assembly passed resolution 72.16. ensuring the role of emergency care in all health systems. (15) In order to provide further clarity to practitioners and policy makers on the role of emergency care, the WHO developed the Emergency Care System Framework (ECSF). The Framework defines a set of core essential functions of an emergency care system at the scene of illness, during transport, and within health facilities. (16) Unfortunately, many who live in resource-limited settings lack access to the human resources, equipment and information technologies needed for a capable high functioning emergency care system. (17)

Previous descriptions of known measures of emergency care quality (18, 19) and barriers to emergency care access (20, 21) have highlighted gaps in emergency care in LMICs, but no comprehensive review on measures of emergency care access in LMICs has been completed to date. The aim of this scoping review is to

categorize all known measures of emergency care access in LMICs in order to help standardize and prioritize emergency care development.

Materials and Methods:

Search Strategy

A rigorous search strategy was employed with the goal of identifying all peer-reviewed studies that described measures of access to emergency care in LMICs. For this review we use the term measure to describe indicators, metrics, and other measurable components of access to emergency care. We performed a scoping review using the following databases: PubMed, Embase, Web of Science, and CINAHL. A subsequent gray literature search was conducted via both Google and Google Scholar, with searches targeted toward organizations thought work on global emergency care.

The initial search strategy (Supplementary Material: Appendix 1) was developed within PubMed and adapted for the remaining databases. Search terms included various iterations of access, emergency care, and LMICs. Free text terms and standardized MeSH headings/subheadings were utilized to optimize sensitivity for relevant literature while minimizing excess search results. The reference lists of relevant primary studies and reviews likely to meet inclusion criteria were also reviewed manually to both verify search sensitivity and identify other potentially relevant studies that were not identified by the electronic search. The initial search was performed in 2020, with a subsequent updated search in November 2022.

The gray literature search was completed via Google and Google Scholar. We performed targeted searches using similar terms relevant to access, including

affordability and barriers to care. The search was targeted toward government ministries of health, professional organizations specific to emergency care, and among well-established non-governmental organizations, including development agencies and those specific to healthcare policy. There was no initial regional or income level specifications given to this search.

Studies published between January 1, 1990, and December 30, 2020, English-language, and describing at least one discrete measure of access to emergency care services in at least one LMIC were included. LMICs were defined by World Bank economic definitions as the Gross National Income (GNI) per capita of the year the research was performed. Articles were excluded that were clearly irrelevant to the topic, did not involve emergency care, did not describe a measure of access or measurable barrier to emergency care, or did not include data from at least one LMIC. For the purposes of this review, we excluded data specific to emergency obstetric and newborn care seeking (EmONC; we anticipate a separate forthcoming review on the subject). As a scoping review, this manuscript does not involve human subjects and is exempt from ethics review based on the corresponding author's IRB.

Patient and Public Involvement

Given the nature of this study it was not possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Data Processing

Manuscripts meeting initial broad search criteria were imported into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Initial title and abstract review were performed by

two independent authors (SH, JD). Disagreements were resolved by a third reviewer (CB). The same procedure was followed for full text review.

Data from included manuscripts were extracted and included the following: author(s) and full citation, publication date and study timeframe, location, study type, setting, methodology, access measure(s) reported, and the primary outcome(s). Countries under study were categorized by income level, WHO region, whether the study was local, regional, national or multinational in scale, and whether the populations under study were rural or urban.

Data Analysis

A structured data extraction tool was used to identify and classify both the number of 'unique' measures, and the number of times a unique measure was studied in the literature. In this manuscript the summation of all of the times each unique measure was studied is referred to as 'total' measures. Unique access measures were aggregated and categorized by access type.

The term "access" is often used as shorthand for distance, leading to a focus on individual patient proximity, either spatial or temporal, to a given health service. (22) While vital, proximity is but one component of accessibility and may not correlate with the true ability to receive quality emergency care. (23) For this scoping review we revert back to a more expansive definition of access, one rooted in a rights-based approach to emergency care and reflecting the spectrum of fit between user and service and inclusive of five dimensions of access—availability, accessibility, accommodation, affordability, and acceptability—as described by Penchansky and Thomas. (Table 1; 24-25) We also reference a modified version of this framework which includes awareness. (26) In Penchansky and Thomas' framework, access is examined through the "fit" of the patient with the health care

system. For example, a health care facility may be available (that is, it exists), but not accessible because of transportation barriers. In addition, the health care facility may not have necessary measures to accommodate a patient (such as 24-hour-access or childcare), may be unaffordable, or may be unacceptable (i.e., due to poor quality or corruption). While dates, and originally validated in the consumer patient satisfaction world, multiple recent studies on healthcare access in low- and middle-income studies have shown utility and validity for this framework, including among geriatric healthcare in Southeast Asia, on HIV treatment access during Covid in Ghana, and among displaced in the Lake Chad region of Cameroon, Chad, Niger and Nigeria. (27-29)

Table 1. Proposed Emergency Care Access Measures for Monitoring, Evaluation and Comparative Analysis by Access Type

Access Type	Definition from Penchansky and Thomas	Adapted definition for emergency care	Proposed sample emergency care access measures
Availability	The relationship of the volume and type of existing services to the clients' volume and types of needs	The relationship between EU services and those seeking EC.	Number of EC beds per catchment area
			Presence of drug, technology, or interventions specific to EC
			Presence of EC clinicians 24 hours a day
			Percent of clinicians with EC training
Accessibility	The relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost	The proximity (in time and space) of a patient to EU care.	Distance to closest emergency care facility
			Time to closest emergency care facility
			Available transport
			Time associated with transport
			Cost of transport to emergency care
Affordability	The relationship of prices of services and providers' insurance or deposit requirements to the clients' income, ability to pay, and existing health insurance.	The cost of EU services and care, relative to patient's household income and ability to pay.	Cost to access initial EC service
			Cost of individual services specific to EC (specific to individual care type)
			Overall EC cost per visit
Accommodation	The relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of operation, walk-in facilities, telephone services) and the clients' ability to accommodate to these factors and the clients' perception of their appropriateness	The manner in which EU services are organized (time of operation, level of training and services able to be rendered) relative to a patient's need.	Hours of operation of EU
			Number of transfers per patient
			Average EU time to provider
			Training provided per specific EU interventions
Acceptability	The relationship of clients' attitudes about personal and practice characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients	The relationship between a patient's individual belief system and larger socio-cultural attributes and their willingness to seek EC.	Understanding of how to navigate EC system
			Acceptability of EU care
			Acceptability of EU conduct or attitudes
			Acceptability of ambulance use

More recently other models have emerged that may provide greater applicability to emergency care. With this in mind we provide analyses and categorize access measures via two additional frameworks. The 'Three Delay' model, was originally conceptualized to understand delays in care leading to increased maternal mortality but has been more recently applied to emergency care. (30, 31) The Three Delay model defines three critical phases of timely care: seeking, reaching, and receiving care. The World Health Organization's ECSF provides another method of understanding emergency care access. The ECSF defines the human resources, equipment, and functions necessary for a fully functioning emergency care system at the scene of illness, during transport to a health facility (prehospital), and within healthcare facilities. (9, 16)

All extracted access measures were collected, with similar measures collapsed into singular unique measures. We report the number of unique measures and the total number of times a measure is reported as a number and percent. Each measure was than categorized according to the three frameworks listed above. Given the heterogeneity of study methods and types, a qualitative analysis and narrative synthesis was undertaken. Thematic analyses focused on the number and general quality of the measures used. Trends and ranges among studies with comparable numeric measures are reported where appropriate. We did not perform a grading of the literature given the overall observational nature of most studies. Criteria proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews statement were adhered to in reporting.(32)

Results

A total of 3103 articles were identified for screening via database searches, and 30 were included from the gray literature and hand searches of relevant literature (**Figure 1**). After removal of 993 duplicates, 2140 articles were screened by title and abstract, 203 articles met criteria for full text screening, after which 128 articles were excluded. In sum, 75 articles met full criteria for inclusion. (Supplementary Material, eTable 1)

[Insert] Figure 1. Prisma Flow Diagram for review of literature on access to emergency care measures in LMICs.

All but one of the 75 studies were published in peer-reviewed journals. The majority (n=44, 58.7%) of studies examined access related to general emergency care; 22 (29.3%) were relevant to prehospital care, 10 (13.3%) were specific to trauma care, and one (1.3%) article focused on pediatric patients. (**Table 2)** Geographically, publications included data from all six WHO regions, with the majority from the African Region (n=35, 46.7%). The majority of included studies originated from lower-middle income countries (n=37, 49.30%), with additional studies from upper-middle income countries (n=15, 20.0%) and low-income countries (n=11, 14.7%). Twelve articles (16.0%) included data from multiple income groups.

Table 2. Characteristics of manuscripts for study inclusion

Characteristic	N (%)
	N=75
Country	
Multinational	12 (16.0)
Ghana	7 (9.3)
Pakistan	6 (8.0)
Kenya	5 (6.7)
India	5 (6.7)
South Africa	4 (5.3)
Brazil	3 (4.0)
Other*	32 (42.7)
WHO Region	

	Africa	35 (46.7)
	Americas	7 (9.3)
	Eastern Mediterranean	5 (6.7)
	European	1 (1.3)
	South-East Asia	15 (20.0)
	Western Pacific	7 (9.3)
	Multiple WHO Regions	5 (6.7)
Income level		
	Low	11 (14.7)
	Lower-middle	37 (49.3)
	Upper-middle	15 (20.0)
	Multiple	12 (16.0)
Settings		
	Local	9 (12.0)
	Regional	34 (45.3)
	National	20 (26.7)
	Multinational	12 (16.0)
Setting if Local or Regional**		
	Urban	8 (18.6)
	Rural	32 (74.4)
	Both	3 (2.3)
Article Type		
	Quantitative	24 (32.0)
	Qualitative	47 (62.7)
	Mixed	4 (5.3)
Methodology		
	Descriptive (Interview)	14 (18.7)
	Descriptive (Survey)	13 (17.3)
	Cross sectional	43 (57.3)
	Mixed methods	5 (6.7)
	Observational pre/post (Cohort, RCT)	0 (0.0)
Population focus		
	General EM care	44 (58.7)
	Prehospital care	22 (29.3)
	Trauma care	10 (13.3)
	Pediatrics	1 (1.3)
Number of study participants		
	0-50	7 (9.3)
	51-100	3 (4.0)
	101-500	9 (12.0)
	501-2000	1 (1.3)
	>2000	7 (9.3)
	Not reported	48 (64.0)

*At least one study from the following countries including Bangladesh, Cambodia, Cameroon, China, Eswatini, Ethiopia, Guinea-Bissau, Haiti, Honduras, Iran, Malaysia, Nigeria, Philippines, Rwanda, Samoa, Solomon Islands, Sierra Leone, Sudan, Tanzania, Thailand, Vietnam, Yugoslavia, Zambia, Zimbabwe

**N= 43

Methodologically, all studies were descriptive and relied on key informant interviews (n=14, 18.7%), surveys (n=13, 17.3%), or cross-sectional data (n=43, 57.3%). No manuscript reported a comparator group, and the majority of studies were qualitative in nature (n=47, 62.7%). Studies varied in the number and type (patients, clinical providers, administrators) of participants. The majority of studies (n=48, 64.0%) used cross-sectional data and did not specify the number of participants. Participant enrollment ranged from 11 to 32,774 individuals. The types of health facilities under study also varied, and included emergency care as accessed at clinics, district hospitals, referral hospitals (with access to intensive care), and more formal emergency units or departments.

Measures by access type

In sum, 137 unique measures of access were described in the 68 studies (**Table 3**). Of the 75 total studies, most (n=49, 72.1%) reported more than one unique measure. Based on Penchansky and Thomas' categories, the highest number of discrete measures of access described accommodation (n=42, 30.7%), followed by availability (n=40, 29.2%). In many instances, a single measure was studied reported more than once leading to a total of 306 total measurements. Among total measures, measures of availability (n=120, 35.7%) were disproportionality over represented while measures of affordability were underrepresented (n=34, 10.1%).

Table 3. Unique and total number of access measure categorized by access type

Access category	Unique measures	Total measures
	N=137 (%)	N=336 (%)
Availability	40 (29.2)	120 (35.7)
Accessibility	19 (13.9)	66 (19.6)
Accommodation	42 (30.7)	62 (18.5)
Affordability	17 (12.4)	34 (10.1)
Acceptability*	19 (13.9)	54 (16.1)

*Awareness accounted for 4 of the unique measures

Availability

Unique measures of availability, defined as the relationship of the volume and type of existing services to the clients' volume and types of needs, totaled 40 (29.2%; Table 1). Total measures of affordability were studied most often (n=120, 35.7%, **Table 4**). Of the unique measures, most (n=29, 72.5%) focused on receiving care. Measurements on receiving care often measured the presence or lack of basic emergency health facilities and resources relevant to emergency care. There was heterogeneity when describing resource service availability, such as the availability of emergency radiologic services (e.g., CT and MRI) and emergency laboratory service (e.g., blood smears for malaria). Measures owing to the presence or absence of clinical providers with qualifications relevant to emergency care were described in 9 of the 75 studies (12.0%).

Table 4. Unique access measures categorized by type and delays in care

	Availability N=40	Accessibility N=19	Accommodation N=42	Affordability N=17	Acceptability N=19
Seeking N=22	N=2	N=3	N=5	N=1	N=11
	Presence of community (lay) responders (62)	Patient access to a telephone (6, 11, 63)	Ability to get through on phone lines on first attempt (6)	Inability to miss work/secondary to cost (10)	Acceptability of EU care: by sex (21); by education level (23); age (23, 47); economic/financial status (53); social status (13); insurance (13); appearance (13); ethnicity (60); religion (60, 72), proximity to health facility (53)
	Presence of dispatchers (68)	Presence of a national universal toll-free emergency number (6, 9, 10, 13, 14, 28, 43, 62, 71)	Concerns over personal safety in seeking care (25)		Awareness of emergency care systems and services (5, 11, 52, 61)
		Median time from onset of patient symptoms to contact with provider (13, 57)	Patients and families responsible for arranging their transportation to the higher-level facility (14)		Community accepts and utilizes EMS care (62)
			Presence of adequate child care (10)		Fear of emergency dental treatment (47)
			Required paperwork filled out before emergency care (13)		Knowledge of emergency number (22, 27, 52, 57, 72)
					Knowledge of where the closest EU facility is located (52)
					Personally knew a healthcare provider (13, 60)
					Preference of traditional methods of care (e.g., bonesetters) over EU care (5, 8)
					Social and family disapproval (53)
					Understanding of how to navigate emergency care systems: general (6, 14, 23, 59)
					Understanding of what qualifies as an emergency condition/perception that condition is severe enough to seek care (8, 17, 23, 52, 53, 72)
Reaching N=46	N=9	N=13	N=12	N=8	N=4
	Basic building (i.e., structural) resources specific and purpose built to emergency care (26)	Dispatcher training provided (6)	EMS delays: general (25); due to referrals (59)	Ambulance fee (27, 64)	Ambulances acceptable based on: language (63), if police involved/transport (63), slow response time (52)
	EU radio/communication devices available for EMS handoff (30)	Geography limits access: rural locations (1); mountainous terrain (10)	Existence of a coordinated emergency response system (9, 28, 43, 71, 72)	Ambulance fee by ambulance-type (52)	Patient preference of ambulance care over other forms of transport (52)
	Fuel available for ambulances (14)	Calculated accessibility by 2SFCA method (24)	Equitable (plan for) distribution of ambulance stations (63)	Ambulance referral fee (27)	Prehospital care acceptable to: those taking government ambulance (56), those taking taxis (56), road traffic accident victims (56), those being transferred for medico-legal reasons (56)
	Fuel for general (non-ambulance) transport (14)	Percent of patients who sought care or made it to a facility within 60 minutes of onset of symptoms (59)	Facilities are notified in advance of patients arriving (15)	Cost of transport (11, 14, 17, 19, 23, 47, 72)	Previous ambulance use and willingness to use ambulances in the future (63)
	Presence of any healthcare facility (14)	Response time from initial call to scene (3, 7, 14, 22, 35, 63, 70)	General maintenance issues with vehicles (11)	Payment required before treatment (34)	
	Presence and number of ambulances for interfacility transport (20)	Roadways limits access: traffic (1); poor or narrow roads (11, 14, 20, 52)	Number of separate modes of transportation (per patient) to reach care at facility (20)	Preauthorization fee (64)	
	Presence and number of ambulances with basic life support capabilities (46)	System to access EC from trained first responders and the scene and urgent transport to a health facility (49)	Patients taken to the police station before taking them to the hospital (13, 14)	Fees are equitable (64)	
	Presence and number of ambulances without medical capabilities/transport only (52)	Transport time from a location to a facility with specific EU capabilities (i.e., PCI-capable hospital, trauma center, obstetric emergencies, tertiary hospital; 36, 45, 48, 55)	Percent of missed or prolonged pick-ups due to prehospital provider misunderstanding of location (6)	Private vehicle transport fees (27)	
	Presence and number of helicopters for transport (68)	Transport time from home to hospital (2, 36, 46, 48, 51, 54)	Presence of drivers willing to respond to patient request (11)		
		Transport time from scene to hospital (13, 29, 33, 35, 74)	Private ambulance services control rooms linked to cellular networks (68)		
		Travel distance (5, 13, 14, 21, 20, 22, 27, 32, 51, 57, 59, 66, 71, 72)	Regulations governing EMS (43)		
		Travel time from home to national ambulance service station (67)	System for care during transfer to a facility or between facilities that has the capability to handle the case (20, 49)		
		Weather/Climate limits access: rainy season (11)			
Receiving N=69	N=29	N=3	N=24	N=8	N=4
	Absolute number of EU providers (stratified by type: physicians, nurses, and EMS providers; 6, 10, 13, 14, 17, 18, 30)	Number of (trauma) fatalities within and outside the first hour (70)	Presence of disaster plan including, additional staffing for disasters (49, 68)	Absolute cost of EC treatment (5, 13, 17, 21, 23, 34, 47, 53, 71, 72)	Acceptable providers conduct and attitudes towards patients (13, 14, 57)
	Advanced cardiac life support or resuscitation equipment available in ambulances or number of ACLS ambulances (28, 30, 46, 56)	Fatality rate per patient kilometer from facility (70)	Availability of 24-hour ambulance care (no night hours, 52)	Copayment for care (65)	EC in line with patient's human rights (58)

Availability of basic EU medications available (13, 15, 47, 50)

Availability of basic EU resources/equipment (9, 13, 14, 18, 20, 26, 30, 50, 71, 72)

Availability of EU infection control materials including soap (26, 77)

Availability of EU procedures: Needle thoracostomy (15); chest tube (15); pelvic binding (15), defibrillation (15), cardioversion (15), pericardiocentesis (15); external cardiac pacing (15); Blood transfusions (15, 32)

Availability of EU specific supplies and equipment: 49, Suture and wound care supplies (15); Gloves (15); Oxygen (15, 45); Stethoscopes (20); Glucometer (15); Pulse oximetry; ECG machine (15); Resuscitation equipment (8)

Availability of imaging (General: 17, Xray: 15, CT: 30, 68, ultrasound or MRI: 30)

Availability of laboratory/diagnostic testing material (general blood/urine tests: 17, 30, 32, 57; malaria smears: 32)

Availability of potable (sterile) water (20, 73)

Availability of pre-hospital providers with standardized training (9, 22, 28, 52, 56)

Availability of sanitation (toilet, 73)

Availability of specified care: trauma care (4); orthopedic (fracture) care (8, 15, 15); obstetrical emergencies (20); HIV care (20); cholera (20); tuberculosis care (20); general surgical services (20); dental care (20); critical care (20); ophthalmological care (20)

Electricity available (20, 26, 45)

Emergency equipment list available (20)

First aid received on scene by lay providers (i.e., members of the public, other motorists, or the less injured casualties; 34, 49)

First aid received on scene by trained providers (34)

Number of doctors staffing EU (appropriate for size; 68)

Number of EU-specific area beds (20)

Number of hospital-facility (non-EU specific) rooms or beds (10, 19, 57)

Presence of EU with resuscitation bed/zone (49, 50)

Presence of EU (within facility; 2, 68)

Presence of EU dedicated nursing personnel (18)

Presence of facility burn unit (2)

Presence of triage (13, 14, 49, 50)

Staff qualified to utilize EU equipment (26)

Staff qualified to treat EU conditions (27)

Staff with EC training: ACLS or BLS training (30, 71, 72); ATLS, PALS (30, 72)

Staff with specialized training relevant to EC: 49, adult critical care (18); continuing education (18); EU equipment use (20); neonatal care (50)

Able to access and receive care in last 12 months (61)

Availability of 24-hour emergency care (13, 26, 57)

Availability of 24-hour staff availability (20)

Care provided during transport (14)

Care provided at lower-level facility before transfer (14)

Legal protections for ambulance providers distributing and providing care (28)

Miscommunication or mis-triage of patient acuity (6)

Number of transfers per patient (6)

Number and Percent mis-triage (6)

Percent of hospitals with out-of-hours clinician coverage (18)

Physician comfort in adequately performing EU-specific procedures (30, 50)

Presence of overcrowding (49)

Presence of a standardized EMR (13)

Protocols for patient transfers (20)

Protocols specific to trauma care (15)

Safe passage for health providers to the hospital at night (72)

Staff comfort in treating EU conditions (32, 34)

Training for community members and police: First aid and triage (72)

Training for providers: adult triage (18)

Training for providers: EU-specific (13, 14, 27, 46, 71)

Training for providers: pediatric triage-specific (18)

Time to lab tests (75); by patient GCS (75)

Time to provider (e.g., wait time; 25, 75)

Utilization and access to standardized clinical care guidelines: general approach (15, 49); condition specific (sepsis, DKA, anemia, 15)

Cost of facility treatment (19)

Cost of medical investigations and radiography (15)

Cost of medicines (17, 23)

Cost of treatment by a bonesetter (8)

Hospital costs beyond scope of patient (e.g., proportion of costs to individual families) (34)

Payment required in cash for imaging (34)

Providers/percent of providers deemed corrupt (13)

Sought care for wounds/trauma (5)

Accessibility

Unique measures of accessibility—the location of supply and the location of clients—totaled 19 (13.9%), with a disproportionate number of measures studied more than once, leading to 66 total measurements (19.6%). The majority of the unique measures of accessibility corresponded to the process of reaching care (n=13, 68.4%) with most measures on the distance or time to a health service (n=11, 64.7%). Among the 13 studies reporting time, travel times to emergency care ranged from 5 minutes to 2 hours. The range of distances to health facilities demonstrated similar variability, though most (n=13) measurements were in kilometers. An additional study (n=1) reported on the percentage of the population living within a given distance or time, while other studies (n=4) reported on a range of distances or times to specific EU care (e.g., trauma, referral, cardiac). Other qualitative barriers to accessibility were also provided, including the effects of terrain, weather, and road quality.

Accommodation

Accommodation measures are those that assess the manner in which emergency care resources are organized to accept patients. Measures of accommodation made up the greatest number of unique measures (n=42, 30.7%), but they were rarely studied more than once (total n=62, 19.6%). Adequacy of child care, concerns over personal safety, and difficulties in getting through to prehospital providers were described as significant barriers in the process of seeking emergency care. The majority of unique measures on accommodation dealt with the process of receiving care (n=25, 59.5%). Among measures categorized as receiving care, facility-based measures (n=11, 44.0%) included measures of provider timeliness and availability, provider training,

overcrowding, and protocols for care. Among the unique measures of accommodation, four (8.9%) described the use of standardized protocols (three related to prehospital care and one on facility-based care).

Affordability

Measures of affordability or assessing the cost of services relative to a patient or caregivers finances, were the least studied. While the 17 (12.4%) unique measures were similar to the numbers for accessibility and acceptance, measures were rarely studied more than once (n=34, 10.1%). Of the unique metrics reported, most reported on different aspects of the cost of transportation in reaching care (n=8, 47.1%) and the cost of receiving treatment (n=5, 29.4%). Types of costs varied, including cost of an ambulance ride, cost of deposit before treatment, and total hospital bills. A single study described the lack of emergency care affordability based on lost wages from missing work.

Acceptability

Acceptability measures uncovered how well patient's attitudes around emergency care matched those of providers or systems. Seventeen (12.4%) unique measures of acceptability were described in the literature. The majority were related to the process of care seeking (n=11, 64.7%). Measures largely described patient's understanding, acceptability, willingness, and fears in activating and navigating emergency care systems.

Awareness

Lastly, some have argued for inclusion of awareness as a 6th category of access. There were 5 unique measures of awareness, which largely overlapped with the previous 5 other categories, most specifically acceptability. These five measures were reported a total of 18 times.

Access measures by frameworks of emergency care

Individual metrics were also mapped to the Three Delay model, and categorized as either, seeking, reaching, or receiving care (Table 4). Unique measures of seeking care (N=22, 16.1%) largely dealt with pre-facility care and included individual thought processes, the socio-cultural forces underlying care seeking behavior, or systematic structural barriers to seeking care. Measures of reaching emergency care (N=46, 33.6%) largely measured the adequacy of out of hospital care, including the presence, number and proportion of ambulances to population, the time from community to care, the cost of ambulance services, and distribution and systems of ambulance-based care. The majority of unique access measures described the processes of receiving care (n=69, 50.4%). Most measures dealt with the availability of facility-based care services.

Measures were also mapped to the WHO emergency care systems framework (**Table 5**). The WHO Framework 'captures essential emergency care functions at the scene of injury or illness, during transport, and through to emergency unit and early inpatient care'. (16) Roughly equal proportions of measures were focused on prehospital care—inclusive of care at the scene and during transport to a facility (n=76, 55.4%) and facility-based emergency care (n=57, 41.6%). However, given the largely linear nature of the framework, a total of 4 (2.9%) unique measures could not be defined by this framework and were neither specific to prehospital nor facility-based care. The

majority of out of hospital care measures focused on the transfer process (n=45 of 76, 59.2%), while most facility-based measures dealt with EU-based care (n=51 of 57, 89.5%). None of the included manuscripts measured EU disposition or elements of early inpatient care.

Table 5. Unique number of access measures as defined by the WHO Emergency Care Systems Framework. by access type.

WHO ECSF		Total*	Access Type				
Site	Primary Function	N=133 (%)	Availability N=39 (%)	Accessibility N=18 (%)	Accommodation N=42 (%)	Affordability N=17 (%)	Acceptability N=19 (%)
Out of hospital care		76 (57.1)	11 (28.2)	17 (94.4)	25 (59.5)	9 (52.9)	14 (73.7)
	Bystander Response	17 (12.8)	1 (2.6)	3 (16.7)	3 (7.1)	1 (5.9)	9 (47.4)
	EMS Dispatch	3 (2.3)	1 (2.6)	1 (5.6)	1 (2.4)		
	Provider Response	11 (8.2)	2 (5.1)	2 (11.1)	6 (14.3)		1 (5.3)
	Transfer	45 (33.8)	7 (17.9)	11 (61.1)	15 (35.7)	8 (47.1)	4 (21.1)
Facility-based care		57 (42.9)	28 (71.8)	1 (5.6)	17 (40.5)	8 (47.1)	3 (15.8)
	Reception and Triage	6 (4.5)	2 (5.1)		4 (9.5)		
	EU Care	51 (38.3)	26 (66.7)	1 (5.6)	13 (31.0)	8 (47.1)	3 (15.8)
	Disposition	--					
	Inpatient Care	--					

*Total is out of 133, as 4 measures could not be defined by ECSF

Discussion

Increased global access to quality emergency care has the potential to reduce mortality associated with non-communicable illness and trauma as well as infectious disease and pregnancy related complications.(9-12) Analyzing emergency care access measures in detail has the potential to elucidate gaps in health systems—made worse by the Covid-19 pandemic—that can guide strategies to address existing inequities in care. To date, this is the first review of access measures specific to emergency care in LMICs.

This review revealed several common themes. The majority of unique emergency care access measures focus on availability and accommodation, but total measures of accessibility appear to be more frequently described in the literature. This has led to the disproportionate emphasis on distance and time to a health facility as demonstrative of emergency care access. In reality, upon arrival to a health facility with an emergency condition, most patients are met with limited, ineffective, or non-existent emergency care provision.

Relative to other categories of access reviewed, measures of affordability were the least studied in the literature. These measures often lacked information to contextualize data relative to the gross domestic product of the study population's cost of living. Cost is known to play a significant role in patient's overall healthcare access in all health systems, not just LMICs. (33) Costs associated with emergency health services are known to vary widely across health systems regardless of a country's GDP.(34, 35) Moreover, cost-effectiveness is a widely used method to inform resource allocation, yet evidence to better understand health inequity in all its forms, should include additional efforts to study the cost-effectiveness of emergency care interventions and emergency care systems in LMICs. Measures of access included in this study included both direct (user fees, medication costs, laboratory and imaging tests) and indirect (lost wages, travel costs). Further consensus led efforts to determine measures most important for system comparison are necessary.

In 2018 the World Health Assembly passed resolution 72.16. ensuring the role of emergency care in all health systems. (16) The WHO Emergency Care System Framework sought to provide further context to health policy makers on the role of

emergency care systems in ensuring universal health coverage. (16) While prehospital and facility-based measures of access were equally represented on the literature, though significant gaps remained in both domains. Among prehospital care, most measures focused on the transfer process, with less focus on dispatch and provider response. Several areas of this framework had no associated measures described in the literature.

According to the ECSF considerably few studies described measures related to the EU reception process (e.g., registration, screening, and triage) or the transfer of care between prehospital and facility-based providers. Additionally, no measures described the process of EU disposition or transfer of care to the inpatient ward. Though disposition, transfer, referrals, and transition of care from one provider to another are often cited as times of higher risk to patients, measures of this risk were not adequately described in this study.(36) Several WHO initiatives have sought to strengthen EU quality globally. Future efforts should seek to define and refine a core set of measures specific to emergency care access to aid in the monitoring and evaluation of those efforts. The further validation of a core set of measures with minimum standards across low, middle, and high-income contexts can help to further increase access to high quality emergency care and the expansion of universal health coverage.

Limitations

This study makes an initial attempt to describe measures of access to emergency care, but it is restricted in scope and possesses several limitations. First, this study is limited to English language articles only and may does not include articles in other languages widely spoken in many LMICs, including French, Portuguese and

Arabic. Second, while a gray literature review was conducted, we are likely missing measures in use by health facilities, global health organizations, and health ministries. Further attempts at key informant interviews or focus groups with those in LMICs, undoubtably would uncover other measures, but was beyond the scope of this review. Third, given the limitations in study data there was no attempt made to rank-order measures based on feasibility, nor the degree to which they correspond to specific patient outcomes. We recognize that not all measures have equal utility, with some better reflecting access to care issues and serving as more significant correlates of patient outcome. Fourth, though the actual corresponding outcome measures were collected (and described in Supplementary Material, eTable 2), given the heterogeneity of measures and limitations of the search strategy we were unable to provide reference (or minimum) standards for the access measures described. Future efforts hope to describe further the actual measurements. Other fields have attempted, at times with similar difficulty, to establish reference standards (e.g., the Lancet Commission on Global Surgery has recommended a maximum two-hour travel time to surgical services, while similar measures of time to surgery remain controversial (37, 38). However, very few consensus derived standards exist for measuring access to emergency care. (39) This lack of consensus makes further facility, regional, and national comparisons difficult and limits effective understanding of care. Similar to previous consensus work on measures of emergency care quality in LMICs, future efforts should aim to define a core list of indicators of access to emergency care.(19) Lastly, risk of bias assessment was not performed given the descriptive nature of most studies. Other methodologic and search strategy sought to limit bias in the initial selection of articles.

Conclusions

Increasing access to quality emergency care is a key step in strengthening heath systems in LMICs. This scoping review demonstrates that while existing literature examines a wide breadth of access metrics, many gaps remain in our understanding of emergency care access in LMICs. As researchers continue to examine access and barriers to emergency care, special attention should be paid to those dimensions of access less commonly examined, such as affordability. Standardized, consensus-based measures of emergency care access in line with the ECSF should be developed to allow for more universal comparisons of healthcare functions.

Author Contributions

CB, ECH, and SH contributed to the conception and design of the work. SH and JD contributed to data collection and review. SH and CB contributed to data analysis and interpretation and drafting of the article. MB, MR, and ECH contributed to critical revisions of the article. All named authors have approved of the version to be published and agreed to be accountable for all aspects of the work.

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References

1. Neilson M, Leatherman S, Syed S. The quality-of-care agenda in fragile, conflict-affected and vulnerable settings. Bull World Health Organ. 2021 Mar 1;99(3):170-170A. doi: 10.2471/BLT.21.285627. PMID: 33716335; PMCID: PMC7941104.

2. Leatherman S, Berwick DM. Accelerating Global Improvements in Health Care Quality. JAMA. 2020 Dec 22;324(24):2479-2480. doi: 10.1001/jama.2020.17628. PMID: 33351051.

3. World Health Organization. Delivering quality health services: a global imperative for universal health coverage. Geneva: World Health Organization, Organization for Economic Co-operation and Development, and The World Bank; 2018.

4. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Adeyi O, Barker P, Daelmans B, Doubova SV, English M, García-Elorrio E, Guanais F, Gureje O, Hirschhorn LR, Jiang L, Kelley E, Lemango ET, Liljestrand J, Malata A, Marchant T, Matsoso MP, Meara JG, Mohanan M, Ndiaye Y, Norheim OF, Reddy KS, Rowe AK, Salomon JA, Thapa G, Twum-Danso NAY, Pate M. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018 Nov;6(11):e1196-e1252. doi: 10.1016/S2214-109X(18)30386-3.

5. United Nations Millennium Development Goals 2008 [Available from: https://www.un.org/millenniumgoals/.] Accessed: June 27, 2022.

6. Zeid S, Bustreo F, Barakat MT, Maurer P, Gilmore K. For every woman, every child, everywhere: a universal agenda for the health of women, children, and adolescents.

Lancet. 2015 May 16;385(9981):1919-20. doi: 10.1016/S0140-6736(15)60766-8. PMID: 26090626.

7. United Nations. The Sustainable Development Goals Report 2021. 2021, United Nations, New York. [Available from: https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf]. Accessed: June 27, 2022

8. Calvello EJ, Broccoli M, Risko N, Theodosis C, Totten VY, Radeos MS, Seidenberg P, Wallis L. Emergency care and health systems: consensus-based recommendations and future research priorities. Acad Emerg Med. 2013 Dec;20(12):1278-88. doi: 10.1111/acem.12266. PMID: 24341583.

9. Reynolds T, Sawe H, Rubiano A, Shin S, Wallis L, Mock C. Strengthening Health Systems to Provide Emergency Care. Disease Control Priorities: Improving Health and Reducing Poverty. 3 ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017. pp 247-65.

10. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? Bull World Health Organ. 2002;80(11):900-5. Epub 2002 Dec 3. PMID: 12481213; PMCID: PMC2567674.

11. Chang CY, Abujaber S, Reynolds TA, Camargo CA Jr, Obermeyer Z. Burden of emergency conditions and emergency care usage: new estimates from 40 countries. Emerg Med J. 2016 Nov;33(11):794-800. doi: 10.1136/emermed-2016-205709. Epub 2016 Jun 22. PMID: 27334758; PMCID: PMC5179323.

12. Razzak J, Usmani M, Bhutta Z. Global, regional and national burden of emergency medical diseases using specific emergency disease indicators: Analysis of the 2015 Global Burden of Disease Study. BMJ Global Health. 2019;4.

13. Reynolds TA, Guisset AL, Dalil S, Relan P, Barkley S, Kelley E. Emergency, critical and operative care services for effective primary care. Bull World Health Organ. 2020 Nov 1;98(11):728-728A. doi: 10.2471/BLT.20.280016. PMID: 33177766; PMCID: PMC7607458.13.

14. Calvello Hynes EJ, Bills CB. Emergency Care Systems: The Missing Link for Effective Treatment of COVID-19 in Africa. Disaster Med Public Health Prep. 2020 Aug;14(4):e11-e12. doi: 10.1017/dmp.2020.239. Epub 2020 Jul 14. PMID: 32660671; PMCID: PMC7450233.

15. World Health Assembly. Resolution 72.16. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured. Geneva: world Health Organization, 2019. https://apps.who.int/gb/ebwha/pdf _ files/WHA72/A72 _ R16-en.pdf?ua=1 (Accessed30 November 2022).

16. WHO. World Health Organization: Emergency Care Systems Framework 2019. https://www.who.int/emergencycare/emergencycare _ infographic/en/ (Accessed 30 November 2022).

17. Obermeyer Z , Abujaber S , Makar M , et al. Emergency care in 59 low-and middle-income countries: a systematic review. Bull World Health Organ 2015;93:577–86.

18. Aaronson EL, Marsh RH, Guha M, Schuur JD, Rouhani SA. Emergency department quality and safety indicators in resource-limited settings: an environmental survey. Int J Emerg Med. 2015 Dec;8(1):39. doi: 10.1186/s12245-015-0088-x. Epub 2015 Oct 31. PMID: 26520848; PMCID: PMC4628609.

19. Broccoli MC, Moresky R, Dixon J, Muya I, Taubman C, Wallis LA, Calvello Hynes EJ. Defining quality indicators for emergency care delivery: findings of an expert

consensus process by emergency care practitioners in Africa. BMJ Glob Health. 2018 Feb 15;3(1):e000479. doi: 10.1136/bmjgh-2017-000479. PMID: 29527337; PMCID: PMC5841514.

20. Cannoodt L, Mock C, Bucagu M. Identifying barriers to emergency care services. Int J Health Plann Manage. 2012 Apr-Jun;27(2):e104-20. doi: 10.1002/hpm.1098. PMID: 22674816.

21. Kironji AG, Hodkinson P, de Ramirez SS, Anest T, Wallis L, Razzak J, Jenson A, Hansoti B. Identifying barriers for out of hospital emergency care in low and low-middle income countries: a systematic review. BMC Health Serv Res. 2018 Apr 19;18(1):291. doi: 10.1186/s12913-018-3091-0. PMID: 29673360; PMCID: PMC5907770.

22. Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, Okiro EA, Snow RW. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018 Mar;6(3):e342-e350. doi: 10.1016/S2214-109X(17)30488-6. Epub 2018 Jan 26. PMID: 29396220; PMCID: PMC5809715.

23. Geduld H, Hynes EJC, Wallis LA, Reynolds T. Hospital proximity does not guarantee access to emergency care. Lancet Glob Health. 2018 Jul;6(7):e731. doi: 10.1016/S2214-109X(18)30235-3. PMID: 29903374.

24. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. Med Care. 1981 Feb;19(2):127-40. doi: 10.1097/00005650-198102000-00001. PMID: 7206846.

25. Burkholder TW, Hill K, Calvello Hynes EJ. Developing emergency care systems: a human rights-based approach. Bull World Health Organ. 2019 Sep 1;97(9):612-619.

doi: 10.2471/BLT.18.226605. Epub 2019 Jun 19. PMID: 31474774; PMCID: PMC6705504.

26. Saurman E. Improving access: modifying Penchansky and Thomas's Theory of Access. J Health Serv Res Policy. 2016 Jan;21(1):36-9. doi: 10.1177/1355819615600001. Epub 2015 Sep 15. PMID: 26377728.

27. Mohd Rosnu NS, Singh DKA, Mat Ludin AF, Ishak WS, Abd Rahman MH, Shahar S. Enablers and Barriers of Accessing Health Care Services among Older Adults in South-East Asia: A Scoping Review. Int J Environ Res Public Health. 2022 Jun 15;19(12):7351. doi: 10.3390/ijerph19127351. PMID: 35742597; PMCID: PMC9223544.

28. Abraham SAA, Doe PF, Osei Berchie G, Agyare E, Ayisi Addo S, Obiri-Yeboah D. Explorative-descriptive study on the effects of COVID-19 on access to antiretroviral therapy services: the case of a teaching hospital in Ghana. BMJ Open. 2022 May 24;12(5):e056386. doi: 10.1136/bmjopen-2021-056386. PMID: 35613780; PMCID: PMC9125379.

29. Oginni SO, Opoku MP, Nketsia W. Crisis at the intersection of four countries: healthcare access for displaced persons in the Lake Chad Basin region. Ethn Health. 2022 Oct;27(7):1698-1717. doi: 10.1080/13557858.2021.1947471. Epub 2021 Jun 28. PMID: 34182835.

30. Barnes-Josiah D, Myntti C, Augustin A. The "three delays" as a framework for examining maternal mortality in Haiti. Soc Sci Med. 1998 Apr;46(8):981-93. doi: 10.1016/s0277-9536(97)10018-1. PMID: 9579750.

31. Calvello EJ, Skog AP, Tenner AG, Wallis LA. Applying the lessons of maternal mortality reduction to global emergency health. Bull World Health Organ. 2015 Jun

1;93(6):417-23. doi: 10.2471/BLT.14.146571. Epub 2015 Mar 16. PMID: 26240463; PMCID: PMC4450708.

32. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467-473. doi: 10.7326/M18-0850. Epub 2018 Sep 4. PMID: 30178033.

33. Lagarde M, Palmer N. The impact of health financing strategies on access to health services in low and middle income countries. Cochrane Database Syst Rev. 2018 Apr 11;2018(4):CD006092. doi: 10.1002/14651858.CD006092.pub2. PMCID: PMC6494435.

34. Werner K, Risko N, Burkholder T, Munge K, Wallis L, Reynolds T. Cost-effectiveness of emergency care interventions in low and middle-income countries: a systematic review. Bull World Health Organ. 2020 May 1;98(5):341-352. doi: 10.2471/BLT.19.241158. Epub 2020 Feb 25. PMID: 32514199; PMCID: PMC7265944.

35. Risko N, Chandra A, Burkholder TW, Wallis LA, Reynolds T, Calvello Hynes EJ, Razzak J. Advancing research on the economic value of emergency care. BMJ Glob Health. 2019 Jul 29;4(Suppl 6):e001768. doi: 10.1136/bmjgh-2019-001768. PMID: 31406603; PMCID: PMC6666808.

36. Sentinel events statistics for 2011. Joint Commission Perspectives. 2012;32(5):5.

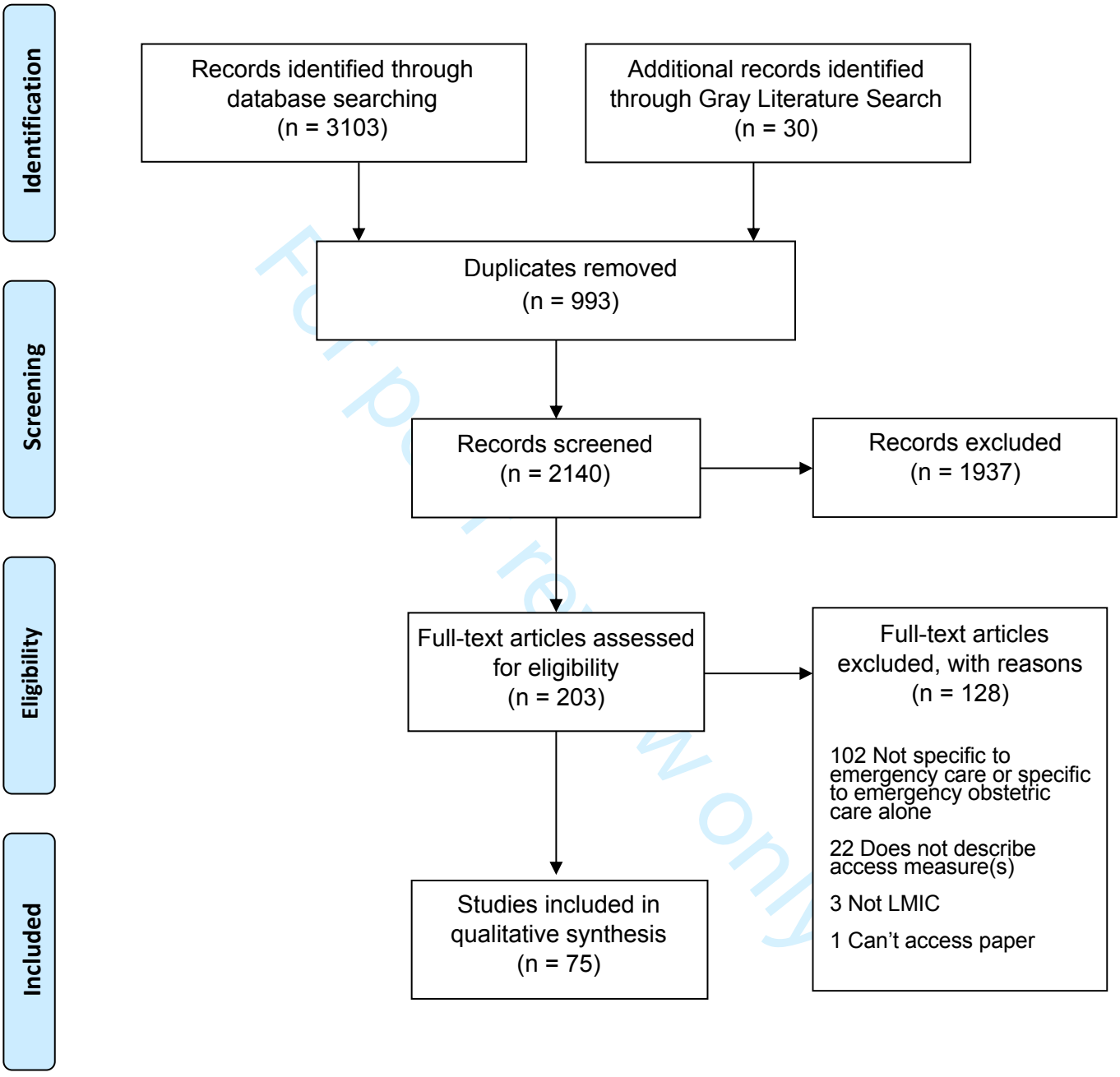
37.Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, Bickler SW, Conteh L, Dare AJ, Davies J, Mérisier ED, El-Halabi S, Farmer PE, Gawande A, Gillies R, Greenberg SL, Grimes CE, Gruen RL, Ismail EA, Kamara TB, Lavy C, Lundeg G,

Mkandawire NC, Raykar NP, Riesel JN, Rodas E, Rose J, Roy N, Shrime MG, Sullivan R, Verguet S, Watters D, Weiser TG, Wilson IH, Yamey G, Yip W. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. Int J Obstet Anesth. 2016 Feb;25:75-8. doi: 10.1016/j.ijoa.2015.09.006. Epub 2015 Sep 30. PMID: 26597405.

38. Lerner EB, Moscati RM. The golden hour: scientific fact or medical "urban legend"? Acad Emerg Med. 2001 Jul;8(7):758-60. doi: 10.1111/j.1553-2712.2001.tb00201.x. PMID: 11435197.

39. Graff L, Stevens C, Spaite D, Foody J. Measuring and improving quality in emergency medicine. Acad Emerg Med. 2002 Nov;9(11):1091-107. doi: 10.1111/j.1553-2712.2002.tb01563.x. PMID: 12414457.

Figure 1. Prisma flow diagram for review of literature on measures of access to emergency and acute care in low- and middle-income countries.



Appendix 1

Search Strategy: PUBMED
Initial Search: Feb 4 2020; Follow up search date: 11/22/2020; Second Follow up search date: 11/30/2020, revised for CINAHL performed on 11/20/2022

Emergency med terms
"emergency responder"[tw] OR "emergency responders"[tw] OR "emergency doctor"[tw] OR "emergency doctors"[tw] OR "emergency clinician"[tw] OR "emergency clinicians"[tw] OR "emergency physician"[tw] OR "emergency physicians"[tw] OR "emergency personnel"[tw] OR "emergency medical personnel"[tw] OR "emergency service"[tw] OR "emergency services"[tw] OR "emergency medical service"[tw] OR "emergency medical services"[tw] OR "emergency medicine"[tw] OR "emergency health service"[tw] OR "emergency health services"[tw] OR "emergency care"[tw] OR "emergency healthcare"[tw] OR "emergency treatment"[tw] OR "emergency treatments"[tw] OR "emergency department"[tw] OR "emergency departments"[tw] OR "emergency room"[tw] OR "emergency rooms"[tw] OR "emergency ward"[tw] OR "emergency wards"[tw] OR "emergency unit"[tw] OR "emergency units"[tw] OR "emergency hospital"[tw] OR "emergency hospitals"[tw] OR "emergency clinic"[tw] OR "emergency clinics"[tw] OR "emergency setting"[tw] OR "emergency staff"[tw] OR "emergency response"[tw] OR "emergency medical technician"[tw] OR "emergency medical technicians"[tw] OR "paramedic"[tw] OR "paramedics"[tw] OR "ambulance"[tw] OR "ambulances"[tw] OR "ER"[tw] OR "first responder"[tw] OR "first responders"[tw] OR "rescue work"[tw] OR "rescue worker"[tw] OR "rescue workers"[tw] OR "relief work"[tw] OR "relief worker"[tw] OR "relief workers"[tw] OR "firefighter"[tw] OR "firefighters"[tw] OR "fire fighter"[tw] OR "fire fighters"[tw] OR "trauma center"[tw] OR "trauma centers"[tw] OR "trauma unit"[tw] OR "trauma units"[tw] OR "critical care"[tw] OR "critical illness"[tw] OR "critical illnesses"[tw] OR "resuscitation"[tw] OR "shock"[tw] OR "sepsis"[tw] OR "septicemia"[tw] OR "septicaemia"[tw] OR "acute care"[tw] OR "acute disease"[tw] OR "acute diseases"[tw] OR "prehospital"[tw] OR "pre hospital"[tw] OR "wound"[tw] OR "wounds"[tw] OR "triage"[tw] OR "pregnancy complication"[tw] OR "pregnancy complications"[tw] OR "obstetric complication"[tw] OR "obstetric complications"[tw] OR "obstetric emergency"[tw] OR "obstetric emergencies"[tw]

AND
"Access"[tw]) AND ("availability" OR "availabl*" OR "affordab*" OR "cost" OR "distance" OR "spatial" OR "barrier" OR "barriers" OR "quality")
AND

LMIC: based on Cochrane Foundation PubMed Filter
("developing country"[tw] OR "developing countries"[tw] OR "developing nation"[tw] OR "developing nations"[tw] OR "developing population"[tw] OR "developing populations"[tw] OR "developing world"[tw] OR "less developed country"[tw] OR "less developed countries"[tw] OR "less developed nation"[tw] OR "less developed nations"[tw] OR "less developed population"[tw] OR "less developed populations"[tw] OR "less developed world"[tw] OR "lesser developed country"[tw] OR "lesser developed countries"[tw] OR "lesser developed nation"[tw] OR "lesser developed nations"[tw] OR "lesser developed population"[tw] OR "lesser developed populations"[tw] OR "lesser developed world"[tw] OR "least developed country"[tw] OR "least developed countries"[tw] OR "least developed nation"[tw] OR "least developed nations"[tw] OR "least developed population"[tw] OR "least developed populations"[tw] OR "least developed world"[tw] OR "under developed country"[tw] OR "under developed countries"[tw] OR "under developed nation"[tw] OR "under developed nations"[tw] OR "under developed population"[tw]

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OR Indonesia[tw] OR Iran[tw] OR Iraq[tw] OR Isle of Man[tw] OR Jamaica[tw] OR Jordan[tw] OR Kazakhstan[tw] OR Kazakh[tw] OR Kenya[tw] OR Kiribati[tw] OR Korea[tw] OR Kosovo[tw] OR Kyrgyzstan[tw] OR Kirghizia[tw] OR Kyrgyz Republic[tw] OR Kirghiz[tw] OR Kirgizstan[tw] OR "Lao PDR"[tw] OR Laos[tw] OR Latvia[tw] OR Lebanon[tw] OR Lesotho[tw] OR Basutoland[tw] OR Liberia[tw] OR Libya[tw] OR Lithuania[tw] OR Macedonia[tw] OR Madagascar[tw] OR Malagasy Republic[tw] OR Malaysia[tw] OR Malaya[tw] OR Malay[tw] OR Sabah[tw] OR Sarawak[tw] OR Malawi[tw] OR Nyasaland[tw] OR Mali[tw] OR Malta[tw] OR Marshall Islands[tw] OR Mauritania[tw] OR Mauritius[tw] OR Agalega Islands[tw] OR Mexico[tw] OR Micronesia[tw] OR Middle East[tw] OR Moldova[tw] OR Moldovia[tw] OR Moldovian[tw] OR Mongolia[tw] OR Montenegro[tw] OR Morocco[tw] OR Ifni[tw] OR Mozambique[tw] OR Myanmar[tw] OR Myanma[tw] OR Burma[tw] OR Namibia[tw] OR Nepal[tw] OR Netherlands Antilles[tw] OR New Caledonia[tw] OR Nicaragua[tw] OR Niger[tw] OR Nigeria[tw] OR Northern Mariana Islands[tw] OR Oman[tw] OR Muscat[tw] OR Pakistan[tw] OR Palau[tw] OR Palestine[tw] OR Panama[tw] OR Paraguay[tw] OR Peru[tw] OR Philippines[tw] OR Philipines[tw] OR Phillipines[tw] OR Phillippines[tw] OR Poland[tw] OR Portugal[tw] OR Puerto Rico[tw] OR Rhodesia[tw] OR Romania[tw] OR Rumania[tw] OR Roumania[tw] OR Russia[tw] OR Russian[tw] OR Rwanda[tw] OR Ruanda[tw] OR Saint Kitts[tw] OR St Kitts[tw] OR Nevis[tw] OR Saint Lucia[tw] OR St Lucia[tw] OR Saint Vincent[tw] OR St Vincent[tw] OR Grenadines[tw] OR Samoa[tw] OR Samoan Islands[tw] OR Navigator Island[tw] OR Navigator Islands[tw] OR Sao Tome[tw] OR Saudi Arabia[tw] OR Senegal[tw] OR Serbia[tw] OR Montenegro[tw] OR Seychelles[tw] OR Sierra Leone[tw] OR Slovenia[tw] OR Sri Lanka[tw] OR Ceylon[tw] OR Solomon Islands[tw] OR Somalia[tw] OR Sudan[tw] OR Suriname[tw] OR Surinam[tw] OR Swaziland[tw] OR Syria[tw] OR Tajikistan[tw] OR Tadzhikistan[tw] OR Tadjikistan[tw] OR Tadzhik[tw] OR Tanzania[tw] OR Thailand[tw] OR Togo[tw] OR Togolese Republic[tw] OR Tonga[tw] OR Trinidad[tw] OR Tobago[tw] OR Tunisia[tw] OR Turkey[tw] OR Turkmenistan[tw] OR Turkmen[tw] OR Uganda[tw] OR Ukraine[tw] OR Uruguay[tw] OR USSR[tw] OR Soviet Union[tw] OR Union of Soviet Socialist Republics[tw] OR Uzbekistan[tw] OR Uzbek OR Vanuatu[tw] OR New Hebrides[tw] OR Venezuela[tw] OR Vietnam[tw] OR Viet Nam[tw] OR West Bank[tw] OR Yemen[tw] OR Yugoslavia[tw] OR Zambia[tw] OR Zimbabwe[tw] OR Pacific region OR Pacific island)

OVID, Global Health (CABI):
Used Identical terms as Embase

Embase:
Date of Search: Feb 6 2020

Access terms

('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies')
AND 'Access' AND ('availability' OR 'availabl*' OR 'affordab*' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') AND ('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies') AND ('developing country' OR 'middle income country' OR 'middle income countr*' OR 'low income country' OR 'global medicine' OR 'third world' OR 'underserved countr*' OR 'resource limited country' OR 'lmic*' OR 'low income economy' OR 'middle income economy' OR 'underdeveloped countr*' OR 'underdeveloped economy' OR 'poor countr*' OR 'poor nation' OR 'world health' OR 'middle-income countr*' OR 'transitional countr*' OR 'lower middle income countr*' OR 'upper middle income' OR 'less developed countr*' OR 'lesser developed countr*' OR 'developing countr*' OR 'developing nation' OR 'lower-middle income countr*' OR 'upper-middle income countr*' OR 'low-income countr*' OR 'deprived countr*' OR 'low gdp' OR 'lami

countr*' OR 'poorer nation' OR 'under served countr*' OR 'under served nation' OR 'lower income population' OR 'low income population' OR 'developing world' OR 'africa' OR 'asia' OR 'caribbean' OR armenian OR aruba OR byelorussian OR belarus OR belorussian OR belorussia OR bosnia OR herzegovina OR hercegovina OR brasil OR 'comoro islands' OR comores OR mayotte OR zaire OR 'ivory coast' OR 'slovak republic' OR 'french somaliland' OR 'east timur' OR 'timor leste' OR 'united arab republic' OR 'gabonese republic' OR gaza OR 'georgia republic' OR 'georgian republic' OR 'gold coast' OR guiana OR maldives OR 'isle of man' OR kazakh OR kiribati OR kirghizia OR 'kyrgyz republic' OR kirghiz OR kirgizstan OR basutoland OR 'malagasy republic' OR malaya OR malay OR sabah OR sarawak OR nyasaland OR 'marshall islands' OR 'agalega islands' OR moldovia OR moldovian OR ifni OR myanma OR burma OR 'northern mariana islands' OR muscat OR palestine OR philipines OR phillipines OR phillippines OR rumania OR roumania OR russian OR ruanda OR 'saint kitts' OR 'st kitts' OR nevis OR 'st lucia' OR 'st vincent' OR 'samoan islands' OR 'navigator island' OR 'navigator islands' OR 'sao tome' OR ceylon OR 'solomon islands' OR surinam OR tadzhikistan OR tadjikistan OR tadzhik OR 'togolese republic' OR turkmen OR 'soviet union' OR 'union of soviet socialist republics' OR uzbek OR 'new hebrides' OR 'viet nam' OR 'west bank' OR rhodesia OR africa OR 'africa, northern' OR 'africa south of the sahara' OR 'africa, central' OR 'africa, eastern or africa, southern' OR 'africa, western or asia' OR 'asia, central' OR 'asia, southeastern' OR 'asia, western' OR 'caribbean region' OR 'west indies' OR 'south america' OR 'latin america' OR 'central america' OR afghanistan OR albania OR algeria OR 'american samoa' OR angola OR antigua OR barbuda OR argentina OR armenia OR azerbaijan OR bahrain OR bangladesh OR barbados OR benin OR byelarus OR belize OR bhutan OR bolivia OR 'bosnia-herzegovina' OR botswana OR brazil OR bulgaria OR 'cape verde' OR 'central african republic' OR chad OR chile OR china OR colombia OR comoros OR congo OR 'costa rica' OR 'cote d ivoire' OR croatia OR cuba OR cyprus OR czechoslovakia OR 'czech republic' OR slovakia OR djibouti OR 'democratic republic of the congo' OR dominica OR 'dominican republic' OR 'east timor' OR ecuador OR egypt OR 'el salvador' OR eritrea OR estonia OR ethiopia OR fiji OR gabon OR gambia OR georgia OR ghana OR greece OR grenada OR guatemala OR guinea OR 'guinea-bissau' OR guam OR guyana OR haiti OR honduras OR hungary OR india OR indonesia OR iran OR iraq OR jamaica OR jordan OR kazakhstan OR kenya OR korea OR kosovo OR kyrgyzstan OR laos OR latvia OR lebanon OR lesotho OR liberia OR libya OR lithuania OR macedonia OR madagascar OR malaysia OR malawi OR mali OR malta OR mauritania OR mauritius OR mexico OR micronesia OR 'middle east' OR moldova OR mongolia OR morocco OR mozambique OR myanmar OR namibia OR nepal OR 'netherlands antilles' OR 'new caledonia' OR nicaragua OR niger OR nigeria OR oman OR pakistan OR palau OR panama OR 'papua new guinea' OR paraguay OR peru OR philippines OR poland OR portugal OR 'puerto rico' OR romania OR russia OR rwanda OR 'saint lucia' OR 'saint vincent' OR grenadines OR samoa OR 'saudi arabia' OR senegal OR serbia OR montenegro OR seychelles OR 'sierra leone' OR slovenia OR 'sri lanka' OR somalia OR 'south africa' OR sudan OR suriname OR swaziland OR syria OR tajikistan OR tanzania OR thailand OR togo OR tonga OR trinidad OR tobago OR tunisia OR turkey OR turkmenistan OR uganda OR ukraine OR uruguay OR ussr OR uzbekistan OR vanuatu OR venezuela OR vietnam OR yemen OR yugoslavia OR zambia OR zimbabwe OR 'burkina faso' OR 'upper volta' OR burundi OR urundi OR cambodia OR 'khmer republic' OR kampuchea OR cameroon OR cameroons OR 'cameron or' AND camerons OR 'cape verde' OR 'central african republic' OR 'pacific region' OR 'pacific island'

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Web of Science:
Date of Initial Search: Feb 6, 2020; Date of second search: Nov 30 2020
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AND

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TS=(Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response"

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Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Rhodesia OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR Navigator Island OR Navigator Islands OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe))

Global Index Medicus:
Initial Search Date: Feb 6, 2020
Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response" OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "fire fighter" OR "fire fighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies")

Supplementary Material

eTable 1. Baseline information on included articles.

Reference No	Primary Author	Citation	Country	WHO Region*	World Bank**	Location	Setting type*	Setting*	Article type	Methodology	Study year(s)	Participant numbers	Participant type
17	Adewole	Adewole OA, Fadeyibi IO, Kayode MO, Giwa SO, Shoga MO, Adejumo AO, Ademiluyi SA. Ambulance services of Lagos state, Nigeria: a six-year (2001-2006) audit. West Afr J Med. 2012;31:3–7.	Nigeria	African	Low	Lagos State	Regional	Urban	Quant	Cross sectional	2001-2006	32,774	Cases
10	Ahmed	Ahmed S, Adams AM, Islam R, Hasan SM, Panciera R. Impact of traffic variability on geographic accessibility to 24/7 emergency healthcare for the Urban poor: A GIS study in Dhaka, Bangladesh. PLoS One. 2019;14(9):e0222488.	Bangladesh	South-East Asia	Lower-middle	Dhaka	Regional	Urban	Quant	Cross sectional	2014	N/A	N/A
13	Ali	Ali M, Miyoshi C, Ushijima H. Emergency medical services in Islamabad, Pakistan: a public-private partnership. Public Health. 2006;120:50–7.	Pakistan	South-East Asia	Lower-middle	Islamabad	Regional	Urban	Quant	Mixed methods	2000-2001	N/A	N/A
4	Alibhai	Alibhai A, Hendrikse C, Bruijns SR. Poor access to acute care resources to treat major trauma in low- and middle-income settings: A self-reported survey of acute care providers. Afr J Emerg Med. 2019;9(Suppl):S38-S42.	Multinational	African	N/A	N/A	International	N/A	Quant	Descriptive Survey	2016	392	Conference delegates
5	Amparo	Amparo ACB, Jayme SI, Roces MCR, Quizon MCL, Mercado MLL, Dela Cruz MPZ, Licuan DA, Villalon EES 3rd, Baquilod MS, Hernandez LM, Taylor LH, Nel LH. The evaluation of Animal Bite Treatment Centers in the Philippines from a patient perspective. PLoS One. 2018 Jul 26;13(7):e0200873.	Philippines	Western Pacific	Lower-middle	Nueva Vizcaya, Palawan and Tarlac Districts	Regional	Both	Quant	Descriptive survey	2017	3537	Households
6	Anest	Anest T, Stewart de Ramirez S, Balhara KS, Hodkinson P, Wallis L, Hansoti B. Defining and improving the role of emergency medical services in Cape Town, South Africa. Emerg Med J. 2016;33(8):557-61.	South Africa	African	Upper-middle	Cape Town	Regional	Urban	Qual	Descriptive Interview	2013	24	Interviewed individuals
7	Anyumba	Anyumba G. Thohoyandou's central business district and the hypothetical accessibility challenges for emergency services. Jamba. 2019;11(2):681.	South Africa	African	Upper-middle	Thohoyandou	Regional	Urban	Quant	Cross sectional	2019	N/A	N/A
8	Aries	Ariës M, Joosten H, Wegdam H, van der Geest S. 2007. Fracture treatment by bonesetters in central Ghana: patients explain their choices and experiences. Tropical Medicine & InterNational Health 12(4): 564–574.	Ghana	African	Low	Brong Ahafo Region	Local	Urban	Both	Mixed methods	2005	46	Patients
9	Bachani	Bachani AM, Botchey I, Paruk F, Wako D, Saidi H, Aliwa B, et al. Nine-point plan to improve care of the injured patient: A case study from Kenya. Surgery. 2017;162(6S):S32-S44.	Kenya	African	Lower-middle	Kenya	National	N/A	Quant	Cross sectional	2011	N/A	N/A
10	Bast	Bast HE, Jenkins JL. Challenges to Prehospital Care in Honduras. Prehosp Disaster Med. 2018;33(6):637-9.	Honduras	Americas	Lower-middle	Honduras	National	N/A	Qual	Descriptive Interview	2018	N/A	N/A
11	Bhopal	Bhopal SS, Halpin SJ, Gerein N. Emergency obstetric referral in Rural Sierra Leone: what can motorbike ambulances contribute? A mixed-methods study. Matern Child Health J. 2013;17:1038–43.	Sierra Leone	African	Low	Kambia region	Regional	Rural	Both	Mixed methods	2013	N/A	N/A

Bigdeli	Bigdeli M, Khorasani-Zavareh D, Mohammadi R. Pre-hospital care time intervals among victims of road traffic injuries in Iran. A cross-sectional study. Bmc Public Health. 2010;10.	Iran	Eastern Mediterranean	Upper-middle	Urmia, Iran	Regional	Urban	Quant	Cross sectional	2005-2007	N/A	N/A
Broccoli	Broccoli MC, Calvello EJ, Skog AP, Wachira B, Wallis LA. Perceptions of emergency care in Kenyan communities lacking access to formalised emergency medical systems: a qualitative study. BMJ Open. 2015;5(11):e009208.	Kenya	African	Lower-middle	Kenya	National	N/A	Qual	Descriptive Interview	2015	528	Focus group members
Broccoli	Broccoli MC, Cunningham C, Twomey M, Wallis LA. Community-based perceptions of emergency care in Zambian communities lacking formalised emergency medicine systems. Emerg Med J. 2016;33(12):870-5.	Zambia	African	Lower-middle	Zambia	National	N/A	Qual	Descriptive Interview	2016	183	Focus group members
Burke	Burke TF, Hines R, Ahn R, Walters M, Young D, Anderson RE, et al. Emergency and urgent care capacity in a resource-limited setting: an assessment of health facilities in western Kenya. BMJ Open. 2014;4(9):e006132.	Kenya	African	Lower-middle	Western Kenya	Regional	Both	Qual	Descriptive Interview	2013-2014	60	Key informants
Chunga	Chunga R, Bruijns SR, Hendrikse C. Access to acute care resources in various income settings to treat new-onset stroke: A survey of acute care providers. Afr J Emerg Med. 2019;9(2):77-80.	Multinational	N/A	N/A	N/A	International	N/A	Qual	Descriptive Survey	2016	382	Healthcare Providers
Comery	Comery B, Perry WRG, Young S, Dare A, Matalavea B, Bissett IP, Windsor JA. Delivery of surgical care in Samoa: perspectives on capacity, barriers and opportunities by local providers. ANZ J Surg. 2020 Oct;90(10):1910-1914.	Samoa	Western Pacific	Lower-middle	Samoa	National	N/A	Qual	Descriptive Interview	2016	N/A	Key informants
Coyle	Coyle RM, Harrison HL. Emergency care capacity in Freetown, Sierra Leone: a service evaluation. BMC Emerg Med. 2015;15(1):2	Sierra Leone	African	Low	Freetown, Sierra Leone	Regional	Urban	Qual	Cross sectional	2015	N/A	N/A
De Wulf	DeWulf A, Otchi EH, Soghoian S. Identifying priorities for quality improvement at an emergency Department in Ghana. BMC Emerg Med. 2017;17(1):28.	Ghana	African	Lower-middle	Urban Ghana.	Local	Urban	Qual	Descriptive Survey	5-Jul	18	EU staff members
De Wulf	De Wulf A, Aluisio AR, Muhlfelder D, Bloem C. Emergency Care Capabilities in North East Haiti: A Cross-sectional Observational Study. Prehosp Disaster Med. 2015;30(6):553-9.	Haiti	Americas	Low	Fort Liberté District, Haiti	Regional	Rural	Qual	Cross sectional	2012	N/A	N/A
El Tayeb	El Tayeb S, Abdalla S, Van den Bergh G, Heuch I. Use of healthcare services by injured people in Khartoum State, Sudan. InterNational Health. 2015;7(3):183-9.	Sudan	Eastern Mediterranean	Lower-middle	Sudan	Regional	Urban	Qual	Descriptive Survey	2010	N/A	N/A
Elbashir	Elbashir K, Gore RJ, Abuaaraki T, Roblin P, Botha M, Yousif M, Ostrovskiys G, Bloem C, James SA. Prehospital emergency care and injury prevention in Sudan. Afr J Emerg Med. 2014;4:170–3.	Sudan	African	Low	Sudan	National	N/A	Qual	Cross sectional	2008 - 2014	N/A	N/A
Emerick	Emmerick IC, Luiza VL, Camacho LA, Ross-Degnan D. Access to medicines for acute illness in middle income countries in Central America. Rev Saude Publica. 2013;47(6):1069-79.	Multinational	Americas	N/A	Central American Countries	International	Both	Qual	Cross sectional	2013	2,761	Households
Hashtarkhani	Hashtarkhani S, Kiani B, Bergquist R, Bagheri N, VafaeiNejad R, Tara M. An age-integrated approach to improve measurement of potential spatial accessibility to emergency medical services for Urban areas. Int J Health Plann Manage. 2020;35(3):788-98.	Iran	Eastern Mediterranean	Upper-middle	Mashhad City, Iran	Regional	Urban	Quant	Cross sectional	2016	N/A	N/A

Hodkinson	Hodkinson PW, Pigoga JL, Wallis L. Emergency healthcare needs in the Lavender Hill suburb of Cape Town, South Africa: a cross-sectional, community-based household survey. BMJ Open. 2020;10(1):e033643.	South Africa	African	Upper-middle	Lavender Hill suburb of Cape Town, South Africa	Regional	Urban	Qual	Descriptive Survey	2018	2754	Interviewed individuals
Hsia	Hsia RY, Mbembati N/A, Macfarlane S, Kruk ME. Access to emergency and surgical care in sub-Saharan Africa: the infrastructure gap. Health Policy Plan. 2012;27(3):234-44.	Multinational	African	N/A	Ghana, Kenya, Rwanda, Tanzania, Uganda	International	N/A	Quant	Cross sectional	2012	N/A	N/A
Jacobs	Jacobs B, Men C, Sam OS, Postma S. Ambulance services as part of the district health system in low-income countries: a feasibility study from Cambodia. InterNational Journal of Health Planning and Management. 2016;31(4):414-29.	Cambodia	South-East Asia	Lower-middle	Cambodia	National	N/A	Qual	Descriptive Interview	2013	N/A	N/A
Khan	Khan AN, Rubin DH. 2003. InterNational pediatric emergency care: establishment of a new specialty in a developing country. Pediatric Emergency Care 19(3): 0181	Kosove	European Region	Upper-middle	Pristina University Hospital	Local	Urban	Quant	Cross sectional	2002	N/A	N/A
Khan	Khan A, Zafar H, Naeem SN, Raza SA. Transfer delay and in-hospital mortality of trauma patients in Pakistan. Int J Surg. 2010;8:155–8.	Pakistan	South-East Asia	Lower-middle	Aga Khan University Hospital, Karachi	Local	Urban	Quant	Cross sectional	1998-2005	N/A	N/A
Kirsch	Kirsch T, Hilwig W, Holder Y, Smith G, Pooran S, Edwards R. 1995. Epidemiology and practice of emergency medicine in a developing country. Annals of Emergency Medicine 26(3): 361–367.	Trinidad and Tobago	Americas	Lower-middle	Port of Spain,	Local	Urban	Qual	Descriptive Interview	N/A	N/A	N/A
Kumar	Kumar S, Chaudhary S, Kumar A, Agarwal AK, Misra MC. Trauma care - a participant observer study of trauma centers at Delhi, Lucknow and Mumbai. Indian J Surg. 2009;71:133–41.	India	South-East Asia	Lower-middle	Delhi, Lucknow, Mumbai	Regional	Urban	Quant	Cross sectional	2009	N/A	N/A
Levine	Levine AC, Presser DZ, Rosborough S, Ghebreyesus TA, Davis MA. Understanding barriers to emergency care in low-income countries: view from the front line. Prehosp Disaster Med. 2007;22(5):467-70.	Ethiopia	African	Low	Tigray	Regional	Rural	Qual	Descriptive Survey	2006	N/A	N/A
Luo	Luo W, Yao J, Mitchell R, Zhang X. Spatiotemporal access to emergency medical services in Wuhan, China: accounting for scene and transport time intervals. Int J Health Geogr. 2020;19(1):52	China	Western Pacific	Upper-middle	Wuhan	Regional	Urban	Quant	Cross sectional	2020	N/A	N/A
Macharia	Macharia WM, Njeru EK, Muli-Musiime F, Nantulya V. Severe road traffic injuries in Kenya, quality of care and access. Afr Health Sci. 2009;9(2):118-24.	Kenya	African Region	Lower-middle	Kenya	National	N/A	Qual	Cross sectional	1997-1998	N/A	N/A
Mahmood	Mahmood KT, Amin F, Ayub H, Yaqoob M, Zaka M. Management of the patient from the site of accident to the hospital/ pre-hospital care. J Pharm Sci Res. 2010;2:804–8.	Pakistan	South-East Asia	Lower-middle	Pakistan	National	N/A	Qual	Cross sectional	2010	N/A	N/A
Mathew	Mathew A, Abdullakutty J, Sebastian P, Viswanathan S, Mathew C, Nair V, et al. Population access to reperfusion services for ST-segment elevation myocardial infarction in Kerala, India. Indian Heart J. 2017;69 Suppl 1(Suppl 1):S51-S6.	India	South-East Asia	Lower-middle	Kerala	Regional	Urban	Quant	Cross sectional	2017	N/A	N/A

Mock	Mock C, nii-Amon-Kotei D, Maier R. 1997. Low utilization of formal medical services by injured persons in a developing nation: health service data underestimate the importance of trauma. The Journal of Trauma: Injury, Infection, nd Critical Care 42(3): 504–513.	Ghana	African	Lower-middle	Ghana	National	N/A	Qua	Descriptive Interview	1995	21105	Interviewed individuals
Mock	Mock C, Ofosu A, Gish O. 2001. Utilization of district health services by injured persons in a Rural area of Ghana. The InterNational Journal of Health Planning and Management 16: 19–32.	Ghana	African	Lower-middle	Ghana	National	N/A	Qua	Descriptive Interview	1995	9442	interviewed individuals
Mock	Mock C, Nguyen S, Quansah R, Arreola-Risa C, Viradia R, Joshipura M. 2006. Evaluation of trauma care capabilities in four countries using the WHO-IATSIC Guidelines for essential trauma care. World Journal of Surgery 30: 946–956.	Multinational	N/A	N/A	Mexico, Vietnam, India, Ghana	International	N/A		Descriptive Interview	2006	N/A	N/A
Mohan	Mohan B, Bansal R, Dogra N, Sharma S, Chopra A, Varma S, et al. Factors influencing prehospital delay in patients presenting with ST-elevation myocardial infarction and the impact of prehospital electrocardiogram. Indian Heart J. 2018;70 Suppl 3(Suppl 3):S194-S8.	India	South-East Asia	Lower-middle	Punjab	Regional	Urban	nt	Cross sectional	2015	619	Patients
Mould-Millman	Mould-Millman NK, Oteng R, Zakariah A, Osei-Ampofo M, Oduro G, Barsan W, et al. Assessment of Emergency Medical Services in the Ashanti Region of Ghana. Ghana Med J. 2015;49(3):125-35.	Ghana	African	Lower-middle	Ashanti Region	Regional	Urban		Cross sectional	2012	N/A	N/A
Mould-Millman	Mould-Millman NK, Rominski SD, Bogus J, Ginde AA, Zakariah AN, Boatemaah CA, et al. Barriers to Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana. Glob Health Sci Pract. 2015;3(4):577-90.	Ghana	African	Lower-middle	Accra	Regional	N/A	Qua	Cross sectional	2013	468	Survey participants
Mould-Millman	Mould-Millman NK, Dixon JM, Sefa N, Yancey A, Hollong BG, Hagahmed M, et al. The State of Emergency Medical Services (EMS) Systems in Africa. Prehospital and Disaster Medicine. 2017;32(3):273-83	Multinational	African	N/A	N/A	International	N/A	Qua	Cross sectional	2013-2014	N/A	N/A
Nagata	Nagata T, Takamori A, Kimura Y, Kimura A, Hashizume M, Nakahara S. Trauma center accessibility for road traffic injuries in Hanoi, Vietnam. J Trauma Manag Outcomes. 2011;5:11.	Vietnam	South-East Asia	Lower-middle	Hanoi	Regional	Urban	nt	Cross sectional	2006	N/A	N/A
Natuzzi	Natuzzi ES, Kushner A, Jagilly R, Pickacha D, Agiomea K, Hou L, Houasia P, Hendricks PL, Ba'erodo D. Surgical care in the Solomon Islands: a road map for universal surgical care delivery. World J Surg. 2011 Jun;35(6):1183-93.	Soloman Islands	Western Pacific	Lower-middle	Outer Islands	Regional	Rural	nt	Cross sectional	2009-2010	9	Health facilities
Nielsen	Nielsen K, Mock C, Joshipura M, Rubiano AM, Zakariah A, Rivara F. Assessment of the status of prehospital care in 13 low- and middle-income countries. Prehosp Emerg Care. 2012;16:381–9.	Multinational	N/A	N/A	13 LMICs in Africa, Asia, and Latin America	International	N/A	Qua	Descriptive Survey	2009–2010	N/A	N/A
Ntabaye	Ntabaye MK, Scheutz F, Poulsen S. 1998. Household survey of access to and utilization of emergency oral health care services in Rural Tanzania. East African Medical Journal 75(11): 649–653.	Tanzania	African	Lower-middle	Rungwe district, Mbeya region	Regional	Rural	Qua	Descriptive Survey	1998	1,106	Households

Ouma	Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, et al. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018;6(3):e342-e50.	MutiNational	African	N/A	N/A	International	N/A	Quant	Cross sectional	2018	N/A	N/A
Phillips	Phillips G, Creaton A, Airdhill-Enosa P, Toito'ona P, Kafoa B, O'Reilly G, Cameron P. Emergency care status, priorities and standards for the Pacific region: A multiphase survey and consensus process across 17 different Pacific Island Countries and Territories. Lancet Reg Health West Pac. 2020 Aug;1:100002.	Multinational	Western Pacific	N/A	17 regional countries	International	N/A	Both	Descriptive interviews & surveys	2018-2019	17	Key informants
Pigoga	Pigoga JL, Joiner AP, Chowa P, Luong J, Mhlanga M, Reynolds TA, et al. Evaluating capacity at three government referral hospital emergency units in the kingdom of Eswatini using the WHO Hospital Emergency Unit Assessment Tool. BMC Emerg Med. 2020;20(1):33.	Eswantini	African	Lower-middle	Eswantini	National	N/A	Quant	Cross sectional	2018	11`	Key informants
Radjou	Radjou AN, Mahajan P, Baliga DK. Where do I go? A trauma victim's plea in an informal trauma system. J Emerg Trauma Shock. 2013;6:164–70.	India	South-East Asia	Lower-middle	Puducherry territory	Regional	Urban	Quant	Cross sectional	2009-2010	N/A	N/A
Razzak	Razzak J, Cone D, Rehmani R. 2001. Emergency medical services and cultural determinants of an emergency in Karachi, Pakistan. Prehospital Emergency Care 5(3): 312–316.	Pakistan	South-East Asia	Lower-middle	Karachi	Regional	Urban	Quant	Descriptive Interview	2001	N/A	N/A
Ro	Ro YS, Shin SD, Jeong J, Kim MJ, Jung YH, Kamgno J, et al. Evaluation of demands, usage and unmet needs for emergency care in Yaounde, Cameroon: a cross-sectional study. Bmj Open. 2017;7(2).	Cameroon	African	Lower-middle	Yaoundé	Regional	Urban	Quant	Cross sectional	2017	658	Households
Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Addressing geographic access barriers to emergency care services: a National ecologic study of hospitals in Brazil. Int J Equity Health. 2017;16(1):149.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Cross sectional	2017	N/A	N/A
Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Access to emergency care services: a transversal ecological study about Brazilian emergency health care network. Public Health. 2017;153:9-15.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Cross sectional	2017	N/A	N/A
Roy	Roy N, Murlidhar V, Chowdhury R, Patil SB, Supe PA, Vaishnav PD, Vatkar A. Where there are no emergency medical services-prehospital care for the injured in Mumbai, India. Prehospital Disaster Med. 2010;25:145–51.	India	South-East Asia	Lower-middle	Mumbai	Local	Urban	Quant	Cross sectional	2005	170	Patients
Scolari	Scolari GAS, Rissardo LK, Baldissera VDA, Carreira L. Emergency care units and dimensions of accessibility to health care for the elderly. Rev Bras Enferm. 2018;71 Suppl†2:811-7.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Descriptive Survey	2018	N/A	N/A
Sheikhbardsiri	Sheikhbardsiri H, Esamaeili Abdar Z, Sheikhasadi H, Ayoubi Mahani S, and Sarani A. Observance of patients' rights in emergency department of educational hospitals in south-east Iran. International Journal of Human Rights in Healthcare. 2020; 13 (5):435-444.	Iran	Eastern Mediterranean	Upper-middle	Kerman	Regional	Urban	Quant	Descriptive survey	2018	382	Patients

Siddiqui	Siddiqui M, Siddiqui SR, Zafar A, Khan FS. Factors delaying hospital arrival of patients with acute stroke. J Pak Med Assoc. 2008;58:178–82.	Pakistan	South-East Asia	Lower-middle	Karachi	Local	Urban	Quant	Cross sectional	2006-2007	165	Patients
Sodemann	Sodemann M, Biai S, Jakobsen MS, Aaby P. Knowing a medical doctor is associated with reduced mortality among sick children consulting a paediatric ward in Guinea-Bissau, West Africa. Trop Med Int Health. 2006;11(12):1868-77.	Guinea-Bissau	African	Low	Guinea-Bissau	Local	Urban	Quant	Descriptive Interview	2001	1572	Patients
Sohayla	Sohayla M. Attalla, Feona AK Tema. Awareness and Accessibility of the Immigrants to the Healthcare Services in Shah Alam, Malaysia; A Pilot Study. European Journal of Molecular & Clinical Medicine, 7, 3, 2020, 5396-5404.	Malaysia	Western Pacific	Upper-middle	Shah Alam	Local	Urban	Quant	Descriptive survey	2020	300	Survey participants
Stein	Stein C, Mould-Millman NK, De Vries S, Wallis L. Access to out-of-hospital emergency care in Africa: Consensus conference recommendations. Afr J Emerg Med. 2016;6(3):158-61.	MutiNational	African	N/A	N/A	N/A	N/A	Quant	Cross sectional	2015	N/A	N/A
Sultan	Sultan M, Abebe Y, Tsadik AW, Ababa A, Yesus AG, Mould-Millman NK. Trends and barriers of emergency medical service use in Addis Ababa; Ethiopia. BMC Emerg Med. 2019;19(1):28.	Ethiopia	African	Low	Ethiopia	National	N/A	Quant	Cross sectional	2017	429	survey participants
Suriyawongpaisal	Suriyawongpaisal P, Atiksawedparit P, Srithamrongsawad S, Thongtan T. Closing the Equity Gap of Access to Emergency Departments of Private Hospitals in Thailand. Emerg Med Int. 2018;2018:6470319.	Thailand	South-East Asia	Upper-middle	Thailand	National	N/A	Quant	Cross sectional	2017	20,206	patients
Suriyawongpaisal	Suriyawongpaisal P, Aekplakorn W, Srithamrongsawat S, Srithongchai C, Prasitsiriphon O, Tansirisithikul R. Copayment and recommended strategies to mitigate its impacts on access to emergency medical services under universal health coverage: a case study from Thailand. BMC Health Serv Res. 2016;16(1):606.	Thailand	South-East Asia	Upper-middle	Thailand	National	N/A	Quant	Mixed methods	2012	N/A	N/A
Tansley	Tansley G, Schuurman N, Amram O, Yanchar N. Spatial Access to Emergency Services in Low- and Middle-Income Countries: A GIS-Based Analysis. PLoS One. 2015;10(11):e0141113.	Multinational	N/A	N/A	N/A	International	N/A	Quant	Cross sectional	2015	N/A	N/A
Tansley	Tansley G, Stewart B, Zakariah A, Boateng E, Achena C, Lewis D, et al. Population-level spatial access to prehospital care by the national ambulance service in Ghana. Prehosp Emerg Care. 2016;20(6):768-75.	Ghana	African	Lower-middle	Ghana	National	N/A	Quant	Cross sectional	2016	N/A	N/A
Thomson	Thomson N. Emergency medical services in Zimbabwe. Resuscitation. 2005;65(1):15-9.	Zimbabwe	African	Lower-middle	Zimbabwe	National	N/A	Quant	Cross sectional	2005	N/A	N/A
Treleaven	Treleaven E, Pham TN, Le DN, Brooks TN, Le HT, Partridge JC. Referral patterns, delays, and equity in access to advanced paediatric emergency care in Vietnam. Int J Equity Health. 2017;16(1):215.	Vietnam	Western Pacific	Lower-middle	Hanoi	Local	Urban	Quant	Cross sectional	2013	557	Patients
Vanderschuren	Vanderschuren M, McKune D. Emergency care facility access in Rural areas within the golden hour?: Western Cape case study. Int J Health Geogr. 2015;14:5.	South Africa	African	Upper-middle	South Africa	Regional	Rural	Quant	Cross sectional	2015	N/A	N/A
Wen	Wen LS, Char D. Existing infrastructure for the delivery of emergency care in post-conflict Rwanda: an initial descriptive study. Acad Emerg Med. 2011;18:S243.	Rwanda	African	Low	Kigali	Regional	Urban	Quant	Mixed methods	2007	60	Health care workers

Wesson	Wesson HK, Stevens KA, Bachani AM, Mogere S, Akungah D, Nyamari J, Masasabi Wekesa J, Hyder AA. Trauma systems in Kenya: a qualitative analysis at the district level. Qual Health Res. 2015 May;25(5):589-99.	Kenya	African	Lower-middle	Kenya	Regional	Urban	Qual	Descriptive Interview	2011	N/A	N/A
WHO/ UNICEF	WHO/UNICEF. Water, Sanitation and Hygiene in Health Care Facilities: Status in Low and Middle Income Countries and Way Forward. Geneva, Switzerland: World Health Organization, 2015.	Multinational	N/A	Lower and middle	54 countries	International	NA	Quant	Cross-sectional	1998-2014	90	Heath care facilities
Zaidi	Zaidi SM, Labrique AB, Khowaja S, Lotia-Farrukh I, Irani J, Salahuddin N, et al. Geographic variation in access to dog-bite care in Pakistan and risk of dog-bite exposure in Karachi: prospective surveillance using a low-cost mobile phone system. PLoS Negl Trop Dis. 2013;7(12):e2574.	Pakistan	Eastern Mediterranean	Lower-middle	Karachi	Regional	Urban	Quant	Cross sectional	2009-2011	N/A	N/A
Zimmerman	Zimmerman A, Fox S, Griffin R, Nelp T, Thomaz E, Mvungi M, et al. An analysis of emergency care delays experienced by traumatic brain injury patients presenting to a regional referral hospital in a low-income country. PLoS One. 2020;15(10):e0240528.	Tanzania	African	Low	Tanzania	Regional	Urban	Quant	Cross sectional	2013-2017	3209	Patients

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eTable 2. Individual access measures and outcomes by article.

Reference No.	Author (year)	Measures	Outcomes
1	Adewole (2012)	1. Geographic barriers	1. Rural population has less access, traffic impedes access
2	Ahmed (2019)	Percent of slums that have	Percent of slums that have
		1. 1 EU per 50,000 population	1. 12%
		2. 1 burn unit per 50,000 population	2. 0%
		Percent of population that lives	Percent of population that lives
		3. Within 60 minutes of EU	3. 63%
		4. Within 60 minutes of burn unit	4. 32%
3	Ali (2006)	1. Average response time to accident	1. 10 min
4	Alibhai (2019)	1. Resource issues	1. LMICs have less resources for trauma care
5	Amparo (2018)	1. Awareness of where to go for care	1. 7.4%
		2. Sought treatment for wounds	2. 44.9%
		Reasons for not seeking care	
		1. Cost	1. 22.7%
		2. Distance	2. 44.9%
		3. Sought traditional/alternative care	3. 5.6%
6	Anest (2016)	1. Training issues	1. Dispatchers lack training
		2. Staffing issues	2. Shortages of physicians and EMS providers
		3. Hospital system issues	3. Errors in triage, lack of childcare for other children in the household and restrictive hours of clinic operations, multiple transfers
		4. Pre-hospital system issues	4. Lack of transportation, Lack of telephone access and no universal emergency number.
		5. Communication issues	5. Difficulty getting through on phone lines, miscommunication regarding the acuity of the patient, misunderstanding of geography and distance
		6. Barriers to reaching care	6. Community understanding of how to navigate the health system and emergency conditions
7	Anyumba (2019)	1. Drive time from University of Venda Clinic to scene of accident	1. 5-7 minutes
		2. Drive time Tshilidzini Hospital to scene of accident	2. 8-10 minutes
		3. Drive time from Donald Frazer hospital to scene of accident	3. 30-45 minutes
8	Aries (2007)	1. Reason that patients do not seek hospital care	1. Lack of specialized fracture treatment
		2. Barrier to prehospital care	2. Lack of resuscitation equipment
		3. Cost of treatment by a bonesetter	3. Average 13 € (range 0–60 €)
		4. Cost of hospital treatment	4. 300 € (range 25–800 €).
		5. Barrier to seeking care	5. Opinion that bonesetters have more expertise.
		6. Demographics associated with seeking hospital care	6. Patients with compound fractures are more likely to be treated in hospital.
9	Bachani (2017)	1. Training issues	1. Lack of training of pre-hospital and in-hospital providers
		2. Resource issues	2. Lack of basic hospital equipment
		3. Pre-hospital system issues	3. There was no functioning emergency number or coordinated response system.
10	Bast (2018)	1. Staffing issues	1. Lack of sufficient room and staffing
		2. Geographic issues	2. Access to facilities is limited by mountainous terrain.
		3. Secondary financial strain	3. Not having adequate child care, the inability to miss work, or being too ill to walk.
		4. Pre-hospital system issues	4. Lack of a universal EMS access code.
11	Bhopal (2013)	1. Barriers to seeking care	1. Poor roads, rainy season inaccessibility, no mobile phone coverage, patient must buy petrol and pay driver, Awareness of ambulance service

	2. Pre-hospital system issues	2. Drivers willing to respond, maintenance issues
Bigdeli (2010)	1. Mean transport times from the scene to the hospital for interurban incidents compared to city areas	1. 17.1 vs. 6.3 minutes
Broccoli (2015)	1. Characteristics that made it easier for patients to access care	1. When patients were dressed well, had a good attitude, showed patience, had personal financial resources or insurance or personally knew a healthcare provider
	2. Barrier to care	2. Many providers were unfriendly towards patients or unmotivated to provide care. Participants were also concerned about corruption.
	3. Training issues	3. Healthcare providers lack training in the basics of emergency care.
	4. Transportation issues	4. Difficulty obtaining transportation, long distances required for travel.
	5. Health system issues	5. Lack of emergency care after business hours, required paperwork before emergency care is provided and poor medical records systems, lack of triage
	6. Financial issues	6. High cost of treatment.
	7. Pre-hospital system issues	7. Officers take patients to the police station before taking them to the hospital, creating delays.
	8. Communication issues	8. Unavailable emergency phone lines
	9. Staffing issues	9. Lack of healthcare provider
	10. Resource issues	10. Lack of resources and critical medications at facilities
Broccoli (2016)	1. Barrier to care	1. Lack of accessible healthcare facilities
	2. Communication issues	2. No functional emergency phone number
	3. Resource issues	3. Lack of necessary equipment
	4. Health system issues	4. No standard national protocols for mass casualty incidents, no triage
	5. Staffing issues	5. Staff shortages
	6. Training issues	6. Lack of specific training in emergency care
	7. Barrier to reaching care	7. The distance to travel to reach a facility
	8. Transportation issues	8. The time it takes for transportation to arrive, lack of fuel for vehicles and poor road conditions
	9. Financial barriers	9. Money was a barrier when trying to obtain transportation
	10. Systems issues that generate delays	10. Certain patients are required to be seen at the police station prior to receiving healthcare, which creates delays. Transferring patients to a higher-level facility with no care or stabilisation at the lower-level facility or during transport. Patients and families are responsible for arranging their transportation to the higher-level facility.
	11. Barriers to seeking care	11. Lack of community knowledge about medical emergencies and emergency care. Participants felt that facility staff had bad attitudes, and thought they should be quicker to provide emergency care.
Burke (2014)	Percent of Level 2 and 3 Trauma facilities that:	Percent of Level 2 and 3 Trauma facilities that:
	1. had a specific approach to a trauma patient	1. 0%
	2. refer trauma immediately	2. 87%
	3. provide first aid and then refer trauma patients	3. 13%
	4. are poorly equipped to handle broken bones	4. 70%
	5. had suture and wound care supplies	5. 87%
	6. had gloves	6. 90%
	7. had oxygen	7. 23%
	8. had splinting/casting supplies	8. 10%
	9. had blood for transfusion	9. 0%
	10. refer patients with a possible heart attack	10. 100%
	11. refer patients with a possible heart attack immediately	11. 60%
	12. treat symptoms and then refer patients with a possible heart attack	12. 27%
	13. check vitals and then refer patients with a possible heart attack	13. 13%
	14. had sublingual nitroglycerine	14. 3%

15. are ill prepared to handle possible diabetic ketoacidosis (DKA) and must refer all cases	15. 93%
16. had a glucometer	16. 20%
17. had insulin	17. 17%
18. refer cases of potential sepsis immediately	18. 50%
19. provide treatment for cases of potential sepsis without referral	19. 37%
20. did not know an approach to sepsis	20. 13%
21. had antibiotics	21. 80%
22. had an organised approach to trauma	22. 30%
23. are notified in advance of patients arriving to the hospital	23. 13%
Percent of Level 4 and 5 facilities that:	Percent of Level 4 and 5 facilities that:
24. had gloves	24. 97%
25. had suture and wound care materials	25. 93%
26. had oxygen	26. 83%
27. did not have access to a trained provider who can administer general or Regional anaesthesia	27. 57%
28. had morphine	28. 50%
29. had a functioning ECG machine	29. 20%
30. had nitroglycerine	30. 20%
31. had a defibrillator	31. 13%
32. are well prepared to manage DKA	32. 33%
33. had a glucometer	33. 93%
34. had insulin	34. 80%
35. provided some treatment for sepsis	35. 97%
36. had standardised clinical care guidelines	36. 0%
37. do not have a standardised approach to trauma	37. 70%
38. had nitroglycerine and a functioning ECG machine	38. 20%
39. had a defibrillator	39. 13%
Number of Level 5 facilities that:	Percent of Level 5 facilities that had:
40. had chest tubes and X-ray capability	40. 100%
41. had splinting and casting supplies	41. 80%
42. had blood available for transfusion	42. 100%
43. gave oxygen to patients with suspected AMI	43. 100%
44. gave aspirin to patients with suspected AMI	44. 60%
45. gave morphine to patients with suspected AMI	45. 40%
46. gave epinephrine to patients with suspected AMI	46. 20%
47. had vasopressor agents	47. 100%
48. had antibiotics	48. 100%
Number of Level 4 facilities that:	Percent of Level 4 facilities that had:
49. had chest tubes	49. 12%
50. had X-ray capability	50. 48%
51. had blood available for transfusion	51. 64%
52. refer someone presenting with a possible acute myocardial infarction immediately	52. 80%
53. stabilize and then refer someone presenting with a possible acute myocardial infarction	53. 44%
54. provides diagnostic and treatment services without referral to someone presenting with a possible AMI	54. 30%
55. had vasopressor agents	55. 44%
56. had antibiotics	56. 92%

Chunga (2019)	Percent of respondents that reported	Percent of respondents that reported
	1. Access to a pre- hospital service in HIC	1. 4%
	2. Access to a pre- hospital service in LMIC	2. 21%
	3. Access to a national emergency number in HIC	3. 4%
	4. Access to a national emergency number in LMIC	4. 21%
Comery (2020)	1. Lackof symptom awareness	1. Qual
	2. Cost of transport to EC	2. Qual
	3. EC Facility access to radiology	3. Qual
	4. EC facility access to laboratory	4. Qual
	5. Cost of EC	5. Qual
	6. Cost of Medications	6. Qual
	7. Lack of staff	7. Qual
Coyle (2015)	Percent of hospitals with	Percent of hospitals with
	1. adult triage training	1. 43%
	2. pediatric triage training	2. 57%
	3. formal training in adult critical care	3. 86%
	4. in-house acute care courses for continuing education	4. 14%
	5. a dedicated EC nurse	5. 71%
	6. out-of-hours clinician cover	6. 71%
	7. intravenous (IV) gentamicin	7. 100%
	8. IV penicillin and quinine	8. 86%
	9. Oral rehydration solution and IV fluids	9. 100%
	10. insulin	10. 29%
	11. equipment required to carry out IV procedures	11. 100%
	12. oxygen concentrators or cylinders available in the EC	12. 43%
	13. with light unsuitable for clinical examination	13. 57%
	14. a system in place to identify ward patients whose clinical condition was deteriorating	14. 29%
	15. guidelines for paediatric critical care	15. 71%
	16. guidelines for adult critical care	16. 57%
	17. Emergency care guidelines for children	17. 57%
	18. Emergency care guidelines for adults	18. 43%
	19. Paediatric triage guidelines	19. 43%
	20. adult triage guidelines	20. 29%
	21. guidelines for oxygen therapy	21. 29%
	22. facilities to check haemoglobin and blood glucose	22. 100%
	23. ability to measure renal function	23. 71%
	24. radiography	24. 57%
	25. had a system in place for delaying regis-tration and payment until after the receipt of emergency treatment for critically unwell adults	25. 29%
	26. had a system in place for delaying registration and payment until after the receipt of emergency treatment for critically unwell children	26. 43%
	Percent of public facilities with	Percent of public facilities with
	27. adult triage training	27. 0
	28. pediatric triage training	28. 2
	Percent of private facilities with	Percent of private facilities with
	29. resuscitation facilities for adults	29. 100%
	30. all of the six infrastructure indicators	30. 100%

	31. all 23 indicator drugs and all 34 equipment indicators	31. 100%
	For public facilities, average number of	For public facilities, average number of
	32. infrastructure indicators	32. 1
	33. drug indicators	33. 16/21
	34. equipment indicators	34. 21/34
	Percent of district hospital with	Percent of district hospital with
	35. access to x-ray facilities	35. 0
	36. emergency blood transfusion	36. 0
De Wulf (2017)	1. Financial barriers	1. The inability to pay for transportation or medications, laboratory investigations, and radiography
	2. Health system issues	2. Limited bed capacity
De Wulf (2015)	Percent of hospitals with	Percent of hospitals with
	1. emergency care area beds	1. 67%
	2. Supervisory level physicians consistently available during the entire 24 hours	2. 67%
	3. with potable water	3. 0%
	4. a list of emergency equipment	4. 67%
	5. emergency equipment was available intermittently	5. 100%
	6. no formal training of staff for the use of this equipment	6. 100%
	7. surgical services and dental care	7. 67%
	8. critical care or ophthalmological services	8. 0%
	9. a protocol for the transfer of patients requiring a higher level of care	9. 33%
	Percent of clinics with	Percent of clinics with
	10. electricity	10. 20%
	11. a list of emergency equipment	11. 0%
	12. basic equipment to manage obstetrical emergencies or imminent deliveries	12. 0%
	13. pulse oximetry and glucometers	13. 20%
	14. stethoscopes	14. 60%
	15. HIV care	15. 0%
	16. cholera and tuberculosis care	16. 60%
	17. a protocol for the transfer of patients requiring a higher level of care	17. 80%
	Percent of health facilities with	Percent of health facilities with
	18. respiratory isolation area	18. 0%
	19. maintenance of records for patients seen in the acute care setting	19. 100%
	20. existence of an additional staffing resource list to be used in event of disaster or emergency situations	20. 13%
	21. access to an ambulance for interfacility transport	21. 13%
	22. use of a protocol or phones for the transfer of patient	22. 0%
	23. Resource issues	23. Hospitals had increased access to equipment, materials, and medications compared to community clinics. No computed tomography existed in the region.
	24. Geographic barriers	24. Some of the health centers required multiple modes of transportation, not being passable consistently by 4-wheeled vehicles.
	25. Referral issues	25. Patients were referred to the closest hospital, regardless of whether that facility had the capability to handle the case.
El Tayeb (2015)	1. Demographics likely to use formal services	1. Males were almost twice as likely as females
	2. Financial barriers	2. Affordability of the formal health service
	3. Geographic barriers	3. Distance

Elbashir (2014)	1. Training issues	1. No standardized training for EMS providers, dispatchers, or ambulance crew.
	2. Average emergency response time	2. 45 minutes
	3. Geographic barriers	3. Few citizens reside where services exist
	4. Pre-hospital issues	4. Single emergency response number is not well publicized
	5. Financial barriers	5. ambulances are paid either by cash on a fee for service basis or via an insurance option
Emerick (2013)	1. Percent of individuals who perceived their condition as severe and sought health care in the formal system	1. 57.4%
	2. Percent of individuals who perceived their condition as non-severe and sought health care in the formal system	2. 36.2%
	3. Demographics associated with increased seeking of formal health care	3. Geographic location less than 30 minutes from a health facility, household head having a secondary school education, patient age under 15, and having health insurance
	4. Percent of individuals who received medicines free of charge	4. 26.1% in Guatemala, 29.1% in Honduras, and 34.2% in Nicaragua
	5. Financial barriers	5. "Do not have money" was the most frequent reason for not seeking care in Nicaragua and Honduras
Hashtarkhani (2020)	1. Calculated accessibility by 2SFCA method	1. Peripheral areas in Mashhad city have low access to EMS. Actual accessibility in the city center is low compared with potential accessibility.
Hodkinson (2020)	1. Barriers to seeking care	1. Concerns over personal safety
	2. Percent of people reporting wait times at facilities as a barrier to seeking care	2. 23.1%
	3. Percent of people reporting financial barriers	3. 5.1%
	4. Pre-hospital issues	4. EMS delays
Hsia (2012)	Percent of hospitals	Percent of hospitals
	1. not equipped with basic building resources	1. 78% in Tanzania
	2. had equipment and staff who could competently utilize the equipment at their facility	2. 41% in Tanzania to 61% in Kenya
	3. had adequate monitoring of medication inventory	3. 14% in health centres and 18% in hospitals in Tanzania
	4. with adequate infection control materials	4. 0% in Tanzania
	5. with capacity to provide 24-hour emergency care	5. Fewer than half
	6. with basic infrastructure components such as water and electricity	6. less than 65%
	Percent of clinics	Percent of clinics
	7. with basic infrastructure	7. 7% to 35% of facilities.
Jacobs (2016)	Fee associated with	Fee associated with
	1. hospital ambulance	1. KHR25 000 ($6.25)
	2. Ambulance referrals to the provincial hospital	2. KHR45 000 ($11.3)
	3. transport by tuk-tuk	3. KHR30 000 ($7.5)
	4. overall fee associated with transport	4. KHR137 697 ($34.4)
	5. Pre-hospital system issues	5. General population did not have the contact number of the ambulance services.
	6. Percent of people transported to health facility using their own means of transport	6. 32%
	7. Percent of individuals who report the health system was too far	7. 9%
	8. Training issues	8. Few health district staff received training in emergency medicine
	9. Percent of health centre staff members who were insufficiently qualified to successfully deal with the condition	9. 59%
Khan (2003)	1. Training issues	1. Neither the ambulance driver nor the nurse has any formal training or certification in advanced life support.
	2. Equipment issues	2. Ambulances lack advanced cardiac life support equipment

		3. Health system issues	3. There is no physical location for advanced pediatric care or pediatric resuscitation.
		4. Pre-hospital issues	4. An organized emergency medical response system does not exist, no emergency number
29	Khan (2010)	1. Mean time from occurrence of injury to arrival in the ER	1. 4.7 h
		2. Range of time from occurrence of injury to arrival in the ER	2. Range 0.8–48 h
		3. Patients who arrived in the ER after 1 hour of injury	3. 675 (69%)
		4. Patients who reached the ER within 1 hour of injury	4. 303 (30.9%)
30	Kirsch (1995)	Percent of physicians who	Percent of physicians who
		1. had taken an Advanced Trauma Life Support course	1. 30%
		2. had taken an Advanced Cardiac Life Support course or Advanced Pediatric Life Support training	2. 0%
		Percent of physicians how believed they could adequately perform	Percent of physicians who believed they could perform
		3. intubation	3. 18%
		4. tube thoracostomy	4. 15%
		5. venous cutdown	5. 15%
		6. tracheostomy	6. 5%
		7. Staffing issues	7. Nursing shortages reported in emergency departments. Trained staff were not available during many nights or weekends. IV line supplies, backboards, or cervical collars are not carried in ambulances.
		8. Resource issues	8. Specialized blood tests are not easily obtained. Limited supplies of banked blood. Limited availability of CT, ultrasound, and MRI.
		9. Health system issues	9. Lengthy delays in response from consulting specialities. Legal restrictions prevent ambulance drivers from starting IV lines or giving medication.
		10. Communication issues.	10. The EDs do not have radios.
31	Kumar (2009)		
32		1. Pre-hospital system issues	1. Trained personnel as first responders were unavailable and pre-hospital care was lacking
32	Levine (2007)	1. Percent of patients that have access to motorized transport	1. 20%
		Percent of providers that	
		2. reported that their patients had to travel more than 10 km for surgical or obstetric services	2. 62.5%
		3. had access to blood smears for malaria	3. Less than half
		4. lacked access to any laboratory diagnostic equipment	4. 44%
		5. could offer blood transfusions	5. 0%
		6. felt comfortable diagnosing the 7 emergency conditions assessed	6. 63%
		7. felt comfortable diagnosing femur fracture or pneumonia	7. 56%
		8. felt comfortable diagnosing obstructed labor	8. 75%
		9. felt comfortable treating the 7 emergency conditions assessed	9. 19%
		10. felt comfortable treating obstructed labor	10. 0%
		11. felt comfortable treating gastroenteritis	11. 64%
33	Luo (2020)		
		1. Standardized E-2SFCA access scores	1. 75% of shequs having a value lower than 0.4 for single trip and 0.8 for the total trip.
		2. Percent of shequs can be reached by an ambulance from the nearest EMS stations within 10 min	2. Over 50% and again a patient can be transported from his/ her shequ to the nearest hospital within 9 min.
34	Macharia (2009)	1. Health facilities demanded cash deposits or letters of guarantee of payment before providing treatment to road traffic injury patients	1. 14.6%
		2. Cost of deposit before treatment	2. US $6.7-667

	3. Percent of health facilities that rated themselves as being well prepared to handle road traffic crash emergencies	3. 40.8%
	Percent of respondents that	Percent of respondents that
	4. owed the hospitals more than of US $ 133.	4. 22.3%
	5. were in a position to pay the bills	5. 19.7%
	6. would approach relatives and friends for financial assistance	6. 58.7%
	7. were transported to hospital by unknown persons	7. 19.7%
	8. were transported to hospital by persons who were previously known to them	8. 76.5%
	9. received any form of first aid at the crash site	9. 16.0%
	10. received first aid from members of the public, other motorists or the less injured casualties	10. 74.0%
Mahmood (2010)	Percent of cases in which the ambulance response time was	Percent of cases in which the ambulance response time was
	1. less than 10 minutes	1. 60%
	2. 15-20 minutes	2. 30%
	3. 30-45 minutes	3. 10%
	Percent of cases in which the time from the site to the hospital was	Percent of cases in which the time from the site to the hospital was
	4. 5 minutes	4. 32%
	5. 10-15 minutes	5. 48%
	6. 20-30 minutes	6. 20%
Mathew (2017)	Percent of districts that	Percent of districts that
	1. had more than 80% of the population residing within half-an-hour travel distance of a PCI-capable hospital	1. 36%
	2. had more than 90% population having timely (within 1h) access to some mode of reperfusion therapy for STEMI, either thrombolysis and/or primary PCI	2. 57%
	Percent of the population	Percent of the population
	3. residing within half-an-hour travel distance from a PCI-capable hospital	3. 69.84%
	4. had access to a thrombolysis-capable hospital within 1h travel time	4. 21.87%
	5. would have had to travel more than an hour to access a reperfusion-capable hospital	5. 8.28%
Mock (1997)	Percent of respondents reporting	Percent of respondents reporting
	1. distance to treatment is too far	1. 8%
	2. preferences for other treatments	2. 37%
	3. Types of injuries more likely to receive formal medical care	3. Head or torso injuries, transportation related injuries and assaults
	4. Use of formal medical services for persons aged less than 20 years	4. 54%
	5. Use of formal medical services for persons aged more than 20 years	5. 61%
Mock (2001)	Percent of survey respondents reporting barriers to care:	Percent of survey respondents reporting barriers to care:
	1. preference for other treatments	1. 20%
	2. financial	2. 53%
	3. health care utilization when health care was available in the user's town	3. 59%
	4. health care utilization when health care was not available in the user's town	4. 41%
Mock (2006)	1. Training issues	1. Lack of training for trauma care, including in-service training for doctors, lack of training to use equipment

	2. Staffing issues	2. Lack of surgical coverage.
	3. Resources issues	3. Resources for acute resuscitation were limited. Difficulties in the procurement process exist. Lack of laboratory tests, imaging, oxygen, fluids, chest tube equipment, pulse oximetry, ventilators, prostheses for amputees, medications.
	4. Health system issues	4. Lack of trauma registry or quality improvement programs.
Mohan (2018)	1. Demographics associated with significant pre-hospital delay	1. Elderly, rural, and illiterate populations
	2. Barriers to seeking care	2. Recognizing symptoms as cardiac in origin
	3. Percent of hospitals with ECG availability	3. 96.4%
	4. Percent of outpatient facilities with ECG availability	4. 83%
	Percent of patients	Percent of patients
	5. to whom a hospital was the nearest medical aid	5. 54.8%
	6. to whom a clinic was the nearest medical aid	6. 45.2%
	7. presented with more than 6 hours of prehospital delay	7. 42%
Mould-Millman (2015) Assessment of Emergency Medical Services in the Ashanti Region of Ghana.	Development of:	Development of:
	1. Tiers of Providers	1. Minimally developed
	2. Recruitment and Retention of providers	2. Mostly developed
	3. Continuing Education	3. Minimally developed
	4. Initial Education	4. Partially developed
	5. Team Training	5. Partially developed
	6. Equipment and Medication	6. Mostly developed
	7. Toll-free Number	7. Moderately developed
	8. Call processing and dispatch	8. Partially developed
	9. Primary Transportation and Inter-facility Transfers	9. Mostly developed
	10. Communication	10. Partially developed
	11. Community Integration	11. Minimally developed
	12. Healthcare System Integration	12. Partially developed
	13. EMS Legislature, Rules and Regulation	13. Mostly developed
	14. Sustainable Resources	14. Mostly developed
	15. Public Knowledge	15. Minimally developed
	16. Quality Assurance and	16. Minimally developed
Mould-Millman (2015) Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana.	Percent of survey respondents that:	Percent of survey respondents that believed that:
	1. believe EMTs offer high-quality care	1. 54.7%
	2. believe it is ‘‘better’’ to go by ambulance	2. 86.1%
	3. believe taxis are faster than ambulances in Accra	3. 78.0%
	4. believe government ambulances were free or affordable	4. 53.2%
	5. believe private ambulances were too expensive	5. 50.2%
	6. knew the existence of a public access medical emergency telephone number	6. 43.8%
	7. knew that the emergency number was a toll-free call	7. 37.1%
	8. would be more likely to call	8. 35.7%
	the emergency number if they knew the call was toll free	9. 45.5%
	9. knew about the government ambulance service	10. 35.3%
	10. indicated it would take a government ambulance 15 minutes or less to arrive at the location	11. 6.8%
	11. indicated it would take 60 minutes or more	
	Percent of systems that utilized:	Percent of systems that utilized:

	1. tier-one (layperson responders trained in first aid)	1. 48%
	2. tier-two (professional or medically-trained)	2. 96.0%
	3. Basic emergency medical technicians (EMTs)	3. 84%
	4. advanced providers more often	4. 60%
	5. basic providers more often	5. 84%
	6. prehospital nurses	6. 28%
	7. used only advanced providers	7. 4%
	8. EMS physicians	8. 40%
	9. quality assurance programs	9. 44%
	10. research	10. 12%
	11. Basic Life Support - capable vehicles	11. 84%
	12. Advanced Life Support -capable vehicles	12. 68%
Mould-Millman (2017)	13. vehicles posted at ambulance stations	13. 72%
	14. vehicles posted at health care facilities	14. 56%
	15. motorcycle ambulances	15. 12%
	16. fixed wing air transport	16. 32%
	17. rotary wing (helicopter) ambulances	17. 32%
	18. water-craft	18. 12%
	19. Total number of EMS systems identified	19. 25
	Percent of countries in which	
	20. EMS systems existed in Africa	20. 29.6%
	21. EMS systems existed in West Africa	21. 12.5%
	22. no EMS systems existed	22. 9.3%
	23. the questionnaire was not returned	23. 51.8%
	24. some form of regulations governing EMS or ambulance operations existed	24. 100%
	25. an established toll-free emergency telephone number existed	25. 26%
Nagata (2011)	Median direct distances between injury sites and the trauma centers were	Median direct distances between injury sites and the trauma centers were
	1. Viet Duc Hospital	1. 5.65 (3.19 - 8.64) km
	2. Bach Mai Hospital	2. 5.31 (2.89 - 8.54) km
	3. Saint Paul Hospital	3. 5.11 (3.11 - 8.72) km
Natuzzi (2011)	1. Percent facilities with running water	1. 80%
	2. Percent facilities with electricity without outages	2. 55.6%
	3. Percent of facilities with consistent oxygen source	3. 88.9%
Nielsen (2012)	1. Access to emergency care services within 1 hour	1. 100 percent in Urban Brazil, Colombia, and Maharashtra State to very low in Kenya, Pakistan, Sri Lanka, and Vietnam
	2. To whom advanced life support capabilities during transport was available	2. A significant number of persons in two of the upper middle income sites
	3. To whom basic life support capabilities during transport was available	3. More than half of people only in South Africa and Gujarat State, India.
	4. Training issues	4. Varying levels of training of providers, including no emergency medicine training
Ntabaye (1998)	1. Resource issues	1. Lack of medicines
	2. Percent of respondents who did not have the ability to pay for health services	2. 45%
	3. Financial barriers	3. Fare for transportation
	4. Demographics more likely to seek care	4. Those who had a higher number of missing teeth, were educated and aged more than 40 years
	5. Percent of respondents who indicated fear of dental treatment	5. 6.5%

Ouma (2018)	1. Percent of people living within 2-hour travel time of the nearest public hospital	1. 71%
	2. Percent of women of child bearing age living within 2-hour travel time of the nearest public hospital	2. 71·8%
	3. Percent of people living more than 2-hour travel time of the nearest public hospital	3. 29%
	4. Percent of women of child bearing age living more than 2-hour travel time of the nearest public hospital	4. 28·2%
	5. Percent of the population within 2-hour travel time of a public hospital	5. Less than 25% in South Sudan to more than 90% in Nigeria, Kenya, Cape Verde, Swaziland, South Africa, Burundi, Comoros, São Tomé and Príncipe, and Zanzibar.
	6. Countries with less than 50% of the population within 2-hour travel time of a public emergency care hospital	6. South Sudan, Mauritania, Eritrea, Niger, Sudan, Madagascar, and Chad.
	7. Countries with more than 90% of their respective population living within 2-hour travel time of a hospital	7. Nigeria, Kenya, and South Africa
	8. Number of countries with more than 80% of the population within 2-hour travel time of a hospital	8. 16
Phillips (2020)	1. Percent with EC training	1. 5.4% report none
	2. Purpose built EU with resus	2. 4.1 report none
	3. EU overcrowding	3. 17.6% report none
	4. EU specific equipment	4. 18.4% report none or limited
	5. Presence and use of triage	5. 39.3% report none or limited
	6. Use of EU guidleine	6. 11.6%
	7. Presence of System for access to EC and first aid from trained first responders	7. 13.9% report no system
	8. Presence of system to provide EC during transport between scene and facility, or between facilities	8. 13.9% report no system
	9. System to access EC from trained first responders and the scene and urgent transport to a health facility (overall system of pre-hospital care)	9. 19.0% report no system
Pigoga (2020)		
	1. Training issues	1. Training related to critical trauma and airway interventions, and neonatal care; issues with treating malnutrition or severe anaemia; inability to perform the following procedures: intraosseous access or venous cutdown, apply three-way dressings for sucking chest wounds or perform fasciotomies or escharotomies
	2. Health system issues	2. Only one facility with a dedicated resuscitation area
	3. Resource issues	3. Lack of medications, equipment, and tests, including: pulse oximetry, airway management, needle thoracostomy, chest tube, pelvic binders, ECG, ultrasound, thrombolytics, blood transfusion, defibrillation, cardioversion, pericardiocentesis, external cardiac pacing, procedural sedation, IV antibiotics, IV vasopressors, uterotonic drugs
	4. Quality issues	4. Lack of: clinical protocols, protocols for communicating critical lab results for infection control infection, triage
Radjou (2013)	1. Mean distance and time travelled by direct group	1. 31.4 km, 90 min
	2. Mean distance and time travelled by referred group	2. 52.81 km, 279 min
	3. Percent of referred cases that clocked unnecessary distance to reach care	3. 54%
	4. Percent of direct cases that clocked unnecessary distance to reach care	4. 14.2%

	5. Median unnecessary distance clocked by referred cases to reach care	5. 24.49 km
	6. Median unnecessary distance clocked by direct cases to reach care	6. 10.86 km
Razzak (2001)	1. Training issues	1. No ambulance driver had formal training in first aid or prehospital care
	2. Percent of ambulance services that carry only a stretcher	2. 71%
	3. Cost of transport for non-air-conditioned ambulances	3. Pakistani rupee (PR) 7–10 ($0.12–0.17) per mile
	4. Cost of transport for air-conditioned ambulances	4. PR 15–20 ($0.26–0.35) per mile
	5. Percent of ambulance services that operate only during day hours	5. 8%
	Percent of patients that said	Percent of patients that said
	6. the streets in their area were too narrow for an ambulance	6. 3%
	7. they did not use ambulances due to high cost	7. 8%
	8. they preferred using taxis or cars due to easy access	8. 38%
	9. the patient was not sick enough to call an ambulance	9. 26%
	10. they used a taxi because the patient was too sick to wait for anything else	10. 20%
	11. patient was sick enough to come to the ED	11. 45%
	12. they did not come to the ED because of the slow response of the ambulance service	12. 23%
	13. they did not come to the ED because they did not know how to find one	13. 11%
	14. they would call an ambulance only if they are unable to walk	14. 44%
	15. they would call an ambulance only if they were very sick or near death	15. 22%
	16. they were not sure when to call an ambulance	16. 21%
	17. they knew of at least one ambulance service	17. 57%
	18. they knew of two ambulance services	18. 21%
	19. they did not know of any ambulance service	19. 14%
	20. knew the phone number of any ambulance service	20. 0%
Ro (2017)	Percent of respondents that reported the primary reasons for not seeking health care were:	Percent of respondents that reported the primary reasons for not seeking health care were:
	1. financial	1. 37.2%
	2. use of complementary medicine	2. 22.2%
	3. the that condition was not severe enough to visit hospital	3. 8.7%
	4. limited accessibility to hospital	4. 5.7%
	5. social and family disapproval	5. 4.6%
	6. Those who were more likely to experience unmet needs in the previous year	6. People whose mean income was below moderate levels, those who lived far from a teaching hospital or close to a district hospital
Rocha (2017)Addressing geographic access barriers to emergency care services: a National ecologic study of hospitals in Brazil.	1. States with high levels of accessibility	1. Paraná, Goiás, Minas Gerais, Bahia, Piauí, Rio Grande do Norte, Ceará e Pernambuco
	2. Number of municipalities that had high accessibility to small hospitals and low to high complexity center	2. 1595
	3. Percentage of municipalities with below average access to high complexity center that were covered by small hospitals	3. 74%
	4. Number of municipalities that did not meet the criteria of maximum travel time of 2 hours	4. 824

Rocha (2017) Access to emergency care services: a transversal ecological study about Brazilian emergency health care network.	1. Percentage of small hospitals that were in municipalities that had also high complexity centers	1. 26% of small hospitals
	2. Percentage of municipalities were located within less than 60 km from the closest city with a high complexity center with an adult ICU	2. 63%
	3. Number of people that were at least 120 km away from a high complexity center with an adult ICU	3. 14 million
	4. Percent of the population who were more than 120 km away from a health facility with a neonatal ICU	4. 12%
Roy (2010)	1. Training issues	1. Lack of training of ambulance attendants
	2. Equipment issues	2. No resuscitation equipment in the ambulance
	Odds ratio of likelihood the following groups would receive prehospital care:	Odds ratio of likelihood the following groups would receive prehospital care:
	3. road traffic accident victims	3. 2.3
	4. arriving by government ambulance	4. 10.83
	5. arriving by taxi	5. 0.54
	6. being transferred from other medical facilities for “medico-legal reasons”	6. 0.1
Scolari (2018)	1. Resource issues	1. Lack of laboratory testing
	2. Acceptability issues	2. Conduct of health professional does not meet the expectations of the patients
	3. Health systems issues	3. Hours of operation and bed limitations
	4. Geographic barriers	4. Geographic relationship to care
Sheikhbardsiri (2020)	1. Mean of patient's rights observed	1. 130.3 (SD: 40.1)
Siddiqui (2008)	1. Mean distance from the residence to the hospital	1. 56.75km±123km.
	Percent of patients who	
	2. came late who were referred	2. 63 %
	3. presented within 60 minutes of onset of symptoms	3. 86.5%
	4. were first taken to another hospital mainly cardiac hospital and then referred here	4. 60.6%
	5. first opted for alternative medicines	5. 12.7%
	6. thought stroke symptoms would resolve spontaneously	6. 28%
	7. did not know a single symptom of stroke	7. 32%
	8. knew at least one stroke symptom	8. 10.9%
	9. hemiplegia was the most familiar stroke symptom	9. 67%
	10. speech disturbance was the most familiar stroke symptom	10. 61%
	11. Median time from onset of symptoms and contact with general practitioner	11. 30 minutes
Sodemann (2006)	1. Odds ratio associated with mortality risk within 30 days of first consultation for those acquainted with a medical doctor	1. 0.55
	2. Those whom were less likely to present a severely ill child	2. Mothers belonging to Muslim ethnic groups
Sohayla (2020)	1. Accessed EC in last 12 months	1. 5%
	2. Aware of EC services	2. Very good: 67.7%
Stein (2016)	1. Pre-hospital issues	1. Lack of a single toll-free emergency number, knowledge of the emergency number, available community first responders, 24-hour EMS availability,
	2. Acceptability issues	2. Acceptability of EMS to the community
Sultan (2019)	1. Factors associated with increased likelihood of ambulance use	1. Amharic speaking, previous ambulance use

	2. Odds ratio associated with the ambulance use and police as a patient companion	2. 1.53
	3. Pre-hospital issues	3. Long arrival time for ambulance, not enough distribution of ambulance stations, and difficulty of accessing the phone
Suriyawongpaisal (2018)	1. Financial barriers	1. Preauthorization
	2. Demographics associated with financial barriers	2. Females were less likely to have preauthorization
Suriyawongpaisal (2016)	1. Financial barriers	1. Copayment
Tansley (2015)	1. Percent of the population within 50km of road travel distance to tertiary care	1. 28%
	2. Proportion of a region's population within a 50-km service area of a Level C facility	2. 0% in the more remote regions to 95.4% in the most Urban region Haiti, 0% in the Nord Ouest department to 89.1% in the Ouest department
Tansley (2016)	1. Proportion of Ghana's landmass that is serviceable within 60-minutes of an National Ambulance Service station (from 2004 to 2014)	1. 8.7 to 59.4%
	2. Proportion of the population within a 60-minute catchment area of a N/AS station (from 2004 to 2014)	2. 37% to 79%
	3. Population within a 30-minute catchment area of a N/AS station	3. 26% to 61%
	4. Ambulances per 100,000	4. 0.05 in the Obuasi Municipal District to 2.4 in the Sissala West District
	Percent of facilities in Namibia found to be capable of providing care level:	Percent of facilities in Namibia found to be capable of providing level:
	5. A	5. 12.4%
	6. B	6. 7.3%
	7. C	7. 1.2%
	8. X (unsuitable for providing emergency care)	8. 88%
	Percent of facilities in Haiti found to be capable of providing care level:	Percent of facilities in Haiti found to be capable of providing care level
	9. A	9. 18.9%
	10. B	10. 1.7%
	11. C	11. 0.9%
	12. X	12. 81.1%
Thomson (2005)	1. Health system issue	1. Rural, district and small Urban hospitals have no emergency department
	2. Training issue	2. No emergency medicine training
	3. Staffing issue	3. EDs are staffed by only one doctor
	4. Resource issues	4. Lack of CT availability after hours
	5. Financial barriers	5. Patients must pay cash for any imaging
	6. Pre-hospital system issues	6. Ambulances have to travel up to 200 miles, lack of helicopters, private ambulance services have tried to link their control rooms to cellular networks, which has delayed response to major accidents and incidents by the responsible authorities, lack of dispatchers
Treleaven (2017)	1. Demographics that demonstrated worse outcomes	1. Poorer, younger, rural, and children who were referred from another facility children
Vanderschuren (2015)	1. Percent of fatalities that were outside of the Golden Hour	1. 53.1%
	2. Fatality rate within the service areas	2. 2.25 fatalities/km
	3. Fatality rate within the service gaps	3. 2.91 fatalities/km
Wen (2011)	1. Financial barriers	1. Payment is requested at the time of care
	2. Percent of individuals who were prevented from receiving treatment due to lack of payment	2. one-third
	3. Pre-hospital system issues	3. Lack of prehospital care
	4. Geographic barriers	4. Hours of travel are required in remote areas
	5. Resource issues	5. Lack of resources, including electricity and equipment

	6. Training issues	6. No emergency medicine training, one hospital provided specialised training at the basic life support (BLS) level, and no hospital provided courses such as Advanced Cardiac Life Support (ACLS), Advanced Trauma Life Support (ATLS), or Paediatric Advanced Life Support (PALS) training.
Wesson (2015)	1. Training issues	1. No formal or trauma-specific training, very few providers are trained in BLS or ACLS.
	2. Resource issues	2. Lack of basic trauma equipment.
	3. Geographic barriers	3. Distance to a facility
	4. Pre-hospital issues	4. A publically available ambulance system did not exist, lack of community awareness of emergency phone number, lack of function of emergency phone number
	5. Transportation issues	5. Lack of transport to the health care facility.
	6. Staffing issues	6. It is not safe for the medical officers to report to the hospital at night
	7. Financial issues	7. Inability to pay hospital fees and transport
	8. Respondents' opinion on how to improve pre-hospital care	8. Provide first aid and triage trauma training to community members and the police
	9. Factors affecting the decision to seek care	9. Severity of the injury, traditional medicine and religion
WHO (2015)	1. Availability of potatble water	1. Globally: 62%, AFRO: 58%, AMRO: 70%, SEARO: 78%
	2. Avavilability of sanitation	2. Globally: 81%, AFRO: 84%, AMRO: 57%
	3. Availability of hand hygiene (soap)	3. Globally: 65%, AFRO: 64%, AMRO: 65%
Zaidi (2013)	1. Median travel time to ER	1. From Hyderabad: (20 minutes), from Mansehra (120 minutes).
	2. Odds ratio associated with patients likely to seek immediate health care at a non-medical facility or administer self- treatment compared to visiting a medical facility	2. Peshawar: 144.45 , Bahawalpur: 131.36, Abbottabad - 5.12, Hyderabad - 6.87
Zimmerman (2020)	Percent of patients who waited the following times to evaluated by a physician in the ED	Percent of patients who waited the following times to evaluated by a physician in the ED
	1. 0.0 to 15.0 minutes	1. 69.2%
	2. 15.1 to 30.0	2. 19.0%
	3. more than 45.0 minutes	3. 7.8%
	4. 30.1 to 45.0 minutes	4. 4.1%
	5. Percent of patients who waited the 0.0 to 1.0 hours to receive lab tests	5. 48.4%
	6. Percent of severe GCS patients who received lab tests within 1.0 hours of physician evaluation	6. 56.1%
	7. Percent of mild GCS patients who received lab tests within 1.0 hours of physician evaluation	7. 52.0%
	8. Percent of moderate GCS patients who received lab tests within 1.0 hours of physician evaluation	8. 53.0%

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5-6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	5-6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	5-6, Supplement
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7-9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7-8
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7-9
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	10
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	10-12
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	10-19
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	10-19
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	19-20
Limitations	20	Discuss the limitations of the scoping review process.	21-22
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	22-23
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	1

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

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Title: Defining Measures of Emergency Care Access in Low- and Middle-Income Countries: A scoping review

Short Title: Access measures of emergency care in LMICs

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Abstract

Background: Over 50% of annual deaths in low and middle-income countries (LMICs) could be averted through access to high-quality emergency care.

Objectives: We performed a scoping review of the literature that described at least one measure of emergency care access in LMICs in order to understand relevant barriers to emergency care systems.

Eligibility criteria: English language studies published between January 1, 1990, and December 30, 2020, with one or more discrete measure(s) of access to emergency health services in LMICs described.

Source of evidence: PubMed, Embase, Web of Science, CINAHL, and the gray literature.

Charting methods: A structured data extraction tool was used to identify and classify the number of 'unique' measures, and the number of times each unique measure was studied in the literature ('total' measures). Measures of access were categorized by access type, defined by Thomas and Penchansky, with further categorization according to the 'Three Delay' model of seeking, reaching, and receiving care, and the World Health Organization's Emergency Care Systems Framework (ECSF).

Results: A total of 3103 articles were screened. 75 met full study inclusion. Articles were uniformly descriptive (n=75, 100%). 137 discrete measures of access were reported. Unique measures of accommodation (n=42, 30.7%) and availability (n=40, 29.2%) were most common. Measures of seeking, reaching, and receiving care were 22 (16.0%), 46 (33.6%), and 69 (50.4%), respectively. According to the ECSF slightly more measures focused on prehospital care—inclusive of care at the scene and through transport to a facility (n=76, 55.4%) as compared to facility-based care (n=57, 41.6%).

Conclusions: Numerous measures of emergency care access are described in the literature, but many measures are over addressed. Development of a core set of

access measures with associated minimum standards are necessary to aid in ensuring universal access to high-quality emergency care in all settings

Strengths and Limitations

- We performed an extensive search in multiple databases and the gray literature of all emergency care access measures according to known best principles of scoping reviews.
- Categorization of measures was performed according to 3 separate frameworks of access and emergency care.
- This study is limited to the available English-language literature.
- Given limitations in the data, we cannot comment on the feasibility of implementing the categorized access measures, provide consensus on which measures correspond to more likely improvements in patient outcomes, nor provide minimum standards for measures.

Introduction

The past 20 years have been called a golden age of public health. (1) A dramatic increase in global health funding has expanded health care resources in low- and middle-income countries (LMICs). (2-4) As a result, significant reductions in infectious disease-related, neonatal, and maternal mortality have been achieved in line with the United Nations Millennium Development Goals. (5) Further reductions in global mortality attributable to non-communicable diseases and trauma has been far less substantial. (6) While a shift from disease specific programs to health system strengthening, equity, and social protection has been an important first step,

progress on current Sustainable Development Goals remains lacking and has been further hampered by existing health inequities made worse by the COVID-19 pandemic. (7)

Improvements in both prehospital and facility-based emergency care have the potential to impact many of the SDGs, lead to marked improvements in healthcare systems, and reduce deaths across multiple disease categories.(8) Estimates suggest that over 50% of annual deaths in LMICs could be averted by the implementation of quality emergency care systems. (9-12) The increasing mortality burden of non-communicable diseases, including injury and chronic conditions, coupled with the acute medical needs of emerging pandemics, such as SARS-CoV-2, requires the development of robust emergency care systems.(1, 13, 14)

In 2018, the World Health Assembly passed resolution 72.16. ensuring the role of emergency care in all health systems. (15) In order to provide further clarity to practitioners and policy makers on the role of emergency care, the WHO developed the Emergency Care System Framework (ECSF). The Framework defines a set of core essential functions of an emergency care system at the scene of illness, during transport, and within health facilities. (16) Unfortunately, many who live in resource-limited settings lack access to the human resources, equipment and information technologies needed for a capable high functioning emergency care system. (17)

Previous descriptions of known measures of emergency care quality (18, 19) and barriers to emergency care access (20, 21) have highlighted gaps in emergency care in LMICs, but no comprehensive review on measures of emergency care access in LMICs has been completed to date. The aim of this scoping review is to categorize all known measures of emergency care access in LMICs in order to help standardize and prioritize emergency care development.

Materials and Methods:

Search Strategy

A rigorous search strategy was employed with the goal of identifying all peer-reviewed studies that described measures of access to emergency care in LMICs. For this review we use the term measure to describe indicators, metrics, and other measurable components of access to emergency care. We performed a scoping review using the following databases: PubMed, Embase, Web of Science, and CINAHL. A subsequent gray literature search was conducted via both Google and Google Scholar, with searches targeted toward organizations that work on global emergency care.

The initial search strategy (Supplementary Material: Appendix 1) was developed within PubMed and adapted for the remaining databases. Search terms included various iterations of access, emergency care, and LMICs. Free text terms and standardized MeSH headings/subheadings were utilized to optimize sensitivity for relevant literature while minimizing excess search results. The reference lists of relevant primary studies and reviews likely to meet inclusion criteria were also reviewed manually to both verify search sensitivity and identify other potentially relevant studies that were not identified by the electronic search. The initial search was performed in 2020, with a subsequent updated search in November 2022.

The gray literature search was completed via Google and Google Scholar. We performed targeted searches using similar terms relevant to access, including affordability and barriers to care. The search was targeted toward government ministries of health, professional organizations specific to emergency care, and

among well-established non-governmental organizations, including development agencies and those specific to healthcare policy. There was no initial regional or income level specifications given to this search.

Studies published between January 1, 1990, and December 30, 2020, English-language, and describing at least one discrete measure of access to emergency care services in at least one LMIC were included. LMICs were defined by World Bank economic definitions as the Gross National Income (GNI) per capita of the year the research was performed. Articles were excluded that were clearly irrelevant to the topic, did not involve emergency care, did not describe a measure of access or measurable barrier to emergency care, or did not include data from at least one LMIC. For the purposes of this review, we excluded data specific to emergency obstetric and newborn care seeking (EmONC; we anticipate a separate forthcoming review on the subject). As a scoping review, this manuscript does not involve human subjects and is exempt from ethics review based on the corresponding author's IRB.

Patient and Public Involvement

Given the nature of this study it was not possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Data Processing

Manuscripts meeting initial broad search criteria were imported into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Initial title and abstract review were performed by two independent authors (SH, JD). Disagreements were resolved by a third reviewer (CB). The same procedure was followed for full text review.

Data from included manuscripts were extracted and included the following: author(s) and full citation, publication date and study timeframe, location, study type, setting, methodology, access measure(s) reported, and the primary outcome(s). Countries under study were categorized by income level, WHO region, whether the study was local, regional, national or multinational in scale, and whether the populations under study were rural or urban.

Data Analysis

A structured data extraction tool was used to identify and classify both the number of 'unique' measures, and the number of times a unique measure was studied in the literature. In this manuscript the summation of all of the times each unique measure was studied is referred to as 'total' measures. Unique access measures were aggregated and categorized by access type.

The term "access" is often used as shorthand for distance, leading to a focus on individual patient proximity, either spatial or temporal, to a given health service. (22) While vital, proximity is but one component of accessibility and may not correlate with the true ability to receive quality emergency care. (23) For this scoping review we revert back to a more expansive definition of access, one rooted in a rights-based approach to emergency care and reflecting the spectrum of fit between user and service and inclusive of five dimensions of access—availability, accessibility, accommodation, affordability, and acceptability—as described by Penchansky and Thomas. (Table 1; 24-25) We also reference a modified version of this framework which includes awareness. (26) In Penchansky and Thomas' framework, access is examined through the "fit" of the patient with the health care system. For example, a health care facility may be available (that is, it exists), but not accessible because of transportation barriers. In addition, the health care facility may

not have necessary measures to accommodate a patient (such as 24-hour-access or childcare), may be unaffordable, or may be unacceptable (i.e., due to poor quality or corruption). While dated, and originally validated in the consumer patient satisfaction world, multiple recent studies on healthcare access in low- and middle-income studies have shown utility and validity for this framework, including among geriatric healthcare in Southeast Asia, on HIV treatment access during Covid in Ghana, and among displaced in the Lake Chad region of Cameroon, Chad, Niger and Nigeria. (27-29)

Table 1. Proposed Emergency Care Access Measures for Monitoring, Evaluation and Comparative Analysis by Access Type

Access Type	Definition from Penchansky and Thomas	Adapted definition for emergency care	Proposed sample emergency care access measures
Availability	The relationship of the volume and type of existing services to the clients' volume and types of needs	The relationship between EU services and those seeking EC.	Number of EC beds per catchment area
			Presence of drug, technology, or interventions specific to EC
			Presence of EC clinicians 24 hours a day
			Percent of clinicians with EC training
Accessibility	The relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost	The proximity (in time and space) of a patient to EU care.	Distance to closest emergency care facility
			Time to closest emergency care facility
			Available transport
			Time associated with transport
			Cost of transport to emergency care
Affordability	The relationship of prices of services and providers' insurance or deposit requirements to the clients' income, ability to pay, and existing health insurance.	The cost of EU services and care, relative to patient's household income and ability to pay.	Cost to access initial EC service
			Cost of individual services specific to EC (specific to individual care type)
			Overall EC cost per visit
Accommodation	The relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of operation, walk-in facilities, telephone services) and the clients' ability to accommodate to these factors and the clients' perception of their appropriateness	The manner in which EU services are organized (time of operation, level of training and services able to be rendered) relative to a patient's need.	Hours of operation of EU
			Number of transfers per patient
			Average EU time to provider
			Training provided per specific EU interventions
Acceptability	The relationship of clients' attitudes about personal and practice characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients	The relationship between a patient's individual belief system and larger socio-cultural attributes and their willingness to seek EC.	Understanding of how to navigate EC system
			Acceptability of EU care
			Acceptability of EU conduct or attitudes
			Acceptability of ambulance use

More recently other models have emerged that may provide greater applicability to emergency care. With this in mind we provide analyses and

categorize access measures via two additional frameworks. The 'Three Delay' model, was originally conceptualized to understand delays in care leading to increased maternal mortality but has been more recently applied to emergency care. (30, 31) The Three Delay model defines three critical phases of timely care: seeking, reaching, and receiving care. The World Health Organization's ECSF provides another method of understanding emergency care access. The ECSF defines the human resources, equipment, and functions necessary for a fully functioning emergency care system at the scene of illness, during transport to a health facility (prehospital), and within healthcare facilities. (9, 16)

All extracted access measures were collected, with similar measures collapsed into singular unique measures. We report the number of unique measures and the total number of times a measure is reported as a number and percent. Each measure was then categorized according to the three frameworks listed above. Given the heterogeneity of study methods and types, a qualitative analysis and narrative synthesis was undertaken. Thematic analyses focused on the number and general quality of the measures used. Trends and ranges among studies with comparable numeric measures are reported where appropriate. We did not perform a grading of the literature given the overall observational nature of most studies. Criteria proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews statement were adhered to in reporting.(32)

Results

A total of 3103 articles were identified for screening via database searches, and 30 were included from the gray literature and hand searches of relevant literature (**Figure 1**). After removal of 993 duplicates, 2140 articles were screened by title and

abstract, 203 articles met criteria for full text screening, after which 128 articles were excluded. In sum, 75 articles met full criteria for inclusion. (Supplementary Material, eTable 1)

[Insert] Figure 1. Prisma Flow Diagram for review of literature on access to emergency care measures in LMICs.

All but one of the 75 studies were published in peer-reviewed journals. The majority (n=44, 58.7%) of studies examined access related to general emergency care; 22 (29.3%) were relevant to prehospital care, 10 (13.3%) were specific to trauma care, and one (1.3%) article focused on pediatric patients. (**Table 2)** Geographically, publications included data from all six WHO regions, with the majority from the African Region (n=35, 46.7%). The majority of included studies originated from lower-middle income countries (n=37, 49.30%), with additional studies from upper-middle income countries (n=15, 20.0%) and low-income countries (n=11, 14.7%). Twelve articles (16.0%) included data from multiple income groups.

Table 2. Characteristics of manuscripts for study inclusion

Characteristic	N (%)
	N=75
Country	
Multinational	12 (16.0)
Ghana	7 (9.3)
Pakistan	6 (8.0)
Kenya	5 (6.7)
India	5 (6.7)
South Africa	4 (5.3)
Brazil	3 (4.0)
Other*	32 (42.7)
WHO Region	
Africa	35 (46.7)
Americas	7 (9.3)
Eastern Mediterranean	5 (6.7)
European	1 (1.3)
South-East Asia	15 (20.0)
Western Pacific	7 (9.3)

Multiple WHO Regions	5 (6.7)
Income level	
Low	11 (14.7)
Lower-middle	37 (49.3)
Upper-middle	15 (20.0)
Multiple	12 (16.0)
Settings	
Local	9 (12.0)
Regional	34 (45.3)
National	20 (26.7)
Multinational	12 (16.0)
Setting if Local or Regional**	
Urban	8 (18.6)
Rural	32 (74.4)
Both	3 (2.3)
Article Type	
Quantitative	24 (32.0)
Qualitative	47 (62.7)
Mixed	4 (5.3)
Methodology	
Descriptive (Interview)	14 (18.7)
Descriptive (Survey)	13 (17.3)
Cross sectional	43 (57.3)
Mixed methods	5 (6.7)
Observational pre/post (Cohort, RCT)	0 (0.0)
Population focus	
General EM care	44 (58.7)
Prehospital care	22 (29.3)
Trauma care	10 (13.3)
Pediatrics	1 (1.3)
Number of study participants	
0-50	7 (9.3)
51-100	3 (4.0)
101-500	9 (12.0)
501-2000	1 (1.3)
>2000	7 (9.3)
Not reported	48 (64.0)

*At least one study from the following countries including Bangladesh, Cambodia, Cameroon, China, Eswatini, Ethiopia, Guinea-Bissau, Haiti, Honduras, Iran, Malaysia, Nigeria, Philippines, Rwanda, Samoa, Solomon Islands, Sierra Leone, Sudan, Tanzania, Thailand, Vietnam, Yugoslavia, Zambia, Zimbabwe

**N= 43

Methodologically, all studies were descriptive and relied on key informant interviews (n=14, 18.7%), surveys (n=13, 17.3%), or cross-sectional data (n=43, 57.3%). No manuscript reported a comparator group, and the majority of studies were qualitative in nature (n=47, 62.7%). Studies varied in the number and type

(patients, clinical providers, administrators) of participants. The majority of studies (n=48, 64.0%) used cross-sectional data and did not specify the number of participants. Participant enrollment ranged from 11 to 32,774 individuals. The types of health facilities under study also varied, and included emergency care as accessed at clinics, district hospitals, referral hospitals (with access to intensive care), and more formal emergency units or departments.

Measures by access type

In sum, 137 unique measures of access were described in the 68 studies (**Table 3**). Of the 75 total studies, most (n=49, 72.1%) reported more than one unique measure. Based on Penchansky and Thomas' categories, the highest number of discrete measures of access described accommodation (n=42, 30.7%), followed by availability (n=40, 29.2%). In many instances, a single measure was studied reported more than once leading to a total of 306 total measurements. Among total measures, measures of availability (n=120, 35.7%) were disproportionality over represented while measures of affordability were underrepresented (n=34, 10.1%).

Table 3. Unique and total number of access measure categorized by access type

Access category	Unique measures	Total measures
	N=137 (%)	N=336 (%)
Availability	40 (29.2)	120 (35.7)
Accessibility	19 (13.9)	66 (19.6)
Accommodation	42 (30.7)	62 (18.5)
Affordability	17 (12.4)	34 (10.1)
Acceptability*	19 (13.9)	54 (16.1)

*Awareness accounted for 4 of the unique measures

Availability

Unique measures of availability, defined as the relationship of the volume and type of existing services to the clients' volume and types of needs, totaled 40 (29.2%; Table

1). Total measures of affordability were studied most often (n=120, 35.7%, **Table 4**). Of the unique measures, most (n=29, 72.5%) focused on receiving care. Measurements on receiving care often measured the presence or lack of basic emergency health facilities and resources relevant to emergency care. There was heterogeneity when describing resource service availability, such as the availability of emergency radiologic services (e.g., CT and MRI) and emergency laboratory service (e.g., blood smears for malaria). Measures owing to the presence or absence of clinical providers with qualifications relevant to emergency care were described in 9 of the 75 studies (12.0%).

Table 4. Unique access measures categorized by type and delays in care

	Availability N=40	Accessibility N=19	Accommodation N=42	Affordability N=17	Acceptability N=19
Seeking N=22	N=2	N=3	N=5	N=1	N=11
	Presence of community (lay) responders (62)	Patient access to a telephone (6, 11, 63)	Ability to get through on phone lines on first attempt (6)	Inability to miss work/secondary to cost (10)	Acceptability of EU care: by sex (21); by education level (23); age (23, 47); economic/financial status (53); social status (13); insurance (13); appearance (13); ethnicity (60); religion (60, 72), proximity to health facility (53)
	Presence of dispatchers (68)	Presence of a national universal toll-free emergency number (6, 9, 10, 13, 14, 28, 43, 62, 71)	Concerns over personal safety in seeking care (25)		Awareness of emergency care systems and services (5, 11, 52, 61)
		Median time from onset of patient symptoms to contact with provider (13, 57)	Patients and families responsible for arranging their transportation to the higher-level facility (14)		Community accepts and utilizes EMS care (62)
			Presence of adequate child care (10)		Fear of emergency dental treatment (47)
			Required paperwork filled out before emergency care (13)		Knowledge of emergency number (22, 27, 52, 57, 72)
					Knowledge of where the closest EU facility is located (52)
					Personally knew a healthcare provider (13, 60)
					Preference of traditional methods of care (e.g., bonesetters) over EU care (5, 8)
					Social and family disapproval (53)
					Understanding of how to navigate emergency care systems: general (6, 14, 23, 59)
					Understanding of what qualifies as an emergency condition/perception that condition is severe enough to seek care (8, 17, 23, 52, 53, 72)
Reaching N=46	N=9	N=13	N=12	N=8	N=4
	Basic building (i.e., structural) resources specific and purpose built to emergency care (26)	Dispatcher training provided (6)	EMS delays: general (25); due to referrals (59)	Ambulance fee (37, 64)	Ambulances acceptable based on: language (63), if police involved/transport (63), slow response time (52)
	EU radio/communication devices available for EMS handoff (30)	Geography limits access: rural locations (1); mountainous terrain (10)	Existence of a coordinated emergency response system (9, 28, 43, 71, 72)	Ambulance fee by ambulance-type (52)	Patient preference of ambulance care over other forms of transport (52)
	Fuel available for ambulances (14)	Calculated accessibility by 2SFCA method (24)	Equitable (plan for) distribution of ambulance stations (63)	Ambulance referral fee (27)	Prehospital care acceptable to: those taking government ambulance (56), those taking taxis (56), road traffic accident victims (56), those being transferred for medico-legal reasons (56)
	Fuel for general (non-ambulance) transport (14)	Percent of patients who sought care or made it to a facility within 60 minutes of onset of symptoms (59)	Facilities are notified in advance of patients arriving (15)	Cost of transport (11, 14, 17, 19, 23, 47, 52)	Previous ambulance use and willingness to use ambulances in the future (63)
	Presence of any healthcare facility (14)	Response time from initial call to scene (3, 7, 14, 22, 35, 63, 70)	General maintenance issues with vehicles (11)	Payment required before treatment (34)	
	Presence and number of ambulances for interfacility transport (20)	Roadways limits access: traffic (1); poor or narrow roads (11, 14, 20, 52)	Number of separate modes of transportation (per patient) to reach care at facility (20)	Preauthorization fee (64)	
	Presence and number of ambulances with basic life support capabilities (46)	System to access EC from trained first responders and the scene and urgent transport to a health facility (49)	Patients taken to the police station before taking them to the hospital (13, 14)	Fees are equitable (64)	
	Presence and number of ambulances without medical capabilities/transport only (52)	Transport time from a location to a facility with specific EU capabilities (i.e., PCI-capable hospital, trauma center, obstetric emergencies, tertiary hospital; 36, 45, 48, 55)	Percent of missed or prolonged pick-ups due to prehospital provider misunderstanding of location (6)	Private vehicle transport fees (27)	
	Presence and number of helicopters for transport (68)	Transport time from home to hospital (2, 36, 46, 48, 51, 54)	Presence of drivers willing to respond to patient request (11)		
		Transport time from scene to hospital (13, 29, 33, 35, 74)	Private ambulance services control rooms linked to cellular networks (68)		
		Travel distance (5, 13, 14, 21, 20, 22, 27, 32, 51, 57, 59, 66, 71, 72)	Regulations governing EMS (43)		
		Travel time from home to national ambulance service station (67)	System for care during transfer to a facility or between facilities that has the capability to handle the case (20, 49)		
		Weather/Climate limits access: rainy season (11)			
Receiving N=69	N=29	N=3	N=24	N=8	N=4
	Absolute number of EU providers (stratified by type: physicians, nurses, and EMS providers; 6, 10, 13, 14, 17, 18, 30)	Number of (trauma) fatalities within and outside the first hour (70)	Presence of disaster plan including, additional staffing for disasters (49, 68)	Absolute cost of EC treatment (5, 14, 17, 21, 23, 34, 47, 53, 71, 72)	Acceptable providers conduct and attitudes towards patients (13, 14, 57)

	Advanced cardiac life support or resuscitation equipment available in ambulances or number of ACLS ambulances (28, 30, 46, 56)	Fatality rate per patient kilometer from facility (70)	Availability of 24-hour ambulance care (no night hours, 52)	Copayment for care (65)	EC in line with patient's human rights (58)
	Availability of basic EU medications available (13, 15, 47, 50)	Able to access and receive care in last 12 months (61)	Availability of 24-hour emergency care (13, 26, 57)	Cost of facility treatment (19)	Providers/percent of providers deemed corrupt (13)
	Availability of basic EU resources/equipment (9, 13, 14, 18, 20, 26, 30, 50, 71, 72)		Availability of 24-hour staff availability (20)	Cost of medical investigations and radiography (19)	Sought care for wounds/trauma (5)
	Availability of EU infection control materials including soap (26, 77)		Care provided during transport (14)	Cost of medicines (17, 23)	
	Availability of EU procedures: Needle thoracostomy (15); chest tube (15); pelvic binding (15), defibrillation (15), cardioversion (15), pericardiocentesis (15); external cardiac pacing (15); Blood transfusions (15, 32)		Care provided at lower-level facility before transfer (14)	Cost of treatment by a bonesetter	
	Availability of EU specific supplies and equipment: 49, Suture and wound care supplies (15); Gloves (15); Oxygen (15, 45); Stethoscopes (20); Glucometer (15); Pulse oximetry; ECG machine (15); Resuscitation equipment (8)		Legal protections for ambulance providers distributing and providing care (28)	Hospital costs beyond scope of patient (e.g., proportion of cost to individual illness) (34)	
	Availability of imaging (General: 17, Xray: 15, CT: 30, 68, ultrasound or MRI: 30)		Miscommunication or mis-triage of patient acuity (6)	Payment required in cash for imaging (14)	
	Availability of laboratory/diagnostic testing material (general blood/urine tests: 17, 30, 32, 57; malaria smears: 32)		Number of transfers per patient (6)		
	Availability of potable (sterile) water (20, 73)		Number and Percent mis-triage (6)		
	Availability of pre-hospital providers with standardized training (9, 22, 28, 52, 56)		Percent of hospitals with out-of-hours clinician coverage (18)		
	Availability of sanitation (toilet, 73)		Physician comfort in adequately performing EU-specific procedures (30, 50)		
	Availability of specified care: trauma care (4); orthopedic (fracture) care (8, 15, 15); obstetrical emergencies (20); HIV care (20); cholera (20); tuberculosis care (20); general surgical services (20); dental care (20); critical care (20); ophthalmological care (20)		Presence of overcrowding (49)		
	Electricity available (20, 26, 45)		Presence of a standardized EMR (13)		
	Emergency equipment list available (20)		Protocols for patient transfers (20)		
	First aid received on scene by lay providers (i.e., members of the public, other motorists, or the less injured casualties; 34, 49)		Protocols specific to trauma care (15)		
	First aid received on scene by trained providers (34)		Safe passage for health providers to the hospital at night (72)		
	Number of doctors staffing EU (appropriate for size; 68)		Staff comfort in treating EU conditions (32, 34)		
	Number of EU-specific area beds (20)		Training for community members and police: First aid and triage (72)		
	Number of hospital-facility (non-EU specific) rooms or beds (10, 19, 57)		Training for providers: adult triage (18)		
	Presence of EU with resuscitation bed/zone (49, 50)		Training for providers: EU-specific (13, 14, 27, 46, 71)		
	Presence of EU (within facility; 2, 68)		Training for providers: pediatric triage-specific (18)		
	Presence of EU dedicated nursing personnel (18)		Time to lab tests (75); by patient GCS (75)		
	Presence of facility burn unit (2)		Time to provider (e.g., wait time; 25, 75)		
	Presence of triage (13, 14, 49, 50)		Utilization and access to standardized clinical care guidelines: general approach (15, 49); condition specific (sepsis, DKA, anemia, 15)		
	Staff qualified to utilize EU equipment (26)				
	Staff qualified to treat EU conditions (27)				
	Staff with EC training: ACLS or BLS training (30, 71, 72); ATLS, PALS (30, 72)				
	Staff with specialized training relevant to EC: 49, adult critical care (18); continuing education (18); EU equipment use (20); neonatal care (50)				

Accessibility

Unique measures of accessibility—the location of supply and the location of clients—totaled 19 (13.9%), with a disproportionate number of measures studied more than once, leading to 66 total measurements (19.6%). The majority of the unique measures of accessibility corresponded to the process of reaching care (n=13, 68.4%) with most measures on the distance or time to a health service (n=11, 64.7%). Among the 13 studies reporting time, travel times to emergency care ranged from 5 minutes to 2 hours. The range of distances to health facilities demonstrated similar variability, though most (n=13) measurements were in kilometers. An additional study (n=1) reported on the percentage of the population living within a given distance or time, while other studies (n=4) reported on a range of distances or times to specific EU care (e.g., trauma, referral, cardiac). Other qualitative barriers to accessibility were also provided, including the effects of terrain, weather, and road quality.

Accommodation

Accommodation measures are those that assess the manner in which emergency care resources are organized to accept patients. Measures of accommodation made up the greatest number of unique measures (n=42, 30.7%), but they were rarely studied more than once (total n=62, 19.6%). Adequacy of child care, concerns over personal safety, and difficulties in getting through to prehospital providers were described as significant barriers in the process of seeking emergency care. The majority of unique measures on accommodation dealt with the process of receiving care (n=25, 59.5%). Among measures categorized as receiving care, facility-based measures (n=11, 44.0%) included measures of provider timeliness and availability, provider training,

overcrowding, and protocols for care. Among the unique measures of accommodation, four (8.9%) described the use of standardized protocols (three related to prehospital care and one on facility-based care).

Affordability

Measures of affordability or assessing the cost of services relative to a patient or caregivers finances, were the least studied. While the 17 (12.4%) unique measures were similar to the numbers for accessibility and acceptance, measures were rarely studied more than once (n=34, 10.1%). Of the unique metrics reported, most reported on different aspects of the cost of transportation in reaching care (n=8, 47.1%) and the cost of receiving treatment (n=5, 29.4%). Types of costs varied, including cost of an ambulance ride, cost of deposit before treatment, and total hospital bills. A single study described the lack of emergency care affordability based on lost wages from missing work.

Acceptability

Acceptability measures uncovered how well patient's attitudes around emergency care matched those of providers or systems. Seventeen (12.4%) unique measures of acceptability were described in the literature. The majority were related to the process of care seeking (n=11, 64.7%). Measures largely described patient's understanding, acceptability, willingness, and fears in activating and navigating emergency care systems.

Awareness

Lastly, some have argued for inclusion of awareness as a 6th category of access. There were 5 unique measures of awareness, which largely overlapped with the previous 5 other categories, most specifically acceptability. These five measures were reported a total of 18 times.

Access measures by frameworks of emergency care

Individual metrics were also mapped to the Three Delay model, and categorized as either, seeking, reaching, or receiving care (Table 4). Unique measures of seeking care (N=22, 16.1%) largely dealt with pre-facility care and included individual thought processes, the socio-cultural forces underlying care seeking behavior, or systematic structural barriers to seeking care. Measures of reaching emergency care (N=46, 33.6%) largely measured the adequacy of out of hospital care, including the presence, number and proportion of ambulances to population, the time from community to care, the cost of ambulance services, and distribution and systems of ambulance-based care. The majority of unique access measures described the processes of receiving care (n=69, 50.4%). Most measures dealt with the availability of facility-based care services.

Measures were also mapped to the WHO emergency care systems framework (**Table 5**). The WHO Framework 'captures essential emergency care functions at the scene of injury or illness, during transport, and through to emergency unit and early inpatient care'. (16) Roughly equal proportions of measures were focused on prehospital care—inclusive of care at the scene and during transport to a facility (n=76, 55.4%) and facility-based emergency care (n=57, 41.6%). However, given the largely linear nature of the framework, a total of 4 (2.9%) unique measures could not be defined by this framework and were neither specific to prehospital nor facility-based care. The

majority of out of hospital care measures focused on the transfer process (n=45 of 76, 59.2%), while most facility-based measures dealt with EU-based care (n=51 of 57, 89.5%). None of the included manuscripts measured EU disposition or elements of early inpatient care.

Table 5. Unique number of access measures as defined by the WHO Emergency Care Systems Framework. by access type.

WHO ECSF		Total*	Access Type				
Site	Primary Function	N=133 (%)	Availability N=39 (%)	Accessibility N=18 (%)	Accommodation N=42 (%)	Affordability N=17 (%)	Acceptability N=19 (%)
Out of hospital care		76 (57.1)	11 (28.2)	17 (94.4)	25 (59.5)	9 (52.9)	14 (73.7)
	Bystander Response	17 (12.8)	1 (2.6)	3 (16.7)	3 (7.1)	1 (5.9)	9 (47.4)
	EMS Dispatch	3 (2.3)	1 (2.6)	1 (5.6)	1 (2.4)		
	Provider Response	11 (8.2)	2 (5.1)	2 (11.1)	6 (14.3)		1 (5.3)
	Transfer	45 (33.8)	7 (17.9)	11 (61.1)	15 (35.7)	8 (47.1)	4 (21.1)
Facility-based care		57 (42.9)	28 (71.8)	1 (5.6)	17 (40.5)	8 (47.1)	3 (15.8)
	Reception and Triage	6 (4.5)	2 (5.1)		4 (9.5)		
	EU Care	51 (38.3)	26 (66.7)	1 (5.6)	13 (31.0)	8 (47.1)	3 (15.8)
	Disposition	--					
	Inpatient Care	--					
*Total is out of 133, as 4 measures could not be defined by ECSF							

Discussion

Increased global access to quality emergency care has the potential to reduce mortality associated with non-communicable illness and trauma as well as infectious disease and pregnancy related complications.(9-12) Analyzing emergency care access measures in detail has the potential to elucidate gaps in health systems—made worse by the Covid-19 pandemic—that can guide strategies to address existing inequities in care. To date, this is the first review of access measures specific to emergency care in LMICs.

This review revealed several common themes. The majority of unique emergency care access measures focus on availability and accommodation, but total measures of accessibility appear to be more frequently described in the literature. This has led to the disproportionate emphasis on distance and time to a health facility as demonstrative of emergency care access. In reality, upon arrival to a health facility with an emergency condition, most patients are met with limited, ineffective, or non-existent emergency care provision.

Relative to other categories of access reviewed, measures of affordability were the least studied in the literature. These measures often lacked information to contextualize data relative to the gross domestic product of the study population's cost of living. Cost is known to play a significant role in patient's overall healthcare access in all health systems, not just LMICs. (33) Costs associated with emergency health services are known to vary widely across health systems regardless of a country's GDP.(34, 35) Moreover, cost-effectiveness is a widely used method to inform resource allocation, yet evidence to better understand health inequity in all its forms, should include additional efforts to study the cost-effectiveness of emergency care interventions and emergency care systems in LMICs. Measures of access included in this study included both direct (user fees, medication costs, laboratory and imaging tests) and indirect (lost wages, travel costs). Further consensus led efforts to determine measures most important for system comparison are necessary.

In 2018 the World Health Assembly passed resolution 72.16. ensuring the role of emergency care in all health systems. (16) The WHO Emergency Care System Framework sought to provide further context to health policy makers on the role of

emergency care systems in ensuring universal health coverage. (16) While prehospital and facility-based measures of access were equally represented on the literature, though significant gaps remained in both domains. Among prehospital care, most measures focused on the transfer process, with less focus on dispatch and provider response. Several areas of this framework had no associated measures described in the literature.

According to the ECSF considerably few studies described measures related to the EU reception process (e.g., registration, screening, and triage) or the transfer of care between prehospital and facility-based providers. Additionally, no measures described the process of EU disposition or transfer of care to the inpatient ward. Though disposition, transfer, referrals, and transition of care from one provider to another are often cited as times of higher risk to patients, measures of this risk were not adequately described in this study.(36) Several WHO initiatives have sought to strengthen EU quality globally. Future efforts should seek to define and refine a core set of measures specific to emergency care access to aid in the monitoring and evaluation of those efforts. The further validation of a core set of measures with minimum standards across low, middle, and high-income contexts can help to further increase access to high quality emergency care and the expansion of universal health coverage.

Limitations

This study makes an initial attempt to describe measures of access to emergency care, but it is restricted in scope and possesses several limitations. First, this study is limited to English language articles only and does not include articles in other languages widely spoken in many LMICs, including French, Portuguese and

Arabic. Second, while a gray literature review was conducted, we are likely missing measures in use by health facilities, global health organizations, and health ministries. Further attempts at key informant interviews or focus groups with those in LMICs, undoubtably would uncover other measures, but was beyond the scope of this review. Third, given the limitations in study data there was no attempt made to rank-order measures based on feasibility, nor the degree to which they correspond to specific patient outcomes. We recognize that not all measures have equal utility, with some better reflecting access to care issues and serving as more significant correlates of patient outcome. Fourth, though the actual corresponding outcome measures were collected (and described in Supplementary Material, eTable 2), given the heterogeneity of measures and limitations of the search strategy we were unable to provide reference (or minimum) standards for the access measures described. Future efforts hope to describe further the actual measurements. Other fields have attempted, at times with similar difficulty, to establish reference standards (e.g., the Lancet Commission on Global Surgery has recommended a maximum two-hour travel time to surgical services, while similar measures of time to surgery remain controversial (37, 38). However, very few consensus derived standards exist for measuring access to emergency care. (39) This lack of consensus makes further facility, regional, and national comparisons difficult and limits effective understanding of care. Similar to previous consensus work on measures of emergency care quality in LMICs, future efforts should aim to define a core list of indicators of access to emergency care.(19) Lastly, risk of bias assessment was not performed given the descriptive nature of most studies. Other methodologic and search strategy sought to limit bias in the initial selection of articles.

Conclusions

Increasing access to quality emergency care is a key step in strengthening heath systems in LMICs. This scoping review demonstrates that while existing literature examines a wide breadth of access metrics, many gaps remain in our understanding of emergency care access in LMICs. As researchers continue to examine access and barriers to emergency care, special attention should be paid to those dimensions of access less commonly examined, such as affordability. Standardized, consensus-based measures of emergency care access in line with the ECSF should be developed to allow for more universal comparisons of healthcare functions.

Author Contributions

CB, ECH, and SH contributed to the conception and design of the work. SH and JD contributed to data collection and review. SH and CB contributed to data analysis and interpretation and drafting of the article. MB, MR, and ECH contributed to critical revisions of the article. All named authors have approved of the version to be published and agreed to be accountable for all aspects of the work.

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Ethics: As a scoping review, this manuscript does not involve human subjects and is exempt from ethics review based on the corresponding author's IRB.

References

1. Neilson M, Leatherman S, Syed S. The quality-of-care agenda in fragile, conflict-affected and vulnerable settings. Bull World Health Organ. 2021 Mar 1;99(3):170-170A. doi: 10.2471/BLT.21.285627. PMID: 33716335; PMCID: PMC7941104.

2. Leatherman S, Berwick DM. Accelerating Global Improvements in Health Care Quality. JAMA. 2020 Dec 22;324(24):2479-2480. doi: 10.1001/jama.2020.17628. PMID: 33351051.

3. World Health Organization. Delivering quality health services: a global imperative for universal health coverage. Geneva: World Health Organization, Organization for Economic Co-operation and Development, and The World Bank; 2018.

4. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Adeyi O, Barker P, Daelmans B, Doubova SV, English M, García-Elorrio E, Guanais F, Gureje O, Hirschhorn LR, Jiang L, Kelley E, Lemango ET, Liljestrand J, Malata A, Marchant T, Matsoso MP, Meara JG, Mohanan M, Ndiaye Y, Norheim OF, Reddy KS, Rowe AK, Salomon JA, Thapa G, Twum-Danso NAY, Pate M. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018 Nov;6(11):e1196-e1252. doi: 10.1016/S2214-109X(18)30386-3.

5. United Nations Millennium Development Goals 2008 [Available from: https://www.un.org/millenniumgoals/.] Accessed: June 27, 2022.

6. Zeid S, Bustreo F, Barakat MT, Maurer P, Gilmore K. For every woman, every child, everywhere: a universal agenda for the health of women, children, and adolescents.

Lancet. 2015 May 16;385(9981):1919-20. doi: 10.1016/S0140-6736(15)60766-8. PMID: 26090626.

7. United Nations. The Sustainable Development Goals Report 2021. 2021, United Nations, New York. [Available from: https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf]. Accessed: June 27, 2022

8. Calvello EJ, Broccoli M, Risko N, Theodosis C, Totten VY, Radeos MS, Seidenberg P, Wallis L. Emergency care and health systems: consensus-based recommendations and future research priorities. Acad Emerg Med. 2013 Dec;20(12):1278-88. doi: 10.1111/acem.12266. PMID: 24341583.

9. Reynolds T, Sawe H, Rubiano A, Shin S, Wallis L, Mock C. Strengthening Health Systems to Provide Emergency Care. Disease Control Priorities: Improving Health and Reducing Poverty. 3 ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017. pp 247-65.

10. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? Bull World Health Organ. 2002;80(11):900-5. Epub 2002 Dec 3. PMID: 12481213; PMCID: PMC2567674.

11. Chang CY, Abujaber S, Reynolds TA, Camargo CA Jr, Obermeyer Z. Burden of emergency conditions and emergency care usage: new estimates from 40 countries. Emerg Med J. 2016 Nov;33(11):794-800. doi: 10.1136/emermed-2016-205709. Epub 2016 Jun 22. PMID: 27334758; PMCID: PMC5179323.

12. Razzak J, Usmani M, Bhutta Z. Global, regional and national burden of emergency medical diseases using specific emergency disease indicators: Analysis of the 2015 Global Burden of Disease Study. BMJ Global Health. 2019;4.

13. Reynolds TA, Guisset AL, Dalil S, Relan P, Barkley S, Kelley E. Emergency, critical and operative care services for effective primary care. Bull World Health Organ. 2020 Nov 1;98(11):728-728A. doi: 10.2471/BLT.20.280016. PMID: 33177766; PMCID: PMC7607458.13.

14. Calvello Hynes EJ, Bills CB. Emergency Care Systems: The Missing Link for Effective Treatment of COVID-19 in Africa. Disaster Med Public Health Prep. 2020 Aug;14(4):e11-e12. doi: 10.1017/dmp.2020.239. Epub 2020 Jul 14. PMID: 32660671; PMCID: PMC7450233.

15. World Health Assembly. Resolution 72.16. Emergency care systems for universal health coverage: ensuring timely care for the acutely ill and injured. Geneva: world Health Organization, 2019. https://apps.who.int/gb/ebwha/pdf _ files/WHA72/A72 _ R16-en.pdf?ua=1 (Accessed30 November 2022).

16. WHO. World Health Organization: Emergency Care Systems Framework 2019. https://www.who.int/emergencycare/emergencycare _ infographic/en/ (Accessed 30 November 2022).

17. Obermeyer Z , Abujaber S , Makar M , et al. Emergency care in 59 low-and middle-income countries: a systematic review. Bull World Health Organ 2015;93:577–86.

18. Aaronson EL, Marsh RH, Guha M, Schuur JD, Rouhani SA. Emergency department quality and safety indicators in resource-limited settings: an environmental survey. Int J Emerg Med. 2015 Dec;8(1):39. doi: 10.1186/s12245-015-0088-x. Epub 2015 Oct 31. PMID: 26520848; PMCID: PMC4628609.

19. Broccoli MC, Moresky R, Dixon J, Muya I, Taubman C, Wallis LA, Calvello Hynes EJ. Defining quality indicators for emergency care delivery: findings of an expert

consensus process by emergency care practitioners in Africa. BMJ Glob Health. 2018 Feb 15;3(1):e000479. doi: 10.1136/bmjgh-2017-000479. PMID: 29527337; PMCID: PMC5841514.

20. Cannoodt L, Mock C, Bucagu M. Identifying barriers to emergency care services. Int J Health Plann Manage. 2012 Apr-Jun;27(2):e104-20. doi: 10.1002/hpm.1098. PMID: 22674816.

21. Kironji AG, Hodkinson P, de Ramirez SS, Anest T, Wallis L, Razzak J, Jenson A, Hansoti B. Identifying barriers for out of hospital emergency care in low and low-middle income countries: a systematic review. BMC Health Serv Res. 2018 Apr 19;18(1):291. doi: 10.1186/s12913-018-3091-0. PMID: 29673360; PMCID: PMC5907770.

22. Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, Okiro EA, Snow RW. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018 Mar;6(3):e342-e350. doi: 10.1016/S2214-109X(17)30488-6. Epub 2018 Jan 26. PMID: 29396220; PMCID: PMC5809715.

23. Geduld H, Hynes EJC, Wallis LA, Reynolds T. Hospital proximity does not guarantee access to emergency care. Lancet Glob Health. 2018 Jul;6(7):e731. doi: 10.1016/S2214-109X(18)30235-3. PMID: 29903374.

24. Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. Med Care. 1981 Feb;19(2):127-40. doi: 10.1097/00005650-198102000-00001. PMID: 7206846.

25. Burkholder TW, Hill K, Calvello Hynes EJ. Developing emergency care systems: a human rights-based approach. Bull World Health Organ. 2019 Sep 1;97(9):612-619.

doi: 10.2471/BLT.18.226605. Epub 2019 Jun 19. PMID: 31474774; PMCID: PMC6705504.

26. Saurman E. Improving access: modifying Penchansky and Thomas's Theory of Access. J Health Serv Res Policy. 2016 Jan;21(1):36-9. doi: 10.1177/1355819615600001. Epub 2015 Sep 15. PMID: 26377728.

27. Mohd Rosnu NS, Singh DKA, Mat Ludin AF, Ishak WS, Abd Rahman MH, Shahar S. Enablers and Barriers of Accessing Health Care Services among Older Adults in South-East Asia: A Scoping Review. Int J Environ Res Public Health. 2022 Jun 15;19(12):7351. doi: 10.3390/ijerph19127351. PMID: 35742597; PMCID: PMC9223544.

28. Abraham SAA, Doe PF, Osei Berchie G, Agyare E, Ayisi Addo S, Obiri-Yeboah D. Explorative-descriptive study on the effects of COVID-19 on access to antiretroviral therapy services: the case of a teaching hospital in Ghana. BMJ Open. 2022 May 24;12(5):e056386. doi: 10.1136/bmjopen-2021-056386. PMID: 35613780; PMCID: PMC9125379.

29. Oginni SO, Opoku MP, Nketsia W. Crisis at the intersection of four countries: healthcare access for displaced persons in the Lake Chad Basin region. Ethn Health. 2022 Oct;27(7):1698-1717. doi: 10.1080/13557858.2021.1947471. Epub 2021 Jun 28. PMID: 34182835.

30. Barnes-Josiah D, Myntti C, Augustin A. The "three delays" as a framework for examining maternal mortality in Haiti. Soc Sci Med. 1998 Apr;46(8):981-93. doi: 10.1016/s0277-9536(97)10018-1. PMID: 9579750.

31. Calvello EJ, Skog AP, Tenner AG, Wallis LA. Applying the lessons of maternal mortality reduction to global emergency health. Bull World Health Organ. 2015 Jun

1;93(6):417-23. doi: 10.2471/BLT.14.146571. Epub 2015 Mar 16. PMID: 26240463; PMCID: PMC4450708.

32. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018 Oct 2;169(7):467-473. doi: 10.7326/M18-0850. Epub 2018 Sep 4. PMID: 30178033.

33. Lagarde M, Palmer N. The impact of health financing strategies on access to health services in low and middle income countries. Cochrane Database Syst Rev. 2018 Apr 11;2018(4):CD006092. doi: 10.1002/14651858.CD006092.pub2. PMCID: PMC6494435.

34. Werner K, Risko N, Burkholder T, Munge K, Wallis L, Reynolds T. Cost-effectiveness of emergency care interventions in low and middle-income countries: a systematic review. Bull World Health Organ. 2020 May 1;98(5):341-352. doi: 10.2471/BLT.19.241158. Epub 2020 Feb 25. PMID: 32514199; PMCID: PMC7265944.

35. Risko N, Chandra A, Burkholder TW, Wallis LA, Reynolds T, Calvello Hynes EJ, Razzak J. Advancing research on the economic value of emergency care. BMJ Glob Health. 2019 Jul 29;4(Suppl 6):e001768. doi: 10.1136/bmjgh-2019-001768. PMID: 31406603; PMCID: PMC6666808.

36. Sentinel events statistics for 2011. Joint Commission Perspectives. 2012;32(5):5.

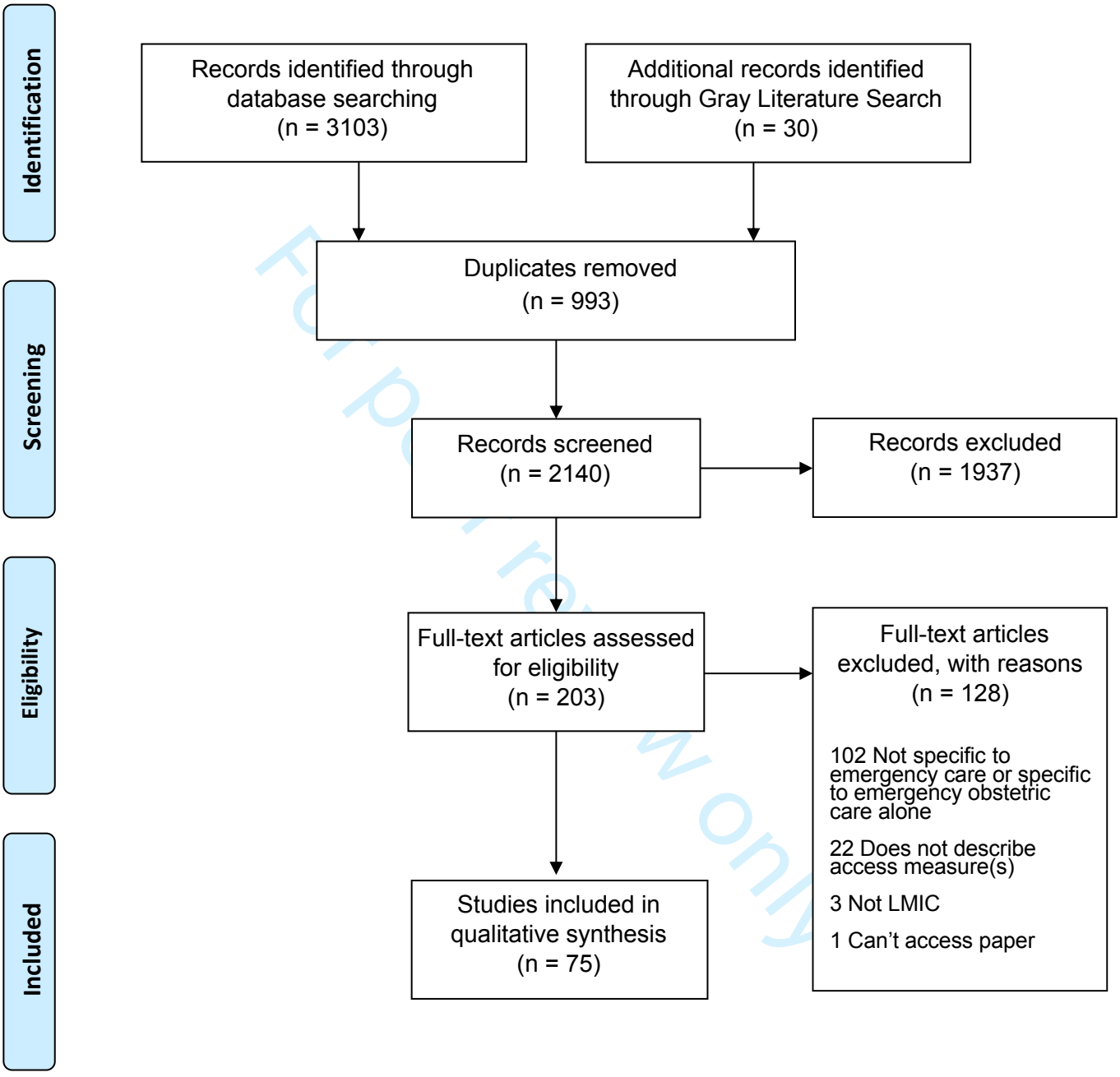
37.Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, Bickler SW, Conteh L, Dare AJ, Davies J, Mérisier ED, El-Halabi S, Farmer PE, Gawande A, Gillies R, Greenberg SL, Grimes CE, Gruen RL, Ismail EA, Kamara TB, Lavy C, Lundeg G,

Mkandawire NC, Raykar NP, Riesel JN, Rodas E, Rose J, Roy N, Shrime MG, Sullivan R, Verguet S, Watters D, Weiser TG, Wilson IH, Yamey G, Yip W. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. Int J Obstet Anesth. 2016 Feb;25:75-8. doi: 10.1016/j.ijoa.2015.09.006. Epub 2015 Sep 30. PMID: 26597405.

38. Lerner EB, Moscati RM. The golden hour: scientific fact or medical "urban legend"? Acad Emerg Med. 2001 Jul;8(7):758-60. doi: 10.1111/j.1553-2712.2001.tb00201.x. PMID: 11435197.

39. Graff L, Stevens C, Spaite D, Foody J. Measuring and improving quality in emergency medicine. Acad Emerg Med. 2002 Nov;9(11):1091-107. doi: 10.1111/j.1553-2712.2002.tb01563.x. PMID: 12414457.

Figure 1. Prisma flow diagram for review of literature on measures of access to emergency and acute care in low- and middle-income countries.



Appendix 1

Search Strategy: PUBMED
Initial Search: Feb 4 2020; Follow up search date: 11/22/2020; Second Follow up search date: 11/30/2020, revised for CINAHL performed on 11/20/2022

Emergency med terms
"emergency responder"[tw] OR "emergency responders"[tw] OR "emergency doctor"[tw] OR "emergency doctors"[tw] OR "emergency clinician"[tw] OR "emergency clinicians"[tw] OR "emergency physician"[tw] OR "emergency physicians"[tw] OR "emergency personnel"[tw] OR "emergency medical personnel"[tw] OR "emergency service"[tw] OR "emergency services"[tw] OR "emergency medical service"[tw] OR "emergency medical services"[tw] OR "emergency medicine"[tw] OR "emergency health service"[tw] OR "emergency health services"[tw] OR "emergency care"[tw] OR "emergency healthcare"[tw] OR "emergency treatment"[tw] OR "emergency treatments"[tw] OR "emergency department"[tw] OR "emergency departments"[tw] OR "emergency room"[tw] OR "emergency rooms"[tw] OR "emergency ward"[tw] OR "emergency wards"[tw] OR "emergency unit"[tw] OR "emergency units"[tw] OR "emergency hospital"[tw] OR "emergency hospitals"[tw] OR "emergency clinic"[tw] OR "emergency clinics"[tw] OR "emergency setting"[tw] OR "emergency staff"[tw] OR "emergency response"[tw] OR "emergency medical technician"[tw] OR "emergency medical technicians"[tw] OR "paramedic"[tw] OR "paramedics"[tw] OR "ambulance"[tw] OR "ambulances"[tw] OR "ER"[tw] OR "first responder"[tw] OR "first responders"[tw] OR "rescue work"[tw] OR "rescue worker"[tw] OR "rescue workers"[tw] OR "relief work"[tw] OR "relief worker"[tw] OR "relief workers"[tw] OR "firefighter"[tw] OR "firefighters"[tw] OR "fire fighter"[tw] OR "fire fighters"[tw] OR "trauma center"[tw] OR "trauma centers"[tw] OR "trauma unit"[tw] OR "trauma units"[tw] OR "critical care"[tw] OR "critical illness"[tw] OR "critical illnesses"[tw] OR "resuscitation"[tw] OR "shock"[tw] OR "sepsis"[tw] OR "septicemia"[tw] OR "septicaemia"[tw] OR "acute care"[tw] OR "acute disease"[tw] OR "acute diseases"[tw] OR "prehospital"[tw] OR "pre hospital"[tw] OR "wound"[tw] OR "wounds"[tw] OR "triage"[tw] OR "pregnancy complication"[tw] OR "pregnancy complications"[tw] OR "obstetric complication"[tw] OR "obstetric complications"[tw] OR "obstetric emergency"[tw] OR "obstetric emergencies"[tw]

AND
"Access"[tw]) AND ("availability" OR "availabl*" OR "affordab*" OR "cost" OR "distance" OR "spatial" OR "barrier" OR "barriers" OR "quality")
AND

LMIC: based on Cochrane Foundation PubMed Filter
("developing country"[tw] OR "developing countries"[tw] OR "developing nation"[tw] OR "developing nations"[tw] OR "developing population"[tw] OR "developing populations"[tw] OR "developing world"[tw] OR "less developed country"[tw] OR "less developed countries"[tw] OR "less developed nation"[tw] OR "less developed nations"[tw] OR "less developed population"[tw] OR "less developed populations"[tw] OR "less developed world"[tw] OR "lesser developed country"[tw] OR "lesser developed countries"[tw] OR "lesser developed nation"[tw] OR "lesser developed nations"[tw] OR "lesser developed population"[tw] OR "lesser developed populations"[tw] OR "lesser developed world"[tw] OR "least developed country"[tw] OR "least developed countries"[tw] OR "least developed nation"[tw] OR "least developed nations"[tw] OR "least developed population"[tw] OR "least developed populations"[tw] OR "least developed world"[tw] OR "under developed country"[tw] OR "under developed countries"[tw] OR "under developed nation"[tw] OR "under developed nations"[tw] OR "under developed population"[tw]

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OVID, Global Health (CABI):
Used Identical terms as Embase

Embase:
Date of Search: Feb 6 2020

Access terms

('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies')
AND 'Access' AND ('availability' OR 'availabl*' OR 'affordab*' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') AND ('emergency responder' OR 'emergency responders' OR 'emergency doctor' OR 'emergency doctors' OR 'emergency clinician' OR 'emergency clinicians' OR 'emergency physician' OR 'emergency physicians' OR 'emergency personnel' OR 'emergency medical personnel' OR 'emergency service' OR 'emergency services' OR 'emergency medical service' OR 'emergency medical services' OR 'emergency medicine' OR 'emergency health service' OR 'emergency health services' OR 'emergency care' OR 'emergency healthcare' OR 'emergency treatment' OR 'emergency treatments' OR 'emergency department' OR 'emergency departments' OR 'emergency room' OR 'emergency rooms' OR 'emergency ward' OR 'emergency wards' OR 'emergency unit' OR 'emergency units' OR 'emergency hospital' OR 'emergency hospitals' OR 'emergency clinic' OR 'emergency clinics' OR 'emergency setting' OR 'emergency staff' OR 'emergency response' OR 'emergency medical technician' OR 'emergency medical technicians' OR 'paramedic' OR 'paramedics' OR 'ambulance' OR 'ambulances' OR 'ER' OR 'first responder' OR 'first responders' OR 'rescue work' OR 'rescue worker' OR 'rescue workers' OR 'relief work' OR 'relief worker' OR 'relief workers' OR 'firefighter' OR 'firefighters' OR 'fire fighter' OR 'fire fighters' OR 'trauma center' OR 'trauma centers' OR 'trauma unit' OR 'trauma units' OR 'critical care' OR 'critical illness' OR 'critical illnesses' OR 'resuscitation' OR 'shock' OR 'sepsis' OR 'septicemia' OR 'septicaemia' OR 'acute care' OR 'acute disease' OR 'acute diseases' OR 'prehospital' OR 'pre hospital' OR 'wound' OR 'wounds' OR 'triage' OR 'pregnancy complication' OR 'pregnancy complications' OR 'obstetric complication' OR 'obstetric complications' OR 'obstetric emergency' OR 'obstetric emergencies') AND ('developing country' OR 'middle income country' OR 'middle income countr*' OR 'low income country' OR 'global medicine' OR 'third world' OR 'underserved countr*' OR 'resource limited country' OR 'lmic*' OR 'low income economy' OR 'middle income economy' OR 'underdeveloped countr*' OR 'underdeveloped economy' OR 'poor countr*' OR 'poor nation' OR 'world health' OR 'middle-income countr*' OR 'transitional countr*' OR 'lower middle income countr*' OR 'upper middle income' OR 'less developed countr*' OR 'lesser developed countr*' OR 'developing countr*' OR 'developing nation' OR 'lower-middle income countr*' OR 'upper-middle income countr*' OR 'low-income countr*' OR 'deprived countr*' OR 'low gdp' OR 'lami

countr*' OR 'poorer nation' OR 'under served countr*' OR 'under served nation' OR 'lower income population' OR 'low income population' OR 'developing world' OR 'africa' OR 'asia' OR 'caribbean' OR armenian OR aruba OR byelorussian OR belarus OR belorussian OR belorussia OR bosnia OR herzegovina OR hercegovina OR brasil OR 'comoro islands' OR comores OR mayotte OR zaire OR 'ivory coast' OR 'slovak republic' OR 'french somaliland' OR 'east timur' OR 'timor leste' OR 'united arab republic' OR 'gabonese republic' OR gaza OR 'georgia republic' OR 'georgian republic' OR 'gold coast' OR guiana OR maldives OR 'isle of man' OR kazakh OR kiribati OR kirghizia OR 'kyrgyz republic' OR kirghiz OR kirgizstan OR basutoland OR 'malagasy republic' OR malaya OR malay OR sabah OR sarawak OR nyasaland OR 'marshall islands' OR 'agalega islands' OR moldovia OR moldovian OR ifni OR myanma OR burma OR 'northern mariana islands' OR muscat OR palestine OR philipines OR phillipines OR phillippines OR rumania OR roumania OR russian OR ruanda OR 'saint kitts' OR 'st kitts' OR nevis OR 'st lucia' OR 'st vincent' OR 'samoan islands' OR 'navigator island' OR 'navigator islands' OR 'sao tome' OR ceylon OR 'solomon islands' OR surinam OR tadzhikistan OR tadjikistan OR tadzhik OR 'togolese republic' OR turkmen OR 'soviet union' OR 'union of soviet socialist republics' OR uzbek OR 'new hebrides' OR 'viet nam' OR 'west bank' OR rhodesia OR africa OR 'africa, northern' OR 'africa south of the sahara' OR 'africa, central' OR 'africa, eastern or africa, southern' OR 'africa, western or asia' OR 'asia, central' OR 'asia, southeastern' OR 'asia, western' OR 'caribbean region' OR 'west indies' OR 'south america' OR 'latin america' OR 'central america' OR afghanistan OR albania OR algeria OR 'american samoa' OR angola OR antigua OR barbuda OR argentina OR armenia OR azerbaijan OR bahrain OR bangladesh OR barbados OR benin OR byelarus OR belize OR bhutan OR bolivia OR 'bosnia-herzegovina' OR botswana OR brazil OR bulgaria OR 'cape verde' OR 'central african republic' OR chad OR chile OR china OR colombia OR comoros OR congo OR 'costa rica' OR 'cote d ivoire' OR croatia OR cuba OR cyprus OR czechoslovakia OR 'czech republic' OR slovakia OR djibouti OR 'democratic republic of the congo' OR dominica OR 'dominican republic' OR 'east timor' OR ecuador OR egypt OR 'el salvador' OR eritrea OR estonia OR ethiopia OR fiji OR gabon OR gambia OR georgia OR ghana OR greece OR grenada OR guatemala OR guinea OR 'guinea-bissau' OR guam OR guyana OR haiti OR honduras OR hungary OR india OR indonesia OR iran OR iraq OR jamaica OR jordan OR kazakhstan OR kenya OR korea OR kosovo OR kyrgyzstan OR laos OR latvia OR lebanon OR lesotho OR liberia OR libya OR lithuania OR macedonia OR madagascar OR malaysia OR malawi OR mali OR malta OR mauritania OR mauritius OR mexico OR micronesia OR 'middle east' OR moldova OR mongolia OR morocco OR mozambique OR myanmar OR namibia OR nepal OR 'netherlands antilles' OR 'new caledonia' OR nicaragua OR niger OR nigeria OR oman OR pakistan OR palau OR panama OR 'papua new guinea' OR paraguay OR peru OR philippines OR poland OR portugal OR 'puerto rico' OR romania OR russia OR rwanda OR 'saint lucia' OR 'saint vincent' OR grenadines OR samoa OR 'saudi arabia' OR senegal OR serbia OR montenegro OR seychelles OR 'sierra leone' OR slovenia OR 'sri lanka' OR somalia OR 'south africa' OR sudan OR suriname OR swaziland OR syria OR tajikistan OR tanzania OR thailand OR togo OR tonga OR trinidad OR tobago OR tunisia OR turkey OR turkmenistan OR uganda OR ukraine OR uruguay OR ussr OR uzbekistan OR vanuatu OR venezuela OR vietnam OR yemen OR yugoslavia OR zambia OR zimbabwe OR 'burkina faso' OR 'upper volta' OR burundi OR urundi OR cambodia OR 'khmer republic' OR kampuchea OR cameroon OR cameroons OR 'cameron or' AND camerons OR 'cape verde' OR 'central african republic' OR 'pacific region' OR 'pacific island'

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Web of Science:
Date of Initial Search: Feb 6, 2020; Date of second search: Nov 30 2020
TS= 'Access' AND ('availability' OR 'availabl*' OR 'affordab*' OR 'cost' OR 'distance' OR 'spatial' OR 'barrier' OR 'barriers' OR 'quality') ANDAND
(emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response" OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "fire fighter" OR "fire fighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies")
AND

TS=("developing countr*" OR "developing nation*" OR "developing population*" OR "less developed countr*" OR "less developed nation*" OR "less developed population*" OR "lesser developed countr*" OR "lesser developed nation*" OR "lesser developed population*" OR "lesser developed world" OR "least developed countr*" OR "least developed nation*" OR "least developed population*" OR "least developed world" OR "under developed countr*" OR "under developed nation*" OR "under developed population*" OR "under developed world" OR "underdeveloped countr*" OR "underdeveloped nation*" OR "underdeveloped population*" OR "underdeveloped world" OR "middle income countr*" OR "middle income nation*" OR "middle income population*" OR "low income countr*" OR "low income nation*" OR "low income population" OR "low income population*" OR "lower income countr*" OR "lower income nation*" OR "lower income population*" OR "underserved countr*" OR "underserved nation*" OR "underserved population*" OR "underserved world" OR "under served countr*" OR "under served nation*" OR "under served population*" OR "under served world" OR "deprived countr*" OR "deprived nation*" OR "deprived population*" OR "deprived world" OR "poor countr*" OR "poor nation*" OR "poor population*" OR "poor world" OR "poorer countr*" OR "poorer nation*" OR "poorer population*" OR "poorer world" OR "developing econom*" OR "less developed econom*" OR "lesser developed econom*" OR "under developed econom*" OR "underdeveloped econom*" OR "middle income econom*" OR "low income econom*" OR "lower income econom*" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmics OR "third world" OR "lami countr*" OR "transitional countr*" OR Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR

Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cameron OR Camerons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Rhodesia OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR Navigator Island OR Navigator Islands OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe)

TS=(Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response"

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Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Rhodesia OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR Navigator Island OR Navigator Islands OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe))

Global Index Medicus:
Initial Search Date: Feb 6, 2020
Access AND (availability OR availabl* OR affordab* OR cost OR distance OR spatial OR barrier OR barriers OR quality) AND ("emergency responder" OR "emergency responders" OR "emergency doctor" OR "emergency doctors" OR "emergency clinician" OR "emergency clinicians" OR "emergency physician" OR "emergency physicians" OR "emergency personnel" OR "emergency medical personnel" OR "emergency service" OR "emergency services" OR "emergency medical service" OR "emergency medical services" OR "emergency medicine" OR "emergency health service" OR "emergency health services" OR "emergency care" OR "emergency healthcare" OR "emergency treatment" OR "emergency treatments" OR "emergency department" OR "emergency departments" OR "emergency room" OR "emergency rooms" OR "emergency ward" OR "emergency wards" OR "emergency unit" OR "emergency units" OR "emergency hospital" OR "emergency hospitals" OR "emergency clinic" OR "emergency clinics" OR "emergency setting" OR "emergency staff" OR "emergency response" OR "emergency medical technician" OR "emergency medical technicians" OR "paramedic" OR "paramedics" OR "ambulance" OR "ambulances" OR "ER" OR "first responder" OR "first responders" OR "rescue work" OR "rescue worker" OR "rescue workers" OR "relief work" OR "relief worker" OR "relief workers" OR "firefighter" OR "firefighters" OR "fire fighter" OR "fire fighters" OR "trauma center" OR "trauma centers" OR "trauma unit" OR "trauma units" OR "critical care" OR "critical illness" OR "critical illnesses" OR "resuscitation" OR "shock" OR "sepsis" OR "septicemia" OR "septicaemia" OR "acute care" OR "acute disease" OR "acute diseases" OR "prehospital" OR "pre hospital" OR "wound" OR "wounds" OR "triage" OR "pregnancy complication" OR "pregnancy complications" OR "obstetric complication" OR "obstetric complications" OR "obstetric emergency" OR "obstetric emergencies")

Supplementary Material

eTable 1. Baseline information on included articles.

Reference No	Primary Author	Citation	Country	WHO Region*	World Bank**	Location	Setting type*	Setting*	Article type	Methodology	Study year(s)	Participant numbers	Participant type
17	Adewole	Adewole OA, Fadeyibi IO, Kayode MO, Giwa SO, Shoga MO, Adejumo AO, Ademiluyi SA. Ambulance services of Lagos state, Nigeria: a six-year (2001-2006) audit. West Afr J Med. 2012;31:3–7.	Nigeria	African	Low	Lagos State	Regional	Urban	Quant	Cross sectional	2001-2006	32,774	Cases
10	Ahmed	Ahmed S, Adams AM, Islam R, Hasan SM, Panciera R. Impact of traffic variability on geographic accessibility to 24/7 emergency healthcare for the Urban poor: A GIS study in Dhaka, Bangladesh. PLoS One. 2019;14(9):e0222488.	Bangladesh	South-East Asia	Lower-middle	Dhaka	Regional	Urban	Quant	Cross sectional	2014	N/A	N/A
13	Ali	Ali M, Miyoshi C, Ushijima H. Emergency medical services in Islamabad, Pakistan: a public-private partnership. Public Health. 2006;120:50–7.	Pakistan	South-East Asia	Lower-middle	Islamabad	Regional	Urban	Quant	Mixed methods	2000-2001	N/A	N/A
4	Alibhai	Alibhai A, Hendrikse C, Bruijns SR. Poor access to acute care resources to treat major trauma in low- and middle-income settings: A self-reported survey of acute care providers. Afr J Emerg Med. 2019;9(Suppl):S38-S42.	Multinational	African	N/A	N/A	International	N/A	Quant	Descriptive Survey	2016	392	Conference delegates
5	Amparo	Amparo ACB, Jayme SI, Roces MCR, Quizon MCL, Mercado MLL, Dela Cruz MPZ, Licuan DA, Villalon EES 3rd, Baquilod MS, Hernandez LM, Taylor LH, Nel LH. The evaluation of Animal Bite Treatment Centers in the Philippines from a patient perspective. PLoS One. 2018 Jul 26;13(7):e0200873.	Philippines	Western Pacific	Lower-middle	Nueva Vizcaya, Palawan and Tarlac Districts	Regional	Both	Quant	Descriptive survey	2017	3537	Households
6	Anest	Anest T, Stewart de Ramirez S, Balhara KS, Hodkinson P, Wallis L, Hansoti B. Defining and improving the role of emergency medical services in Cape Town, South Africa. Emerg Med J. 2016;33(8):557-61.	South Africa	African	Upper-middle	Cape Town	Regional	Urban	Qual	Descriptive Interview	2013	24	Interviewed individuals
7	Anyumba	Anyumba G. Thohoyandou's central business district and the hypothetical accessibility challenges for emergency services. Jamba. 2019;11(2):681.	South Africa	African	Upper-middle	Thohoyandou	Regional	Urban	Quant	Cross sectional	2019	N/A	N/A
8	Aries	Ariës M, Joosten H, Wegdam H, van der Geest S. 2007. Fracture treatment by bonesetters in central Ghana: patients explain their choices and experiences. Tropical Medicine & InterNational Health 12(4): 564–574.	Ghana	African	Low	Brong Ahafo Region	Local	Urban	Both	Mixed methods	2005	46	Patients
9	Bachani	Bachani AM, Botchey I, Paruk F, Wako D, Saidi H, Aliwa B, et al. Nine-point plan to improve care of the injured patient: A case study from Kenya. Surgery. 2017;162(6S):S32-S44.	Kenya	African	Lower-middle	Kenya	National	N/A	Quant	Cross sectional	2011	N/A	N/A
10	Bast	Bast HE, Jenkins JL. Challenges to Prehospital Care in Honduras. Prehosp Disaster Med. 2018;33(6):637-9.	Honduras	Americas	Lower-middle	Honduras	National	N/A	Qual	Descriptive Interview	2018	N/A	N/A
11	Bhopal	Bhopal SS, Halpin SJ, Gerein N. Emergency obstetric referral in Rural Sierra Leone: what can motorbike ambulances contribute? A mixed-methods study. Matern Child Health J. 2013;17:1038–43.	Sierra Leone	African	Low	Kambia region	Regional	Rural	Both	Mixed methods	2013	N/A	N/A

Bigdeli	Bigdeli M, Khorasani-Zavareh D, Mohammadi R. Pre-hospital care time intervals among victims of road traffic injuries in Iran. A cross-sectional study. Bmc Public Health. 2010;10.	Iran	Eastern Mediterranean	Upper-middle	Urmia, Iran	Regional	Urban	Quant	Cross sectional	2005-2007	N/A	N/A
Broccoli	Broccoli MC, Calvello EJ, Skog AP, Wachira B, Wallis LA. Perceptions of emergency care in Kenyan communities lacking access to formalised emergency medical systems: a qualitative study. BMJ Open. 2015;5(11):e009208.	Kenya	African	Lower-middle	Kenya	National	N/A	Qual	Descriptive Interview	2015	528	Focus group members
Broccoli	Broccoli MC, Cunningham C, Twomey M, Wallis LA. Community-based perceptions of emergency care in Zambian communities lacking formalised emergency medicine systems. Emerg Med J. 2016;33(12):870-5.	Zambia	African	Lower-middle	Zambia	National	N/A	Qual	Descriptive Interview	2016	183	Focus group members
Burke	Burke TF, Hines R, Ahn R, Walters M, Young D, Anderson RE, et al. Emergency and urgent care capacity in a resource-limited setting: an assessment of health facilities in western Kenya. BMJ Open. 2014;4(9):e006132.	Kenya	African	Lower-middle	Western Kenya	Regional	Both	Qual	Descriptive Interview	2013-2014	60	Key informants
Chunga	Chunga R, Bruijns SR, Hendrikse C. Access to acute care resources in various income settings to treat new-onset stroke: A survey of acute care providers. Afr J Emerg Med. 2019;9(2):77-80.	Multinational	N/A	N/A	N/A	International	N/A	Qual	Descriptive Survey	2016	382	Healthcare Providers
Comery	Comery B, Perry WRG, Young S, Dare A, Matalavea B, Bissett IP, Windsor JA. Delivery of surgical care in Samoa: perspectives on capacity, barriers and opportunities by local providers. ANZ J Surg. 2020 Oct;90(10):1910-1914.	Samoa	Western Pacific	Lower-middle	Samoa	National	N/A	Qual	Descriptive Interview	2016	N/A	Key informants
Coyle	Coyle RM, Harrison HL. Emergency care capacity in Freetown, Sierra Leone: a service evaluation. BMC Emerg Med. 2015;15(1):2	Sierra Leone	African	Low	Freetown, Sierra Leone	Regional	Urban	Qual	Cross sectional	2015	N/A	N/A
De Wulf	DeWulf A, Otchi EH, Soghoian S. Identifying priorities for quality improvement at an emergency Department in Ghana. BMC Emerg Med. 2017;17(1):28.	Ghana	African	Lower-middle	Urban Ghana.	Local	Urban	Qual	Descriptive Survey	5-Jul	18	EU staff members
De Wulf	De Wulf A, Aluisio AR, Muhlfelder D, Bloem C. Emergency Care Capabilities in North East Haiti: A Cross-sectional Observational Study. Prehosp Disaster Med. 2015;30(6):553-9.	Haiti	Americas	Low	Fort Liberté District, Haiti	Regional	Rural	Qual	Cross sectional	2012	N/A	N/A
El Tayeb	El Tayeb S, Abdalla S, Van den Bergh G, Heuch I. Use of healthcare services by injured people in Khartoum State, Sudan. InterNational Health. 2015;7(3):183-9.	Sudan	Eastern Mediterranean	Lower-middle	Sudan	Regional	Urban	Qual	Descriptive Survey	2010	N/A	N/A
Elbashir	Elbashir K, Gore RJ, Abuaaraki T, Roblin P, Botha M, Yousif M, Ostrovskiys G, Bloem C, James SA. Prehospital emergency care and injury prevention in Sudan. Afr J Emerg Med. 2014;4:170–3.	Sudan	African	Low	Sudan	National	N/A	Qual	Cross sectional	2008 - 2014	N/A	N/A
Emerick	Emmerick IC, Luiza VL, Camacho LA, Ross-Degnan D. Access to medicines for acute illness in middle income countries in Central America. Rev Saude Publica. 2013;47(6):1069-79.	Multinational	Americas	N/A	Central American Countries	International	Both	Qual	Cross sectional	2013	2,761	Households
Hashtarkhani	Hashtarkhani S, Kiani B, Bergquist R, Bagheri N, VafaeiNejad R, Tara M. An age-integrated approach to improve measurement of potential spatial accessibility to emergency medical services for Urban areas. Int J Health Plann Manage. 2020;35(3):788-98.	Iran	Eastern Mediterranean	Upper-middle	Mashhad City, Iran	Regional	Urban	Quant	Cross sectional	2016	N/A	N/A

Hodkinson	Hodkinson PW, Pigoga JL, Wallis L. Emergency healthcare needs in the Lavender Hill suburb of Cape Town, South Africa: a cross-sectional, community-based household survey. BMJ Open. 2020;10(1):e033643.	South Africa	African	Upper-middle	Lavender Hill suburb of Cape Town, South Africa	Regional	Urban	Qual	Descriptive Survey	2018	2754	Interviewed individuals
Hsia	Hsia RY, Mbembati N/A, Macfarlane S, Kruk ME. Access to emergency and surgical care in sub-Saharan Africa: the infrastructure gap. Health Policy Plan. 2012;27(3):234-44.	Multinational	African	N/A	Ghana, Kenya, Rwanda, Tanzania, Uganda	International	N/A	Quant	Cross sectional	2012	N/A	N/A
Jacobs	Jacobs B, Men C, Sam OS, Postma S. Ambulance services as part of the district health system in low-income countries: a feasibility study from Cambodia. InterNational Journal of Health Planning and Management. 2016;31(4):414-29.	Cambodia	South-East Asia	Lower-middle	Cambodia	National	N/A	Qual	Descriptive Interview	2013	N/A	N/A
Khan	Khan AN, Rubin DH. 2003. InterNational pediatric emergency care: establishment of a new specialty in a developing country. Pediatric Emergency Care 19(3): 0181	Kosove	European Region	Upper-middle	Pristina University Hospital	Local	Urban	Quant	Cross sectional	2002	N/A	N/A
Khan	Khan A, Zafar H, Naeem SN, Raza SA. Transfer delay and in-hospital mortality of trauma patients in Pakistan. Int J Surg. 2010;8:155–8.	Pakistan	South-East Asia	Lower-middle	Aga Khan University Hospital, Karachi	Local	Urban	Quant	Cross sectional	1998-2005	N/A	N/A
Kirsch	Kirsch T, Hilwig W, Holder Y, Smith G, Pooran S, Edwards R. 1995. Epidemiology and practice of emergency medicine in a developing country. Annals of Emergency Medicine 26(3): 361–367.	Trinidad and Tobago	Americas	Lower-middle	Port of Spain,	Local	Urban	Qual	Descriptive Interview	N/A	N/A	N/A
Kumar	Kumar S, Chaudhary S, Kumar A, Agarwal AK, Misra MC. Trauma care - a participant observer study of trauma centers at Delhi, Lucknow and Mumbai. Indian J Surg. 2009;71:133–41.	India	South-East Asia	Lower-middle	Delhi, Lucknow, Mumbai	Regional	Urban	Quant	Cross sectional	2009	N/A	N/A
Levine	Levine AC, Presser DZ, Rosborough S, Ghebreyesus TA, Davis MA. Understanding barriers to emergency care in low-income countries: view from the front line. Prehosp Disaster Med. 2007;22(5):467-70.	Ethiopia	African	Low	Tigray	Regional	Rural	Qual	Descriptive Survey	2006	N/A	N/A
Luo	Luo W, Yao J, Mitchell R, Zhang X. Spatiotemporal access to emergency medical services in Wuhan, China: accounting for scene and transport time intervals. Int J Health Geogr. 2020;19(1):52	China	Western Pacific	Upper-middle	Wuhan	Regional	Urban	Quant	Cross sectional	2020	N/A	N/A
Macharia	Macharia WM, Njeru EK, Muli-Musiime F, Nantulya V. Severe road traffic injuries in Kenya, quality of care and access. Afr Health Sci. 2009;9(2):118-24.	Kenya	African Region	Lower-middle	Kenya	National	N/A	Qual	Cross sectional	1997-1998	N/A	N/A
Mahmood	Mahmood KT, Amin F, Ayub H, Yaqoob M, Zaka M. Management of the patient from the site of accident to the hospital/ pre-hospital care. J Pharm Sci Res. 2010;2:804–8.	Pakistan	South-East Asia	Lower-middle	Pakistan	National	N/A	Qual	Cross sectional	2010	N/A	N/A
Mathew	Mathew A, Abdullakutty J, Sebastian P, Viswanathan S, Mathew C, Nair V, et al. Population access to reperfusion services for ST-segment elevation myocardial infarction in Kerala, India. Indian Heart J. 2017;69 Suppl 1(Suppl 1):S51-S6.	India	South-East Asia	Lower-middle	Kerala	Regional	Urban	Quant	Cross sectional	2017	N/A	N/A

Mock	Mock C, nii-Amon-Kotei D, Maier R. 1997. Low utilization of formal medical services by injured persons in a developing nation: health service data underestimate the importance of trauma. The Journal of Trauma: Injury, Infection, nd Critical Care 42(3): 504–513.	Ghana	African	Lower-middle	Ghana	National	N/A	Qua	Descriptive Interview	1995	21105	Interviewed individuals
Mock	Mock C, Ofosu A, Gish O. 2001. Utilization of district health services by injured persons in a Rural area of Ghana. The InterNational Journal of Health Planning and Management 16: 19–32.	Ghana	African	Lower-middle	Ghana	National	N/A	Qua	Descriptive Interview	1995	9442	interviewed individuals
Mock	Mock C, Nguyen S, Quansah R, Arreola-Risa C, Viradia R, Joshipura M. 2006. Evaluation of trauma care capabilities in four countries using the WHO-IATSIC Guidelines for essential trauma care. World Journal of Surgery 30: 946–956.	Multinational	N/A	N/A	Mexico, Vietnam, India, Ghana	International	N/A		Descriptive Interview	2006	N/A	N/A
Mohan	Mohan B, Bansal R, Dogra N, Sharma S, Chopra A, Varma S, et al. Factors influencing prehospital delay in patients presenting with ST-elevation myocardial infarction and the impact of prehospital electrocardiogram. Indian Heart J. 2018;70 Suppl 3(Suppl 3):S194-S8.	India	South-East Asia	Lower-middle	Punjab	Regional	Urban	nt	Cross sectional	2015	619	Patients
Mould-Millman	Mould-Millman NK, Oteng R, Zakariah A, Osei-Ampofo M, Oduro G, Barsan W, et al. Assessment of Emergency Medical Services in the Ashanti Region of Ghana. Ghana Med J. 2015;49(3):125-35.	Ghana	African	Lower-middle	Ashanti Region	Regional	Urban		Cross sectional	2012	N/A	N/A
Mould-Millman	Mould-Millman NK, Rominski SD, Bogus J, Ginde AA, Zakariah AN, Boatemaah CA, et al. Barriers to Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana. Glob Health Sci Pract. 2015;3(4):577-90.	Ghana	African	Lower-middle	Accra	Regional	N/A	Qua	Cross sectional	2013	468	Survey participants
Mould-Millman	Mould-Millman NK, Dixon JM, Sefa N, Yancey A, Hollong BG, Hagahmed M, et al. The State of Emergency Medical Services (EMS) Systems in Africa. Prehospital and Disaster Medicine. 2017;32(3):273-83	Multinational	African	N/A	N/A	International	N/A	Qua	Cross sectional	2013-2014	N/A	N/A
Nagata	Nagata T, Takamori A, Kimura Y, Kimura A, Hashizume M, Nakahara S. Trauma center accessibility for road traffic injuries in Hanoi, Vietnam. J Trauma Manag Outcomes. 2011;5:11.	Vietnam	South-East Asia	Lower-middle	Hanoi	Regional	Urban	nt	Cross sectional	2006	N/A	N/A
Natuzzi	Natuzzi ES, Kushner A, Jagilly R, Pickacha D, Agiomea K, Hou L, Houasia P, Hendricks PL, Ba'erodo D. Surgical care in the Solomon Islands: a road map for universal surgical care delivery. World J Surg. 2011 Jun;35(6):1183-93.	Soloman Islands	Western Pacific	Lower-middle	Outer Islands	Regional	Rural	nt	Cross sectional	2009-2010	9	Health facilities
Nielsen	Nielsen K, Mock C, Joshipura M, Rubiano AM, Zakariah A, Rivara F. Assessment of the status of prehospital care in 13 low- and middle-income countries. Prehosp Emerg Care. 2012;16:381–9.	Multinational	N/A	N/A	13 LMICs in Africa, Asia, and Latin America	International	N/A	Qua	Descriptive Survey	2009–2010	N/A	N/A
Ntabaye	Ntabaye MK, Scheutz F, Poulsen S. 1998. Household survey of access to and utilization of emergency oral health care services in Rural Tanzania. East African Medical Journal 75(11): 649–653.	Tanzania	African	Lower-middle	Rungwe district, Mbeya region	Regional	Rural	Qua	Descriptive Survey	1998	1,106	Households

Ouma	Ouma PO, Maina J, Thuranira PN, Macharia PM, Alegana VA, English M, et al. Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. Lancet Glob Health. 2018;6(3):e342-e50.	MutiNational	African	N/A	N/A	International	N/A	Quant	Cross sectional	2018	N/A	N/A
Phillips	Phillips G, Creaton A, Airdhill-Enosa P, Toito'ona P, Kafoa B, O'Reilly G, Cameron P. Emergency care status, priorities and standards for the Pacific region: A multiphase survey and consensus process across 17 different Pacific Island Countries and Territories. Lancet Reg Health West Pac. 2020 Aug;1:100002.	Multinational	Western Pacific	N/A	17 regional countries	International	N/A	Both	Descriptive interviews & surveys	2018-2019	17	Key informants
Pigoga	Pigoga JL, Joiner AP, Chowa P, Luong J, Mhlanga M, Reynolds TA, et al. Evaluating capacity at three government referral hospital emergency units in the kingdom of Eswatini using the WHO Hospital Emergency Unit Assessment Tool. BMC Emerg Med. 2020;20(1):33.	Eswantini	African	Lower-middle	Eswantini	National	N/A	Quant	Cross sectional	2018	11`	Key informants
Radjou	Radjou AN, Mahajan P, Baliga DK. Where do I go? A trauma victim's plea in an informal trauma system. J Emerg Trauma Shock. 2013;6:164–70.	India	South-East Asia	Lower-middle	Puducherry territory	Regional	Urban	Quant	Cross sectional	2009-2010	N/A	N/A
Razzak	Razzak J, Cone D, Rehmani R. 2001. Emergency medical services and cultural determinants of an emergency in Karachi, Pakistan. Prehospital Emergency Care 5(3): 312–316.	Pakistan	South-East Asia	Lower-middle	Karachi	Regional	Urban	Quant	Descriptive Interview	2001	N/A	N/A
Ro	Ro YS, Shin SD, Jeong J, Kim MJ, Jung YH, Kamgno J, et al. Evaluation of demands, usage and unmet needs for emergency care in Yaounde, Cameroon: a cross-sectional study. Bmj Open. 2017;7(2).	Cameroon	African	Lower-middle	Yaoundé	Regional	Urban	Quant	Cross sectional	2017	658	Households
Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Addressing geographic access barriers to emergency care services: a National ecologic study of hospitals in Brazil. Int J Equity Health. 2017;16(1):149.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Cross sectional	2017	N/A	N/A
Rocha	Rocha TAH, da Silva NC, Amaral PV, Barbosa ACQ, Rocha JVM, Alvares V, et al. Access to emergency care services: a transversal ecological study about Brazilian emergency health care network. Public Health. 2017;153:9-15.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Cross sectional	2017	N/A	N/A
Roy	Roy N, Murlidhar V, Chowdhury R, Patil SB, Supe PA, Vaishnav PD, Vatkar A. Where there are no emergency medical services-prehospital care for the injured in Mumbai, India. Prehospital Disaster Med. 2010;25:145–51.	India	South-East Asia	Lower-middle	Mumbai	Local	Urban	Quant	Cross sectional	2005	170	Patients
Scolari	Scolari GAS, Rissardo LK, Baldissera VDA, Carreira L. Emergency care units and dimensions of accessibility to health care for the elderly. Rev Bras Enferm. 2018;71 Suppl†2:811-7.	Brazil	Americas	Upper-middle	Brazil	National	N/A	Quant	Descriptive Survey	2018	N/A	N/A
Sheikhbardsiri	Sheikhbardsiri H, Esamaeili Abdar Z, Sheikhasadi H, Ayoubi Mahani S, and Sarani A. Observance of patients' rights in emergency department of educational hospitals in south-east Iran. International Journal of Human Rights in Healthcare. 2020; 13 (5):435-444.	Iran	Eastern Mediterranean	Upper-middle	Kerman	Regional	Urban	Quant	Descriptive survey	2018	382	Patients

Siddiqui	Siddiqui M, Siddiqui SR, Zafar A, Khan FS. Factors delaying hospital arrival of patients with acute stroke. J Pak Med Assoc. 2008;58:178–82.	Pakistan	South-East Asia	Lower-middle	Karachi	Local	Urban	Quant	Cross sectional	2006-2007	165	Patients
Sodemann	Sodemann M, Biai S, Jakobsen MS, Aaby P. Knowing a medical doctor is associated with reduced mortality among sick children consulting a paediatric ward in Guinea-Bissau, West Africa. Trop Med Int Health. 2006;11(12):1868-77.	Guinea-Bissau	African	Low	Guinea-Bissau	Local	Urban	Quant	Descriptive Interview	2001	1572	Patients
Sohayla	Sohayla M. Attalla, Feona AK Tema. Awareness and Accessibility of the Immigrants to the Healthcare Services in Shah Alam, Malaysia; A Pilot Study. European Journal of Molecular & Clinical Medicine, 7, 3, 2020, 5396-5404.	Malaysia	Western Pacific	Upper-middle	Shah Alam	Local	Urban	Quant	Descriptive survey	2020	300	Survey participants
Stein	Stein C, Mould-Millman NK, De Vries S, Wallis L. Access to out-of-hospital emergency care in Africa: Consensus conference recommendations. Afr J Emerg Med. 2016;6(3):158-61.	MutiNational	African	N/A	N/A	N/A	N/A	Quant	Cross sectional	2015	N/A	N/A
Sultan	Sultan M, Abebe Y, Tsadik AW, Ababa A, Yesus AG, Mould-Millman NK. Trends and barriers of emergency medical service use in Addis Ababa; Ethiopia. BMC Emerg Med. 2019;19(1):28.	Ethiopia	African	Low	Ethiopia	National	N/A	Quant	Cross sectional	2017	429	survey participants
Suriyawongpaisal	Suriyawongpaisal P, Atiksawedparit P, Srithamrongsawad S, Thongtan T. Closing the Equity Gap of Access to Emergency Departments of Private Hospitals in Thailand. Emerg Med Int. 2018;2018:6470319.	Thailand	South-East Asia	Upper-middle	Thailand	National	N/A	Quant	Cross sectional	2017	20,206	patients
Suriyawongpaisal	Suriyawongpaisal P, Aekplakorn W, Srithamrongsawat S, Srithongchai C, Prasitsiriphon O, Tansirisithikul R. Copayment and recommended strategies to mitigate its impacts on access to emergency medical services under universal health coverage: a case study from Thailand. BMC Health Serv Res. 2016;16(1):606.	Thailand	South-East Asia	Upper-middle	Thailand	National	N/A	Quant	Mixed methods	2012	N/A	N/A
Tansley	Tansley G, Schuurman N, Amram O, Yanchar N. Spatial Access to Emergency Services in Low- and Middle-Income Countries: A GIS-Based Analysis. PLoS One. 2015;10(11):e0141113.	Multinational	N/A	N/A	N/A	International	N/A	Quant	Cross sectional	2015	N/A	N/A
Tansley	Tansley G, Stewart B, Zakariah A, Boateng E, Achena C, Lewis D, et al. Population-level spatial access to prehospital care by the national ambulance service in Ghana. Prehosp Emerg Care. 2016;20(6):768-75.	Ghana	African	Lower-middle	Ghana	National	N/A	Quant	Cross sectional	2016	N/A	N/A
Thomson	Thomson N. Emergency medical services in Zimbabwe. Resuscitation. 2005;65(1):15-9.	Zimbabwe	African	Lower-middle	Zimbabwe	National	N/A	Quant	Cross sectional	2005	N/A	N/A
Treleaven	Treleaven E, Pham TN, Le DN, Brooks TN, Le HT, Partridge JC. Referral patterns, delays, and equity in access to advanced paediatric emergency care in Vietnam. Int J Equity Health. 2017;16(1):215.	Vietnam	Western Pacific	Lower-middle	Hanoi	Local	Urban	Quant	Cross sectional	2013	557	Patients
Vanderschuren	Vanderschuren M, McKune D. Emergency care facility access in Rural areas within the golden hour?: Western Cape case study. Int J Health Geogr. 2015;14:5.	South Africa	African	Upper-middle	South Africa	Regional	Rural	Quant	Cross sectional	2015	N/A	N/A
Wen	Wen LS, Char D. Existing infrastructure for the delivery of emergency care in post-conflict Rwanda: an initial descriptive study. Acad Emerg Med. 2011;18:S243.	Rwanda	African	Low	Kigali	Regional	Urban	Quant	Mixed methods	2007	60	Health care workers

Wesson	Wesson HK, Stevens KA, Bachani AM, Mogere S, Akungah D, Nyamari J, Masasabi Wekesa J, Hyder AA. Trauma systems in Kenya: a qualitative analysis at the district level. Qual Health Res. 2015 May;25(5):589-99.	Kenya	African	Lower-middle	Kenya	Regional	Urban	Qual	Descriptive Interview	2011	N/A	N/A
WHO/ UNICEF	WHO/UNICEF. Water, Sanitation and Hygiene in Health Care Facilities: Status in Low and Middle Income Countries and Way Forward. Geneva, Switzerland: World Health Organization, 2015.	Multinational	N/A	Lower and middle	54 countries	International	NA	Quant	Cross-sectional	1998-2014	90	Heath care facilities
Zaidi	Zaidi SM, Labrique AB, Khowaja S, Lotia-Farrukh I, Irani J, Salahuddin N, et al. Geographic variation in access to dog-bite care in Pakistan and risk of dog-bite exposure in Karachi: prospective surveillance using a low-cost mobile phone system. PLoS Negl Trop Dis. 2013;7(12):e2574.	Pakistan	Eastern Mediterranean	Lower-middle	Karachi	Regional	Urban	Quant	Cross sectional	2009-2011	N/A	N/A
Zimmerman	Zimmerman A, Fox S, Griffin R, Nelp T, Thomaz E, Mvungi M, et al. An analysis of emergency care delays experienced by traumatic brain injury patients presenting to a regional referral hospital in a low-income country. PLoS One. 2020;15(10):e0240528.	Tanzania	African	Low	Tanzania	Regional	Urban	Quant	Cross sectional	2013-2017	3209	Patients

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eTable 2. Individual access measures and outcomes by article.

Reference No.	Author (year)	Measures	Outcomes
1	Adewole (2012)	1. Geographic barriers	1. Rural population has less access, traffic impedes access
2	Ahmed (2019)	Percent of slums that have	Percent of slums that have
		1. 1 EU per 50,000 population	1. 12%
		2. 1 burn unit per 50,000 population	2. 0%
		Percent of population that lives	Percent of population that lives
		3. Within 60 minutes of EU	3. 63%
		4. Within 60 minutes of burn unit	4. 32%
3	Ali (2006)	1. Average response time to accident	1. 10 min
4	Alibhai (2019)	1. Resource issues	1. LMICs have less resources for trauma care
5	Amparo (2018)	1. Awareness of where to go for care	1. 7.4%
		2. Sought treatment for wounds	2. 44.9%
		Reasons for not seeking care	
		1. Cost	1. 22.7%
		2. Distance	2. 44.9%
		3. Sought traditional/alternative care	3. 5.6%
6	Anest (2016)	1. Training issues	1. Dispatchers lack training
		2. Staffing issues	2. Shortages of physicians and EMS providers
		3. Hospital system issues	3. Errors in triage, lack of childcare for other children in the household and restrictive hours of clinic operations, multiple transfers
		4. Pre-hospital system issues	4. Lack of transportation, Lack of telephone access and no universal emergency number.
		5. Communication issues	5. Difficulty getting through on phone lines, miscommunication regarding the acuity of the patient, misunderstanding of geography and distance
		6. Barriers to reaching care	6. Community understanding of how to navigate the health system and emergency conditions
7	Anyumba (2019)	1. Drive time from University of Venda Clinic to scene of accident	1. 5-7 minutes
		2. Drive time Tshilidzini Hospital to scene of accident	2. 8-10 minutes
		3. Drive time from Donald Frazer hospital to scene of accident	3. 30-45 minutes
8	Aries (2007)	1. Reason that patients do not seek hospital care	1. Lack of specialized fracture treatment
		2. Barrier to prehospital care	2. Lack of resuscitation equipment
		3. Cost of treatment by a bonesetter	3. Average 13 € (range 0–60 €)
		4. Cost of hospital treatment	4. 300 € (range 25–800 €).
		5. Barrier to seeking care	5. Opinion that bonesetters have more expertise.
		6. Demographics associated with seeking hospital care	6. Patients with compound fractures are more likely to be treated in hospital.
9	Bachani (2017)	1. Training issues	1. Lack of training of pre-hospital and in-hospital providers
		2. Resource issues	2. Lack of basic hospital equipment
		3. Pre-hospital system issues	3. There was no functioning emergency number or coordinated response system.
10	Bast (2018)	1. Staffing issues	1. Lack of sufficient room and staffing
		2. Geographic issues	2. Access to facilities is limited by mountainous terrain.
		3. Secondary financial strain	3. Not having adequate child care, the inability to miss work, or being too ill to walk.
		4. Pre-hospital system issues	4. Lack of a universal EMS access code.
11	Bhopal (2013)	1. Barriers to seeking care	1. Poor roads, rainy season inaccessibility, no mobile phone coverage, patient must buy petrol and pay driver, Awareness of ambulance service

	2. Pre-hospital system issues	2. Drivers willing to respond, maintenance issues
Bigdeli (2010)	1. Mean transport times from the scene to the hospital for interurban incidents compared to city areas	1. 17.1 vs. 6.3 minutes
Broccoli (2015)	1. Characteristics that made it easier for patients to access care	1. When patients were dressed well, had a good attitude, showed patience, had personal financial resources or insurance or personally knew a healthcare provider
	2. Barrier to care	2. Many providers were unfriendly towards patients or unmotivated to provide care. Participants were also concerned about corruption.
	3. Training issues	3. Healthcare providers lack training in the basics of emergency care.
	4. Transportation issues	4. Difficulty obtaining transportation, long distances required for travel.
	5. Health system issues	5. Lack of emergency care after business hours, required paperwork before emergency care is provided and poor medical records systems, lack of triage
	6. Financial issues	6. High cost of treatment.
	7. Pre-hospital system issues	7. Officers take patients to the police station before taking them to the hospital, creating delays.
	8. Communication issues	8. Unavailable emergency phone lines
	9. Staffing issues	9. Lack of healthcare provider
	10. Resource issues	10. Lack of resources and critical medications at facilities
Broccoli (2016)	1. Barrier to care	1. Lack of accessible healthcare facilities
	2. Communication issues	2. No functional emergency phone number
	3. Resource issues	3. Lack of necessary equipment
	4. Health system issues	4. No standard national protocols for mass casualty incidents, no triage
	5. Staffing issues	5. Staff shortages
	6. Training issues	6. Lack of specific training in emergency care
	7. Barrier to reaching care	7. The distance to travel to reach a facility
	8. Transportation issues	8. The time it takes for transportation to arrive, lack of fuel for vehicles and poor road conditions
	9. Financial barriers	9. Money was a barrier when trying to obtain transportation
	10. Systems issues that generate delays	10. Certain patients are required to be seen at the police station prior to receiving healthcare, which creates delays. Transferring patients to a higher-level facility with no care or stabilisation at the lower-level facility or during transport. Patients and families are responsible for arranging their transportation to the higher-level facility.
	11. Barriers to seeking care	11. Lack of community knowledge about medical emergencies and emergency care. Participants felt that facility staff had bad attitudes, and thought they should be quicker to provide emergency care.
Burke (2014)	Percent of Level 2 and 3 Trauma facilities that:	Percent of Level 2 and 3 Trauma facilities that:
	1. had a specific approach to a trauma patient	1. 0%
	2. refer trauma immediately	2. 87%
	3. provide first aid and then refer trauma patients	3. 13%
	4. are poorly equipped to handle broken bones	4. 70%
	5. had suture and wound care supplies	5. 87%
	6. had gloves	6. 90%
	7. had oxygen	7. 23%
	8. had splinting/casting supplies	8. 10%
	9. had blood for transfusion	9. 0%
	10. refer patients with a possible heart attack	10. 100%
	11. refer patients with a possible heart attack immediately	11. 60%
	12. treat symptoms and then refer patients with a possible heart attack	12. 27%
	13. check vitals and then refer patients with a possible heart attack	13. 13%
	14. had sublingual nitroglycerine	14. 3%

15. are ill prepared to handle possible diabetic ketoacidosis (DKA) and must refer all cases	15. 93%
16. had a glucometer	16. 20%
17. had insulin	17. 17%
18. refer cases of potential sepsis immediately	18. 50%
19. provide treatment for cases of potential sepsis without referral	19. 37%
20. did not know an approach to sepsis	20. 13%
21. had antibiotics	21. 80%
22. had an organised approach to trauma	22. 30%
23. are notified in advance of patients arriving to the hospital	23. 13%
Percent of Level 4 and 5 facilities that:	Percent of Level 4 and 5 facilities that:
24. had gloves	24. 97%
25. had suture and wound care materials	25. 93%
26. had oxygen	26. 83%
27. did not have access to a trained provider who can administer general or Regional anaesthesia	27. 57%
28. had morphine	28. 50%
29. had a functioning ECG machine	29. 20%
30. had nitroglycerine	30. 20%
31. had a defibrillator	31. 13%
32. are well prepared to manage DKA	32. 33%
33. had a glucometer	33. 93%
34. had insulin	34. 80%
35. provided some treatment for sepsis	35. 97%
36. had standardised clinical care guidelines	36. 0%
37. do not have a standardised approach to trauma	37. 70%
38. had nitroglycerine and a functioning ECG machine	38. 20%
39. had a defibrillator	39. 13%
Number of Level 5 facilities that:	Percent of Level 5 facilities that had:
40. had chest tubes and X-ray capability	40. 100%
41. had splinting and casting supplies	41. 80%
42. had blood available for transfusion	42. 100%
43. gave oxygen to patients with suspected AMI	43. 100%
44. gave aspirin to patients with suspected AMI	44. 60%
45. gave morphine to patients with suspected AMI	45. 40%
46. gave epinephrine to patients with suspected AMI	46. 20%
47. had vasopressor agents	47. 100%
48. had antibiotics	48. 100%
Number of Level 4 facilities that:	Percent of Level 4 facilities that had:
49. had chest tubes	49. 12%
50. had X-ray capability	50. 48%
51. had blood available for transfusion	51. 64%
52. refer someone presenting with a possible acute myocardial infarction immediately	52. 80%
53. stabilize and then refer someone presenting with a possible acute myocardial infarction	53. 44%
54. provides diagnostic and treatment services without referral to someone presenting with a possible AMI	54. 30%
55. had vasopressor agents	55. 44%
56. had antibiotics	56. 92%

Chunga (2019)	Percent of respondents that reported	Percent of respondents that reported
	1. Access to a pre- hospital service in HIC	1. 4%
	2. Access to a pre- hospital service in LMIC	2. 21%
	3. Access to a national emergency number in HIC	3. 4%
	4. Access to a national emergency number in LMIC	4. 21%
Comery (2020)	1. Lackof symptom awareness	1. Qual
	2. Cost of transport to EC	2. Qual
	3. EC Facility access to radiology	3. Qual
	4. EC facility access to laboratory	4. Qual
	5. Cost of EC	5. Qual
	6. Cost of Medications	6. Qual
	7. Lack of staff	7. Qual
Coyle (2015)	Percent of hospitals with	Percent of hospitals with
	1. adult triage training	1. 43%
	2. pediatric triage training	2. 57%
	3. formal training in adult critical care	3. 86%
	4. in-house acute care courses for continuing education	4. 14%
	5. a dedicated EC nurse	5. 71%
	6. out-of-hours clinician cover	6. 71%
	7. intravenous (IV) gentamicin	7. 100%
	8. IV penicillin and quinine	8. 86%
	9. Oral rehydration solution and IV fluids	9. 100%
	10. insulin	10. 29%
	11. equipment required to carry out IV procedures	11. 100%
	12. oxygen concentrators or cylinders available in the EC	12. 43%
	13. with light unsuitable for clinical examination	13. 57%
	14. a system in place to identify ward patients whose clinical condition was deteriorating	14. 29%
	15. guidelines for paediatric critical care	15. 71%
	16. guidelines for adult critical care	16. 57%
	17. Emergency care guidelines for children	17. 57%
	18. Emergency care guidelines for adults	18. 43%
	19. Paediatric triage guidelines	19. 43%
	20. adult triage guidelines	20. 29%
	21. guidelines for oxygen therapy	21. 29%
	22. facilities to check haemoglobin and blood glucose	22. 100%
	23. ability to measure renal function	23. 71%
	24. radiography	24. 57%
	25. had a system in place for delaying regis-tration and payment until after the receipt of emergency treatment for critically unwell adults	25. 29%
	26. had a system in place for delaying registration and payment until after the receipt of emergency treatment for critically unwell children	26. 43%
	Percent of public facilities with	Percent of public facilities with
	27. adult triage training	27. 0
	28. pediatric triage training	28. 2
	Percent of private facilities with	Percent of private facilities with
	29. resuscitation facilities for adults	29. 100%
	30. all of the six infrastructure indicators	30. 100%

	31. all 23 indicator drugs and all 34 equipment indicators	31. 100%
	For public facilities, average number of	For public facilities, average number of
	32. infrastructure indicators	32. 1
	33. drug indicators	33. 16/21
	34. equipment indicators	34. 21/34
	Percent of district hospital with	Percent of district hospital with
	35. access to x-ray facilities	35. 0
	36. emergency blood transfusion	36. 0
De Wulf (2017)	1. Financial barriers	1. The inability to pay for transportation or medications, laboratory investigations, and radiography
	2. Health system issues	2. Limited bed capacity
De Wulf (2015)	Percent of hospitals with	Percent of hospitals with
	1. emergency care area beds	1. 67%
	2. Supervisory level physicians consistently available during the entire 24 hours	2. 67%
	3. with potable water	3. 0%
	4. a list of emergency equipment	4. 67%
	5. emergency equipment was available intermittently	5. 100%
	6. no formal training of staff for the use of this equipment	6. 100%
	7. surgical services and dental care	7. 67%
	8. critical care or ophthalmological services	8. 0%
	9. a protocol for the transfer of patients requiring a higher level of care	9. 33%
	Percent of clinics with	Percent of clinics with
	10. electricity	10. 20%
	11. a list of emergency equipment	11. 0%
	12. basic equipment to manage obstetrical emergencies or imminent deliveries	12. 0%
	13. pulse oximetry and glucometers	13. 20%
	14. stethoscopes	14. 60%
	15. HIV care	15. 0%
	16. cholera and tuberculosis care	16. 60%
	17. a protocol for the transfer of patients requiring a higher level of care	17. 80%
	Percent of health facilities with	Percent of health facilities with
	18. respiratory isolation area	18. 0%
	19. maintenance of records for patients seen in the acute care setting	19. 100%
	20. existence of an additional staffing resource list to be used in event of disaster or emergency situations	20. 13%
	21. access to an ambulance for interfacility transport	21. 13%
	22. use of a protocol or phones for the transfer of patient	22. 0%
	23. Resource issues	23. Hospitals had increased access to equipment, materials, and medications compared to community clinics. No computed tomography existed in the region.
	24. Geographic barriers	24. Some of the health centers required multiple modes of transportation, not being passable consistently by 4-wheeled vehicles.
	25. Referral issues	25. Patients were referred to the closest hospital, regardless of whether that facility had the capability to handle the case.
El Tayeb (2015)	1. Demographics likely to use formal services	1. Males were almost twice as likely as females
	2. Financial barriers	2. Affordability of the formal health service
	3. Geographic barriers	3. Distance

Elbashir (2014)	1. Training issues	1. No standardized training for EMS providers, dispatchers, or ambulance crew.
	2. Average emergency response time	2. 45 minutes
	3. Geographic barriers	3. Few citizens reside where services exist
	4. Pre-hospital issues	4. Single emergency response number is not well publicized
	5. Financial barriers	5. ambulances are paid either by cash on a fee for service basis or via an insurance option
Emerick (2013)	1. Percent of individuals who perceived their condition as severe and sought health care in the formal system	1. 57.4%
	2. Percent of individuals who perceived their condition as non-severe and sought health care in the formal system	2. 36.2%
	3. Demographics associated with increased seeking of formal health care	3. Geographic location less than 30 minutes from a health facility, household head having a secondary school education, patient age under 15, and having health insurance
	4. Percent of individuals who received medicines free of charge	4. 26.1% in Guatemala, 29.1% in Honduras, and 34.2% in Nicaragua
	5. Financial barriers	5. "Do not have money" was the most frequent reason for not seeking care in Nicaragua and Honduras
Hashtarkhani (2020)	1. Calculated accessibility by 2SFCA method	1. Peripheral areas in Mashhad city have low access to EMS. Actual accessibility in the city center is low compared with potential accessibility.
Hodkinson (2020)	1. Barriers to seeking care	1. Concerns over personal safety
	2. Percent of people reporting wait times at facilities as a barrier to seeking care	2. 23.1%
	3. Percent of people reporting financial barriers	3. 5.1%
	4. Pre-hospital issues	4. EMS delays
Hsia (2012)	Percent of hospitals	Percent of hospitals
	1. not equipped with basic building resources	1. 78% in Tanzania
	2. had equipment and staff who could competently utilize the equipment at their facility	2. 41% in Tanzania to 61% in Kenya
	3. had adequate monitoring of medication inventory	3. 14% in health centres and 18% in hospitals in Tanzania
	4. with adequate infection control materials	4. 0% in Tanzania
	5. with capacity to provide 24-hour emergency care	5. Fewer than half
	6. with basic infrastructure components such as water and electricity	6. less than 65%
	Percent of clinics	Percent of clinics
	7. with basic infrastructure	7. 7% to 35% of facilities.
Jacobs (2016)	Fee associated with	Fee associated with
	1. hospital ambulance	1. KHR25 000 ($6.25)
	2. Ambulance referrals to the provincial hospital	2. KHR45 000 ($11.3)
	3. transport by tuk-tuk	3. KHR30 000 ($7.5)
	4. overall fee associated with transport	4. KHR137 697 ($34.4)
	5. Pre-hospital system issues	5. General population did not have the contact number of the ambulance services.
	6. Percent of people transported to health facility using their own means of transport	6. 32%
	7. Percent of individuals who report the health system was too far	7. 9%
	8. Training issues	8. Few health district staff received training in emergency medicine
	9. Percent of health centre staff members who were insufficiently qualified to successfully deal with the condition	9. 59%
Khan (2003)	1. Training issues	1. Neither the ambulance driver nor the nurse has any formal training or certification in advanced life support.
	2. Equipment issues	2. Ambulances lack advanced cardiac life support equipment

		3. Health system issues	3. There is no physical location for advanced pediatric care or pediatric resuscitation.
		4. Pre-hospital issues	4. An organized emergency medical response system does not exist, no emergency number
29	Khan (2010)	1. Mean time from occurrence of injury to arrival in the ER	1. 4.7 h
		2. Range of time from occurrence of injury to arrival in the ER	2. Range 0.8–48 h
		3. Patients who arrived in the ER after 1 hour of injury	3. 675 (69%)
		4. Patients who reached the ER within 1 hour of injury	4. 303 (30.9%)
30	Kirsch (1995)	Percent of physicians who	Percent of physicians who
		1. had taken an Advanced Trauma Life Support course	1. 30%
		2. had taken an Advanced Cardiac Life Support course or Advanced Pediatric Life Support training	2. 0%
		Percent of physicians how believed they could adequately perform	Percent of physicians who believed they could perform
		3. intubation	3. 18%
		4. tube thoracostomy	4. 15%
		5. venous cutdown	5. 15%
		6. tracheostomy	6. 5%
		7. Staffing issues	7. Nursing shortages reported in emergency departments. Trained staff were not available during many nights or weekends. IV line supplies, backboards, or cervical collars are not carried in ambulances.
		8. Resource issues	8. Specialized blood tests are not easily obtained. Limited supplies of banked blood. Limited availability of CT, ultrasound, and MRI.
		9. Health system issues	9. Lengthy delays in response from consulting specialities. Legal restrictions prevent ambulance drivers from starting IV lines or giving medication.
		10. Communication issues.	10. The EDs do not have radios.
31	Kumar (2009)		
32		1. Pre-hospital system issues	1. Trained personnel as first responders were unavailable and pre-hospital care was lacking
32	Levine (2007)	1. Percent of patients that have access to motorized transport	1. 20%
		Percent of providers that	
		2. reported that their patients had to travel more than 10 km for surgical or obstetric services	2. 62.5%
		3. had access to blood smears for malaria	3. Less than half
		4. lacked access to any laboratory diagnostic equipment	4. 44%
		5. could offer blood transfusions	5. 0%
		6. felt comfortable diagnosing the 7 emergency conditions assessed	6. 63%
		7. felt comfortable diagnosing femur fracture or pneumonia	7. 56%
		8. felt comfortable diagnosing obstructed labor	8. 75%
		9. felt comfortable treating the 7 emergency conditions assessed	9. 19%
		10. felt comfortable treating obstructed labor	10. 0%
		11. felt comfortable treating gastroenteritis	11. 64%
33	Luo (2020)		
		1. Standardized E-2SFCA access scores	1. 75% of shequs having a value lower than 0.4 for single trip and 0.8 for the total trip.
		2. Percent of shequs can be reached by an ambulance from the nearest EMS stations within 10 min	2. Over 50% and again a patient can be transported from his/ her shequ to the nearest hospital within 9 min.
34	Macharia (2009)	1. Health facilities demanded cash deposits or letters of guarantee of payment before providing treatment to road traffic injury patients	1. 14.6%
		2. Cost of deposit before treatment	2. US $6.7-667

	3. Percent of health facilities that rated themselves as being well prepared to handle road traffic crash emergencies	3. 40.8%
	Percent of respondents that	Percent of respondents that
	4. owed the hospitals more than of US $ 133.	4. 22.3%
	5. were in a position to pay the bills	5. 19.7%
	6. would approach relatives and friends for financial assistance	6. 58.7%
	7. were transported to hospital by unknown persons	7. 19.7%
	8. were transported to hospital by persons who were previously known to them	8. 76.5%
	9. received any form of first aid at the crash site	9. 16.0%
	10. received first aid from members of the public, other motorists or the less injured casualties	10. 74.0%
Mahmood (2010)	Percent of cases in which the ambulance response time was	Percent of cases in which the ambulance response time was
	1. less than 10 minutes	1. 60%
	2. 15-20 minutes	2. 30%
	3. 30-45 minutes	3. 10%
	Percent of cases in which the time from the site to the hospital was	Percent of cases in which the time from the site to the hospital was
	4. 5 minutes	4. 32%
	5. 10-15 minutes	5. 48%
	6. 20-30 minutes	6. 20%
Mathew (2017)	Percent of districts that	Percent of districts that
	1. had more than 80% of the population residing within half-an-hour travel distance of a PCI-capable hospital	1. 36%
	2. had more than 90% population having timely (within 1h) access to some mode of reperfusion therapy for STEMI, either thrombolysis and/or primary PCI	2. 57%
	Percent of the population	Percent of the population
	3. residing within half-an-hour travel distance from a PCI-capable hospital	3. 69.84%
	4. had access to a thrombolysis-capable hospital within 1h travel time	4. 21.87%
	5. would have had to travel more than an hour to access a reperfusion-capable hospital	5. 8.28%
Mock (1997)	Percent of respondents reporting	Percent of respondents reporting
	1. distance to treatment is too far	1. 8%
	2. preferences for other treatments	2. 37%
	3. Types of injuries more likely to receive formal medical care	3. Head or torso injuries, transportation related injuries and assaults
	4. Use of formal medical services for persons aged less than 20 years	4. 54%
	5. Use of formal medical services for persons aged more than 20 years	5. 61%
Mock (2001)	Percent of survey respondents reporting barriers to care:	Percent of survey respondents reporting barriers to care:
	1. preference for other treatments	1. 20%
	2. financial	2. 53%
	3. health care utilization when health care was available in the user's town	3. 59%
	4. health care utilization when health care was not available in the user's town	4. 41%
Mock (2006)	1. Training issues	1. Lack of training for trauma care, including in-service training for doctors, lack of training to use equipment

	2. Staffing issues	2. Lack of surgical coverage.
	3. Resources issues	3. Resources for acute resuscitation were limited. Difficulties in the procurement process exist. Lack of laboratory tests, imaging, oxygen, fluids, chest tube equipment, pulse oximetry, ventilators, prostheses for amputees, medications.
	4. Health system issues	4. Lack of trauma registry or quality improvement programs.
Mohan (2018)	1. Demographics associated with significant pre-hospital delay	1. Elderly, rural, and illiterate populations
	2. Barriers to seeking care	2. Recognizing symptoms as cardiac in origin
	3. Percent of hospitals with ECG availability	3. 96.4%
	4. Percent of outpatient facilities with ECG availability	4. 83%
	Percent of patients	Percent of patients
	5. to whom a hospital was the nearest medical aid	5. 54.8%
	6. to whom a clinic was the nearest medical aid	6. 45.2%
	7. presented with more than 6 hours of prehospital delay	7. 42%
Mould-Millman (2015) Assessment of Emergency Medical Services in the Ashanti Region of Ghana.	Development of:	Development of:
	1. Tiers of Providers	1. Minimally developed
	2. Recruitment and Retention of providers	2. Mostly developed
	3. Continuing Education	3. Minimally developed
	4. Initial Education	4. Partially developed
	5. Team Training	5. Partially developed
	6. Equipment and Medication	6. Mostly developed
	7. Toll-free Number	7. Moderately developed
	8. Call processing and dispatch	8. Partially developed
	9. Primary Transportation and Inter-facility Transfers	9. Mostly developed
	10. Communication	10. Partially developed
	11. Community Integration	11. Minimally developed
	12. Healthcare System Integration	12. Partially developed
	13. EMS Legislature, Rules and Regulation	13. Mostly developed
	14. Sustainable Resources	14. Mostly developed
	15. Public Knowledge	15. Minimally developed
	16. Quality Assurance and	16. Minimally developed
Mould-Millman (2015) Accessing Emergency Medical Services in Accra, Ghana: Development of a Survey Instrument and Initial Application in Ghana.	Percent of survey respondents that:	Percent of survey respondents that believed that:
	1. believe EMTs offer high-quality care	1. 54.7%
	2. believe it is ‘‘better’’ to go by ambulance	2. 86.1%
	3. believe taxis are faster than ambulances in Accra	3. 78.0%
	4. believe government ambulances were free or affordable	4. 53.2%
	5. believe private ambulances were too expensive	5. 50.2%
	6. knew the existence of a public access medical emergency telephone number	6. 43.8%
	7. knew that the emergency number was a toll-free call	7. 37.1%
	8. would be more likely to call	8. 35.7%
	the emergency number if they knew the call was toll free	9. 45.5%
	9. knew about the government ambulance service	10. 35.3%
	10. indicated it would take a government ambulance 15 minutes or less to arrive at the location	11. 6.8%
	11. indicated it would take 60 minutes or more	
	Percent of systems that utilized:	Percent of systems that utilized:

	1. tier-one (layperson responders trained in first aid)	1. 48%
	2. tier-two (professional or medically-trained)	2. 96.0%
	3. Basic emergency medical technicians (EMTs)	3. 84%
	4. advanced providers more often	4. 60%
	5. basic providers more often	5. 84%
	6. prehospital nurses	6. 28%
	7. used only advanced providers	7. 4%
	8. EMS physicians	8. 40%
	9. quality assurance programs	9. 44%
	10. research	10. 12%
	11. Basic Life Support - capable vehicles	11. 84%
	12. Advanced Life Support -capable vehicles	12. 68%
Mould-Millman (2017)	13. vehicles posted at ambulance stations	13. 72%
	14. vehicles posted at health care facilities	14. 56%
	15. motorcycle ambulances	15. 12%
	16. fixed wing air transport	16. 32%
	17. rotary wing (helicopter) ambulances	17. 32%
	18. water-craft	18. 12%
	19. Total number of EMS systems identified	19. 25
	Percent of countries in which	
	20. EMS systems existed in Africa	20. 29.6%
	21. EMS systems existed in West Africa	21. 12.5%
	22. no EMS systems existed	22. 9.3%
	23. the questionnaire was not returned	23. 51.8%
	24. some form of regulations governing EMS or ambulance operations existed	24. 100%
	25. an established toll-free emergency telephone number existed	25. 26%
Nagata (2011)	Median direct distances between injury sites and the trauma centers were	Median direct distances between injury sites and the trauma centers were
	1. Viet Duc Hospital	1. 5.65 (3.19 - 8.64) km
	2. Bach Mai Hospital	2. 5.31 (2.89 - 8.54) km
	3. Saint Paul Hospital	3. 5.11 (3.11 - 8.72) km
Natuzzi (2011)	1. Percent facilities with running water	1. 80%
	2. Percent facilities with electricity without outages	2. 55.6%
	3. Percent of facilities with consistent oxygen source	3. 88.9%
Nielsen (2012)	1. Access to emergency care services within 1 hour	1. 100 percent in Urban Brazil, Colombia, and Maharashtra State to very low in Kenya, Pakistan, Sri Lanka, and Vietnam
	2. To whom advanced life support capabilities during transport was available	2. A significant number of persons in two of the upper middle income sites
	3. To whom basic life support capabilities during transport was available	3. More than half of people only in South Africa and Gujarat State, India.
	4. Training issues	4. Varying levels of training of providers, including no emergency medicine training
Ntabaye (1998)	1. Resource issues	1. Lack of medicines
	2. Percent of respondents who did not have the ability to pay for health services	2. 45%
	3. Financial barriers	3. Fare for transportation
	4. Demographics more likely to seek care	4. Those who had a higher number of missing teeth, were educated and aged more than 40 years
	5. Percent of respondents who indicated fear of dental treatment	5. 6.5%

Ouma (2018)	1. Percent of people living within 2-hour travel time of the nearest public hospital	1. 71%
	2. Percent of women of child bearing age living within 2-hour travel time of the nearest public hospital	2. 71·8%
	3. Percent of people living more than 2-hour travel time of the nearest public hospital	3. 29%
	4. Percent of women of child bearing age living more than 2-hour travel time of the nearest public hospital	4. 28·2%
	5. Percent of the population within 2-hour travel time of a public hospital	5. Less than 25% in South Sudan to more than 90% in Nigeria, Kenya, Cape Verde, Swaziland, South Africa, Burundi, Comoros, São Tomé and Príncipe, and Zanzibar.
	6. Countries with less than 50% of the population within 2-hour travel time of a public emergency care hospital	6. South Sudan, Mauritania, Eritrea, Niger, Sudan, Madagascar, and Chad.
	7. Countries with more than 90% of their respective population living within 2-hour travel time of a hospital	7. Nigeria, Kenya, and South Africa
	8. Number of countries with more than 80% of the population within 2-hour travel time of a hospital	8. 16
Phillips (2020)	1. Percent with EC training	1. 5.4% report none
	2. Purpose built EU with resus	2. 4.1 report none
	3. EU overcrowding	3. 17.6% report none
	4. EU specific equipment	4. 18.4% report none or limited
	5. Presence and use of triage	5. 39.3% report none or limited
	6. Use of EU guidleine	6. 11.6%
	7. Presence of System for access to EC and first aid from trained first responders	7. 13.9% report no system
	8. Presence of system to provide EC during transport between scene and facility, or between facilities	8. 13.9% report no system
	9. System to access EC from trained first responders and the scene and urgent transport to a health facility (overall system of pre-hospital care)	9. 19.0% report no system
Pigoga (2020)		
	1. Training issues	1. Training related to critical trauma and airway interventions, and neonatal care; issues with treating malnutrition or severe anaemia; inability to perform the following procedures: intraosseous access or venous cutdown, apply three-way dressings for sucking chest wounds or perform fasciotomies or escharotomies
	2. Health system issues	2. Only one facility with a dedicated resuscitation area
	3. Resource issues	3. Lack of medications, equipment, and tests, including: pulse oximetry, airway management, needle thoracostomy, chest tube, pelvic binders, ECG, ultrasound, thrombolytics, blood transfusion, defibrillation, cardioversion, pericardiocentesis, external cardiac pacing, procedural sedation, IV antibiotics, IV vasopressors, uterotonic drugs
	4. Quality issues	4. Lack of: clinical protocols, protocols for communicating critical lab results for infection control infection, triage
Radjou (2013)	1. Mean distance and time travelled by direct group	1. 31.4 km, 90 min
	2. Mean distance and time travelled by referred group	2. 52.81 km, 279 min
	3. Percent of referred cases that clocked unnecessary distance to reach care	3. 54%
	4. Percent of direct cases that clocked unnecessary distance to reach care	4. 14.2%

	5. Median unnecessary distance clocked by referred cases to reach care	5. 24.49 km
	6. Median unnecessary distance clocked by direct cases to reach care	6. 10.86 km
Razzak (2001)	1. Training issues	1. No ambulance driver had formal training in first aid or prehospital care
	2. Percent of ambulance services that carry only a stretcher	2. 71%
	3. Cost of transport for non-air-conditioned ambulances	3. Pakistani rupee (PR) 7–10 ($0.12–0.17) per mile
	4. Cost of transport for air-conditioned ambulances	4. PR 15–20 ($0.26–0.35) per mile
	5. Percent of ambulance services that operate only during day hours	5. 8%
	Percent of patients that said	Percent of patients that said
	6. the streets in their area were too narrow for an ambulance	6. 3%
	7. they did not use ambulances due to high cost	7. 8%
	8. they preferred using taxis or cars due to easy access	8. 38%
	9. the patient was not sick enough to call an ambulance	9. 26%
	10. they used a taxi because the patient was too sick to wait for anything else	10. 20%
	11. patient was sick enough to come to the ED	11. 45%
	12. they did not come to the ED because of the slow response of the ambulance service	12. 23%
	13. they did not come to the ED because they did not know how to find one	13. 11%
	14. they would call an ambulance only if they are unable to walk	14. 44%
	15. they would call an ambulance only if they were very sick or near death	15. 22%
	16. they were not sure when to call an ambulance	16. 21%
	17. they knew of at least one ambulance service	17. 57%
	18. they knew of two ambulance services	18. 21%
	19. they did not know of any ambulance service	19. 14%
	20. knew the phone number of any ambulance service	20. 0%
Ro (2017)	Percent of respondents that reported the primary reasons for not seeking health care were:	Percent of respondents that reported the primary reasons for not seeking health care were:
	1. financial	1. 37.2%
	2. use of complementary medicine	2. 22.2%
	3. the that condition was not severe enough to visit hospital	3. 8.7%
	4. limited accessibility to hospital	4. 5.7%
	5. social and family disapproval	5. 4.6%
	6. Those who were more likely to experience unmet needs in the previous year	6. People whose mean income was below moderate levels, those who lived far from a teaching hospital or close to a district hospital
Rocha (2017)Addressing geographic access barriers to emergency care services: a National ecologic study of hospitals in Brazil.	1. States with high levels of accessibility	1. Paraná, Goiás, Minas Gerais, Bahia, Piauí, Rio Grande do Norte, Ceará e Pernambuco
	2. Number of municipalities that had high accessibility to small hospitals and low to high complexity center	2. 1595
	3. Percentage of municipalities with below average access to high complexity center that were covered by small hospitals	3. 74%
	4. Number of municipalities that did not meet the criteria of maximum travel time of 2 hours	4. 824

Rocha (2017) Access to emergency care services: a transversal ecological study about Brazilian emergency health care network.	1. Percentage of small hospitals that were in municipalities that had also high complexity centers	1. 26% of small hospitals
	2. Percentage of municipalities were located within less than 60 km from the closest city with a high complexity center with an adult ICU	2. 63%
	3. Number of people that were at least 120 km away from a high complexity center with an adult ICU	3. 14 million
	4. Percent of the population who were more than 120 km away from a health facility with a neonatal ICU	4. 12%
Roy (2010)	1. Training issues	1. Lack of training of ambulance attendants
	2. Equipment issues	2. No resuscitation equipment in the ambulance
	Odds ratio of likelihood the following groups would receive prehospital care:	Odds ratio of likelihood the following groups would receive prehospital care:
	3. road traffic accident victims	3. 2.3
	4. arriving by government ambulance	4. 10.83
	5. arriving by taxi	5. 0.54
	6. being transferred from other medical facilities for “medico-legal reasons”	6. 0.1
Scolari (2018)	1. Resource issues	1. Lack of laboratory testing
	2. Acceptability issues	2. Conduct of health professional does not meet the expectations of the patients
	3. Health systems issues	3. Hours of operation and bed limitations
	4. Geographic barriers	4. Geographic relationship to care
Sheikhbardsiri (2020)	1. Mean of patient's rights observed	1. 130.3 (SD: 40.1)
Siddiqui (2008)	1. Mean distance from the residence to the hospital	1. 56.75km±123km.
	Percent of patients who	
	2. came late who were referred	2. 63 %
	3. presented within 60 minutes of onset of symptoms	3. 86.5%
	4. were first taken to another hospital mainly cardiac hospital and then referred here	4. 60.6%
	5. first opted for alternative medicines	5. 12.7%
	6. thought stroke symptoms would resolve spontaneously	6. 28%
	7. did not know a single symptom of stroke	7. 32%
	8. knew at least one stroke symptom	8. 10.9%
	9. hemiplegia was the most familiar stroke symptom	9. 67%
	10. speech disturbance was the most familiar stroke symptom	10. 61%
	11. Median time from onset of symptoms and contact with general practitioner	11. 30 minutes
Sodemann (2006)	1. Odds ratio associated with mortality risk within 30 days of first consultation for those acquainted with a medical doctor	1. 0.55
	2. Those whom were less likely to present a severely ill child	2. Mothers belonging to Muslim ethnic groups
Sohayla (2020)	1. Accessed EC in last 12 months	1. 5%
	2. Aware of EC services	2. Very good: 67.7%
Stein (2016)	1. Pre-hospital issues	1. Lack of a single toll-free emergency number, knowledge of the emergency number, available community first responders, 24-hour EMS availability,
	2. Acceptability issues	2. Acceptability of EMS to the community
Sultan (2019)	1. Factors associated with increased likelihood of ambulance use	1. Amharic speaking, previous ambulance use

	2. Odds ratio associated with the ambulance use and police as a patient companion	2. 1.53
	3. Pre-hospital issues	3. Long arrival time for ambulance, not enough distribution of ambulance stations, and difficulty of accessing the phone
Suriyawongpaisal (2018)	1. Financial barriers	1. Preauthorization
	2. Demographics associated with financial barriers	2. Females were less likely to have preauthorization
Suriyawongpaisal (2016)	1. Financial barriers	1. Copayment
Tansley (2015)	1. Percent of the population within 50km of road travel distance to tertiary care	1. 28%
	2. Proportion of a region's population within a 50-km service area of a Level C facility	2. 0% in the more remote regions to 95.4% in the most Urban region Haiti, 0% in the Nord Ouest department to 89.1% in the Ouest department
Tansley (2016)	1. Proportion of Ghana's landmass that is serviceable within 60-minutes of an National Ambulance Service station (from 2004 to 2014)	1. 8.7 to 59.4%
	2. Proportion of the population within a 60-minute catchment area of a N/AS station (from 2004 to 2014)	2. 37% to 79%
	3. Population within a 30-minute catchment area of a N/AS station	3. 26% to 61%
	4. Ambulances per 100,000	4. 0.05 in the Obuasi Municipal District to 2.4 in the Sissala West District
	Percent of facilities in Namibia found to be capable of providing care level:	Percent of facilities in Namibia found to be capable of providing level:
	5. A	5. 12.4%
	6. B	6. 7.3%
	7. C	7. 1.2%
	8. X (unsuitable for providing emergency care)	8. 88%
	Percent of facilities in Haiti found to be capable of providing care level:	Percent of facilities in Haiti found to be capable of providing care level
	9. A	9. 18.9%
	10. B	10. 1.7%
	11. C	11. 0.9%
	12. X	12. 81.1%
Thomson (2005)	1. Health system issue	1. Rural, district and small Urban hospitals have no emergency department
	2. Training issue	2. No emergency medicine training
	3. Staffing issue	3. EDs are staffed by only one doctor
	4. Resource issues	4. Lack of CT availability after hours
	5. Financial barriers	5. Patients must pay cash for any imaging
	6. Pre-hospital system issues	6. Ambulances have to travel up to 200 miles, lack of helicopters, private ambulance services have tried to link their control rooms to cellular networks, which has delayed response to major accidents and incidents by the responsible authorities, lack of dispatchers
Treleaven (2017)	1. Demographics that demonstrated worse outcomes	1. Poorer, younger, rural, and children who were referred from another facility children
Vanderschuren (2015)	1. Percent of fatalities that were outside of the Golden Hour	1. 53.1%
	2. Fatality rate within the service areas	2. 2.25 fatalities/km
	3. Fatality rate within the service gaps	3. 2.91 fatalities/km
Wen (2011)	1. Financial barriers	1. Payment is requested at the time of care
	2. Percent of individuals who were prevented from receiving treatment due to lack of payment	2. one-third
	3. Pre-hospital system issues	3. Lack of prehospital care
	4. Geographic barriers	4. Hours of travel are required in remote areas
	5. Resource issues	5. Lack of resources, including electricity and equipment

	6. Training issues	6. No emergency medicine training, one hospital provided specialised training at the basic life support (BLS) level, and no hospital provided courses such as Advanced Cardiac Life Support (ACLS), Advanced Trauma Life Support (ATLS), or Paediatric Advanced Life Support (PALS) training.
Wesson (2015)	1. Training issues	1. No formal or trauma-specific training, very few providers are trained in BLS or ACLS.
	2. Resource issues	2. Lack of basic trauma equipment.
	3. Geographic barriers	3. Distance to a facility
	4. Pre-hospital issues	4. A publically available ambulance system did not exist, lack of community awareness of emergency phone number, lack of function of emergency phone number
	5. Transportation issues	5. Lack of transport to the health care facility.
	6. Staffing issues	6. It is not safe for the medical officers to report to the hospital at night
	7. Financial issues	7. Inability to pay hospital fees and transport
	8. Respondents' opinion on how to improve pre-hospital care	8. Provide first aid and triage trauma training to community members and the police
	9. Factors affecting the decision to seek care	9. Severity of the injury, traditional medicine and religion
WHO (2015)	1. Availability of potatble water	1. Globally: 62%, AFRO: 58%, AMRO: 70%, SEARO: 78%
	2. Avavilability of sanitation	2. Globally: 81%, AFRO: 84%, AMRO: 57%
	3. Availability of hand hygiene (soap)	3. Globally: 65%, AFRO: 64%, AMRO: 65%
Zaidi (2013)	1. Median travel time to ER	1. From Hyderabad: (20 minutes), from Mansehra (120 minutes).
	2. Odds ratio associated with patients likely to seek immediate health care at a non-medical facility or administer self- treatment compared to visiting a medical facility	2. Peshawar: 144.45 , Bahawalpur: 131.36, Abbottabad - 5.12, Hyderabad - 6.87
Zimmerman (2020)	Percent of patients who waited the following times to evaluated by a physician in the ED	Percent of patients who waited the following times to evaluated by a physician in the ED
	1. 0.0 to 15.0 minutes	1. 69.2%
	2. 15.1 to 30.0	2. 19.0%
	3. more than 45.0 minutes	3. 7.8%
	4. 30.1 to 45.0 minutes	4. 4.1%
	5. Percent of patients who waited the 0.0 to 1.0 hours to receive lab tests	5. 48.4%
	6. Percent of severe GCS patients who received lab tests within 1.0 hours of physician evaluation	6. 56.1%
	7. Percent of mild GCS patients who received lab tests within 1.0 hours of physician evaluation	7. 52.0%
	8. Percent of moderate GCS patients who received lab tests within 1.0 hours of physician evaluation	8. 53.0%

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	NA
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5-6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	5-6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	5-6, Supplement
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7-9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7-8
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7-9
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	10
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	10-12
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	10-19
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	10-19
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	19-20
Limitations	20	Discuss the limitations of the scoping review process.	21-22
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	22-23
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	1

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.