International Journal of Technology Assessment in Health Care

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Assessing the capacity of Ghana to introduce health technology assessment: a systematic review of economic evaluations conducted in Ghana

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Assessment

Cite this article: Addo R, Goodall S, Hall J, Haas M (2020). Assessing the capacity of Ghana to introduce health technology assessment: a systematic review of economic evaluations conducted in Ghana. *International Journal of Technology Assessment in Health Care* **36**, 500–507. https://doi.org/10.1017/S0266462320000689

Received: 16 December 2019
Revised: 22 July 2020
Accepted: 23 August 2020
First published online: 25 September 2020

Key words:
Health technology assessment; Capacity assessment; Economic evaluation; Systematic review; Ghana

Objectives. Ghana is in the process of formally introducing health technology assessment (HTA) for health decision making. Similar to other low- and middle-income countries, evidence suggests that the lack of data and human capacity is a major barrier to the conduct and use of HTA. This study assessed the current human and data capacity available in Ghana to undertake HTA.

Methods. As economic evaluation (EE) forms an integral part of HTA, a systematic review of EE studies undertaken in Ghana was conducted to identify the quality and number of studies available, methods and source of data used, and local persons involved. The literature search was undertaken in EMBASE (including MEDLINE), PUBMED, and Google Scholar. The quality of studies was evaluated using the Consolidated Health Economics Evaluation Reporting Standards. The number of local Ghanaians who contributed to authorship were used as a proxy for assessing human capacity for HTA.

Results. Thirty-one studies were included in the final review. Overall, studies were of good quality. Studies derived their effectiveness, resource utilization and cost data mainly from Ghana. The most common source of cost data was from the National Health Insurance Scheme pricing list for medicines and tariffs. Effectiveness data were mostly derived from either single study or intervention programs. Sixty out of 199 authors were Ghanaians (30 percent); these authors were mostly involved in data collection and study conceptualization.

Conclusions. Human capacity for HTA in Ghana is limited. To introduce HTA successfully in Ghana, policy makers would need to develop more local capacity to undertake Ghanaian-specific HTA.

Rising health costs accompanied by the introduction of new health technologies have created demand for evidenced-based practice that represents value for money. Recently, the World Health Organization (WHO) has recommended that all member states use health technology assessment (HTA) (1). HTA involves evaluation of the effectiveness, cost effectiveness (in an economic evaluation (EE)), and financial impact of health technologies on the health system (2) and an HTA may also consider wider implications such as, social, ethical, and legal consequences of the technology (2;3). Its reported worldwide use includes negotiation of prices of health technologies and cost containment (4); reimbursement of drugs; selection of benefit package under an insurance scheme (5); and development of clinical guidelines (6).

Despite the WHO recommendation, the use of HTA in low- and middle-income countries (LMICs) remains limited (1) due to reasons such as lack of human resource capacity (7), unavailability of relevant data (7;8), and limited resources to support it (9). Amidst these challenges, Ghana is in the process of introducing HTA for formal health decision making. This decision was largely prompted by policy makers exploring more efficient and sustainable ways of financing health care in Ghana. Currently, the majority of health care in Ghana is funded through the Ghana National Health Insurance Scheme (NHIS), which the government is struggling to financially sustain (10). Most health decisions including the selection of the NHIS benefit package is reported to be determined by factors such as burden of disease in Ghana, population density, effectiveness, efficacy, and accessibility/availability of health technologies and sometimes cost of the health technologies (11–13). HTA is expected to provide policy makers with information on the cost effectiveness and financial implications of health technologies for decision making on selection of NHIS benefit package, reimbursement of drugs and services, and the development of treatment guidelines (14;15).

In a study conducted in 2016, Ghanaian health decision makers and researchers noted the lack of human and data capacity for HTA in Ghana as the major barrier to the formal introduction and use of HTA for decision making in the country (14). This was confirmed in a report published in 2017 that looked at the landscape evaluation of HTA in Ghana, and

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concluded that data for HTA was limited and that HTA skills and experience within the Ministry of Health was limited and fragmented (15). Some key milestones include a pilot HTA study on antihypertensive drugs, which received financial and technical support from the international Decision Support Initiative (iDSI) and National Institute for Health Care and Excellence (NICE) (16). Findings from this pilot study confirms the recommendations for the management of hypertension in the latest Ghana standard treatment guidelines, hence in their report, representatives of iDSI recommended that Ghana strengthen the STG position on the management of hypertensions with the findings from the pilot study (17). Following this, provisions have been made in the newest Ghana National Medicines Policy for the use of HTA for selection of essential medicines (18). There are ongoing collaborations between academia and policy makers, particularly, the Ministry of Health; and continuous dialog between a range of experts and stakeholders toward the formal institutionalization of HTA in Ghana for health decision making (19). What remains uncertain is how this policy will be implemented successfully considering the aforementioned challenges of the use of HTA in LMICs. Without the appropriate human capacity and data the ability of Ghana to undertake quality HTA appraisals which will be acceptable by decision makers may never be realized.

For Ghana to introduce a formal system of HTA decision making effectively, these challenges will have to be examined and addressed by Ghanaian policy makers. The objective of this study was to assess the human and data capacity of Ghana for HTA to contribute to the current discourse and inform policy makers in the preparations toward HTA institutionalization in Ghana. Data availability and the issue of transferability of results from one setting to another (such as the reliance on translating the results of high income countries to LMICs) remains contentious due to differences in their geographical, demographical, and epidemiological characteristics (20–22), hence the need for country-specific studies.

There is paucity of literature on assessment of HTA capacity in LMICs. Previous studies assessing the capacity of a country for HTA used self-reported surveys of respondents from government and educational institutions about their organization's and/or individual HTA skills (23–26). Unlike these studies, the current study used a different approach (details outlined under 'Methods' and 'Discussion' sections) to assess the human and data capacity for HTA in Ghana.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used for the process of identifying and reporting papers included in this review.

Literature Search

A literature search was carried out in October 2019 to identify EE studies conducted in Ghana from 1990 to 2019. The search was conducted in three electronic databases: EMBASE (including Ovid MEDLINE, Old Ovid MEDLINE, and Ovid in process and other non-indexed citation), PUBMED, and Google Scholar. A manual search was carried out in the reference lists of the included studies. The keywords used for the search included "cost effectiveness analysis," "cost benefit analysis," "cost utility analysis," "costs and cost analysis," "economics," "health care costs," "Ghana," "economic value of life," "economic evaluation," "health technology assessment," and "technology assessment" in the title or abstract of articles. A complete search strategy is provided in Supplementary Table 1 of Supplementary file 1.

Inclusion Criteria

Studies that met all the criteria outlined below were included in this review:

(1) Studies conducted in Ghana only and in Ghana along with other countries irrespective of income level.
(2) Health economic studies containing an EE (cost utility, cost effectiveness, and cost benefit analysis) on either a single health technology or public health program.
(3) Peer-reviewed publications with full article accessible.
(4) Publication in English language.

Studies were excluded if they were not EEs, were cost of illness studies, were EE studies that did not pertain to health technologies and were from gray literature.

Selection of Studies and Data Extraction

Two reviewers (RA and SAA) screened the titles and abstracts of the identified studies after removal of duplicates. Full text versions of the eligible studies were reviewed and those that satisfied the inclusion criteria included in the final review. Discrepancies between the data extracted by the two reviewers were investigated and reconciled. Data extracted included general information (year of publication, origin of lead author, journal of publication, type of disease evaluated, and type of technology evaluated), methodological details (type of economic analysis, perspective of analysis, type of model used, source of data, costs included, health outcome measure, and type of sensitivity analysis), and characteristics of each study. Data were entered and analyzed in Microsoft Excel 2017.

Data Available for HTA

The data available for HTA were assessed as the quantity of EE studies available, the scope of conditions evaluated, and the quality of the studies, as well as the type and sources of data used for the evaluation. The quantity of EE studies was assessed as the number of studies identified for the review.

The quality of studies was examined using the Consolidated Health Economics Evaluation Reporting Standards (CHEERS) checklist developed by the International Society for Pharmacoeconomics Outcome and Research (ISPOR) (27). Although the checklist was not developed for the purposes of assessing the quality of EE studies, its aim was to ensure good conduct and quality reporting of such studies. This study adopted the CHEERS checklist as a quality assessment tool under the assumption that the quality of an EE study was dependent on the methodological approach used and subsequent reporting. In addition, most international health economics journals require its use for reporting EE studies. The CHEERS checklist comprises twenty-four criteria (27). The number of criteria a study satisfies is equivalent to its quality score. A data extraction tool was developed to capture the characteristics of the studies such as health technology evaluated, and the type and source of data used in the evaluations. The scope of studies was characterized by indications and type of

https://doi.org/10.1017/S0266462320000689 Published online by Cambridge University Press

technologies, and further defined by communicable and non-communicable diseases.

Human Capacity for HTA

The number of local Ghanaian persons included in the author list of the included studies was used as a proxy for the local capacity available to undertake HTA. Local persons were identified by their names and/or affiliation to a Ghanaian institution at the time of publication. The contribution of each local person in authoring the paper (where these are provided by the journal, $n = 19$, 61 percent) was used as a proxy to determine the different kinds of skill sets available in Ghana for HTA. No attempt was made to place value on the different skill sets of local persons as HTA is a multidisciplinary process requiring multidisciplinary team with different skill set to undertake a full HTA appraisal.

Results

In total, forty-six studies were assessed for eligibility after the initial screening of 1,197 citations. Reasons for exclusion are provided in Figure 1. Of the forty-six studies, fifteen studies were excluded because they were conference abstracts ($n = 12$), commentary ($n = 1$), thesis ($n = 1$), and cost of illness studies ($n = 1$). Overall, thirty-one studies were included in the final review (Figure 1).

Study Characteristics

A summary of the main characteristics of studies reviewed are presented in Table 1. Twenty of the studies were CUA and eleven CEA. The most common perspective of analysis was provider/health system (42 percent). Markov models and/or decision trees were the most commonly used models, although almost half (42 percent) of the studies did not specify and/or use an explicit model for their analysis. Only one study was published before year 2000, with 81 percent being published after 2010. Disability-adjusted life-years (DALYs) were often used as an outcome measure of effectiveness in these studies (48 percent). Four studies (13 percent) had both clinical outcomes and DALYs/quality-adjusted life-years (QALYs) as an outcome metric. All the studies were published in international journals. Although 77 percent of the included studies were conducted in Ghana only, the remaining 23 percent involved Ghana and other countries.

Data Available for HTA

Overall, this review identified thirty-one EEs in Ghana that could be used for an HTA appraisal. Technologies evaluated were drugs (36 percent), treatment procedures (19 percent), diagnostics/screening (19 percent), and other healthcare programs (26 percent). The majority of studies focused on preventive care (58 percent) and evaluated non-communicable diseases (55 percent) (Table 1). Eleven studies covered maternal and/or child health (28–39), eight studies covered malaria interventions (40–47), and three studies covered HIV infection (48–50). The remaining studies evaluated hepatitis B and C (48), hernia surgery (51), diabetes (52), chronic heart failure (53), glaucoma (54), abortion (55), breast cancer (56), typhoid fever (57), and surgical outreach (58) (see Supplementary Table 2 in Supplementary file 1 for detailed characteristics of studies).

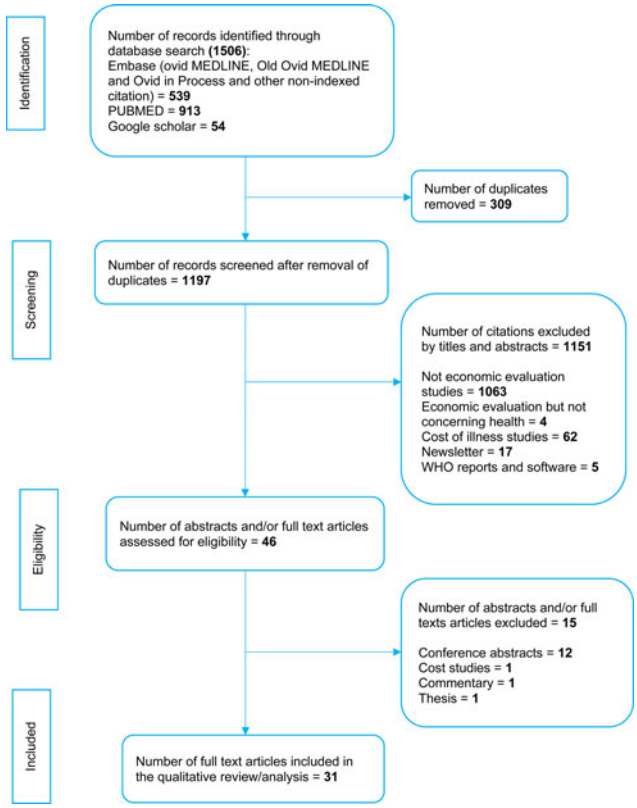

Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) chart illustrating the phases of the systematic review.

The mean quality score was 20 out of 24 (range: 14–23). The number of studies that satisfied each of the twenty-four quality criteria is presented is Figure 2 (see Supplementary Table 3 in Supplementary file 1 for the quality assessment score of each study). Some quality limitations of the studies were failure to characterize heterogeneity ($n = 30$, 97 percent), lack of transparency in the type of decision analytic model used for the evaluation ($n = 16$, 52 percent), failure to assess the structural uncertainties of model used ($n = 14$, 45 percent), failure to mention the costing approach used ($n = 20$, 65 percent), and not estimating incremental costs and outcomes ($n = 10$, 32 percent). Six studies did not include a conflict of interest statement/declaration (28;41;42;46;55;56).

The sources of data used for the evaluations were deemed appropriate. Ghana was the major source of effectiveness data ($n = 17$, 55 percent) which were mainly derived from either a single study (randomized controlled trial or before and after study) or intervention programs (Table 1). The remaining fourteen studies (31;35–39;48–50;52;53;55–57) relied on data from the published and/or unpublished literature (mostly local) as primary data source for effectiveness, epidemiology, death rates, resource use, and costs inputs. In addition to the primary data source, some of the studies relied on international literature for additional information where these were not locally available. Except for two studies (52;54), all studies relied on utilization data from Ghana for estimating resource use. In general, the utilization data were derived from trials and programs; and NHIS pricing list for medicines and tariffs, cost of implementing programs and trials, and health facilities cost records were used to cost the health care provided. The studies that did not use cost

https://doi.org/10.1017/S0266462320000689 Published online by Cambridge University Press

Table 1. Summary characteristics of studies included in the systematic review

Characteristics	*N*	%
Type of economic analysis		
Cost effectiveness analysis	11	35
Cost utility analysis	20	65
Perspective of analysis		
Provider/health system only	13	42
Societal only	5	16
Provider and societal	7	23
Provider and patient	1	3
Not specified	5	16
Model used		
Decision tree	5	16
Markov model	3	9.5
Markov and decision tree	3	9.5
Others	7	23
Not specified/no model	13	42
Source of data		
Trial-based only	5	16
Before and after design	2	6
Published and/or unpublished literature	14	45
Trial-based and other published and/or unpublished literature	3	10
Program and/or published and/or unpublished data	7	23
Costs included		
Direct only	12	39
Indirect only	0	0
Direct and indirect	19	61
Sensitivity analysis		
Univariate	13	42
Multivariate	0	0
Univariate and multivariate	5	16
Probabilistic	2	7
Probabilistic and/or others	10	32
None	1	3
Outcome measure of effectiveness		
DALYs only	15	48
QALYs only	2	7
Years of lives saved only	1	3
Clinical end points only	7	23
Years of lives saved/gained and clinical end point	2	6
QALYs and clinical end points	1	3
DALYs and clinical end points	3	10
Time horizon		
Less than 1 year	3	10
1–5 years	15	48
6–10 years	3	10
Lifetime	6	19
Not specified	4	13
Year of publication		
Before 2000	1	3
2000 to 2010	5	16
After 2010	25	81
Lead/corresponding author		
Local	8	26
Foreigner	23	74
Journal of publication		
Local journal	0	0
International journal	31	100
Type of disease addressing		
Communicable	14	45
Non-communicable	17	55
Category/type of care		
Curative	13	42
Preventive	18	58
Source of funding		
International	28	90
Local	1	3
Not specified	2	7
Type of technology		
Drugs	11	36
Treatment intervention	6	19
Diagnostics/screening	6	19
Others e.g., program	8	26
Setting of study		
Ghana	24	77
Ghana and other countries	7	23

data from Ghana had no local person as a co-author (52;54). None of the studies explicitly stated using expert opinion for data were unavailable as published or unpublished document.

Human Capacity for HTA

There were a total of 199 authors of the 31 studies reviewed: an average of approximately six authors per paper. Sixty (30 percent) out of 199 were local authors (from Ghana); 37 (62 percent) had their role in 19 studies (61 percent) described (Figure 3). Most local authors were involved in data collection ($n = 33$, 89 percent) followed by study conceptualization ($n = 23$, 62 percent). Except for six studies (33;36;37;51;52;54), all the studies had at least one local author contributing to the paper, when it was assumed

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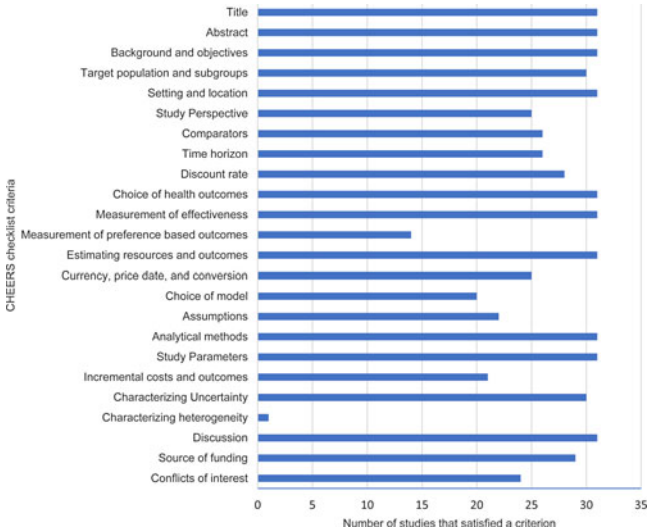

Figure 2. Quality of studies included in this review.

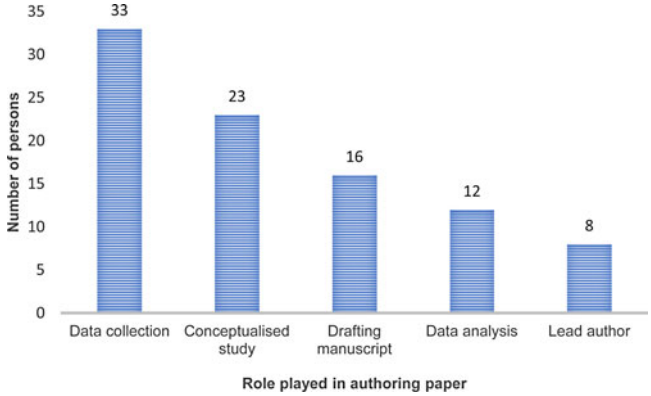

Figure 3. The roles played by local persons in authoring nineteen of the studies reviewed.

that all authors contributed to the paper irrespective of their roles being described. A local author was the lead author of the publication in eight studies (26 percent), with the remaining ($n = 23$, 74 percent) being led by foreign authors.

Discussion

This study utilized a "novel" approach in assessing the human and data capacity for HTA in a country. Unlike other studies that relied on self-reported surveys to reveal the capacity of organizations and individuals for HTA in their countries, this study assessed the human and data capacity of Ghana for HTA by systematically reviewing EE studies undertaken in Ghana, as EE forms an integral part of HTA, and data such as on costs and epidemiological used for EE could be relied upon for budget impact analysis in HTA. This approach provides reliable evidence on the number of existing EEs for HTA, local persons who carried out the analysis, methods used, and the quality and source of data. In addition, studies included in the review are peer-reviewed and the systematic method used to identify and select the studies reduces bias in findings and the conclusions drawn.

This review demonstrated that a number of EEs for a broad scope of diseases have been undertaken in Ghana. In general, most evaluations focused on interventions specific to primary health care (basic and essential health services) for universal health coverage. The majority of the studies (74 percent) investigated the cost-effectiveness of an intervention to treat a common condition in Ghana (i.e., in the top twenty disease burdens for Ghana) (59), which contrasts with the findings of Teerawattananon et al. (60), who reported on the lack of EE for fifteen of the twenty highest disease burdens in the Thai setting.

The increase in the use of EE studies to inform health system decision making world-wide could be expected to result in growth in the number of publications; however, this is not observed in the Ghanaian setting. The thirty-one EEs undertaken in Ghana is low compared to the number conducted in other LMICs, for instance, India ($n = 104$) (61), South Africa ($n = 45$) (62), and Thailand ($n = 39$) (60). It is, however, better than those reported for Bangladesh ($n = 12$) (63), Nigeria ($n = 10$) (64), and Zimbabwe ($n = 3$) (65). The reasons for the low number of evaluations in Ghana are not altogether clear, but there is currently no formal policy mandating the use of HTA and EE studies for decision making, nor is there a formal HTA agency in Ghana, and as a consequence there is a limited number of people available to undertake these studies.

In contrast to studies conducted in LMICs such as India, Vietnam, and South Africa (62;66;67) that used the Quality of Health Economics Studies (QHES) (68) instrument to assess the quality of the papers reviewed, this study used the CHEERS checklist. Although the stated purpose of these tools is different, both have criteria that essentially assess the same methodological characteristics of EE studies. Similar to the current study, these studies included only studies published in peer-reviewed journals. The conclusion made about the quality of EE studies in India, Vietnam, and South Africa are the same as for this study; of good quality. The quality of these studies and that of the current study may largely be driven by the predominance of foreign authors with the necessary skills for conducting EEs. No study has previously reported on the quality of EE studies conducted in Ghana.

DALYs were the most commonly used measure of health outcomes, probably because the WHO and the World Bank recommends it (69–71). There were variations in the methodological approach used by studies such as the time horizon, discount rates, choice of health outcome, and perspective of analysis. The variation in the measure of health outcome (except for studies that used DALYs as an outcome metric) chosen restricts comparison of results in interventions for the same health condition and across interventions for different health conditions. For instance, studies that evaluated malaria interventions used different outcomes including correctly treated fever, deaths averted, malaria cases averted, and DALYs averted, making the results difficult to compare. Therefore, a decision maker seeking to prioritize malaria interventions according to available resources using the results from these studies will face a difficult task because comparability is impossible.

One pronounced methodological flaw in the studies was a failure to conduct a subgroup analysis which describe the differences in costs and outcomes of patients with different characteristics and how such differences may have contributed to variations in the cost effectiveness of the intervention between these subgroups, the overall cost effectiveness and in the decision (27). None of the systematic reviews carried out in other LMICs and discussed here reported whether the studies they reviewed characterized

https://doi.org/10.1017/S0266462320000689 Published online by Cambridge University Press

heterogeneity. This may be because these studies used QHES, which does not have a criterion to assess this. Another limitation of some of the studies was the fact that it is not clear how all resources and estimates used for the evaluation were captured as they failed to specify the use of a model in estimating the cost effectiveness of an intervention. The absence of a model was more common in studies where local researchers played the lead role, perhaps because Ghanaian researchers have limited skills in using a model for EE.

Sources of data used for the evaluations were mostly context-specific and deemed appropriate (Table 1). They were largely consistent with the requirements of international guidelines for EE. The studies that relied on data from other jurisdiction, most especially effectiveness data, did not report factors that might have affected the translation of data from elsewhere to the Ghanaian population, or the methods used to address this as recommended (72–73). Areas that could be explored in future studies are the use of "experts" to elicit data that are not publicly available and/or unknown. The source of cost data used by authors was dependent on the existence and availability of local data. A study was more likely to use local cost data if one of the authors was residing in Ghana. Two studies (52;54) did not use resource data specific to Ghana: both these studies had no local person as an author and relied on an international referencing price. Local cost estimates reflect the real cost of the intervention in the local context thus fostering accuracy and therefore acceptability of results to local decision makers. The most common source of cost data that could be used for future EEs was the NHIS medicines and tariffs list. Even though healthcare costs are not perfectly represented by tariffs, using the NHIS as a source of cost data is a good start and is more likely to result in consistent findings. However, more investment is required by Ghana in terms of data collection and storage by stakeholders such as the government and research institutions.

An average of six authors per paper wrote the articles reviewed which is similar to that reported for India (6.22 authors) (61) but is higher than those of other African countries such as South Africa (three authors) (62), Zimbabwe (three authors) (65), and Nigeria (four authors) (64). Majority of authors were foreign-based (70 percent) and this can be attributed to the fact that, to date, EEs conducted in LMICs may have largely been driven by international donors and other organizations based outside the country. There is no established benchmark for what constitute adequate human capacity for HTA in a country. However, if the number of local persons who authored the studies ($n = 60$) is used as a proxy for the human resource capacity available in Ghana, capacity is limited when compared to the total number of persons who authored these studies (60 vs. 199). This is confounded by the fact that less than 50 percent of local authors were reported to be involved in the conceptualization and analysis of data. This limited human capacity could explain the small number of studies undertaken and published. Ghanaian authors' residing in the country were from academic institutions, government agencies, research institutions, and NGOs. There is the need for Ghanaian decision makers to invest in building human capacity for HTA. Human capacity can be developed through HTA-based research collaborations with researchers from other countries with the needed skills. Another way is in-country training with visiting trainers and sending people outside of the country to institutions renowned in HTA training. Investment in human capital could in-turn pass on their knowledge to other local researchers in Ghana.

Limitations of the Review

The number of EE studies identified and reviewed may have been less than actually published because the literature search was limited to international databases. Unpublished reports from workshops, symposia, and seminar presentations, gray literature such as government reports, and masters and doctoral thesis that are not peer-reviewed were not captured.

The local capacity available for HTA may have been over- or under-estimated due to the methodological approach used in this study. Some of the journals did not provide the individual contributions of authors, hence their skill set could not be ascertained. The actual skill set of those involved in data collection is unknown hence it is possible to have included those without HTA skills. It is possible that the capacity of these local persons identified in this study may have changed since the studies were published, however, these individuals may only require refresher courses. It is likely that some local persons with skills for HTA who might have published work in other countries were not captured because the systematic reviews were restricted to those concerning Ghana. Also, local persons involved in cost of illness studies, which were excluded from the review may have skills useful for HTA.

Although the review was undertaken using a checklist and quality assessment tool, the lack of clarity in the description of methods and results of some of the papers reviewed may have impaired the interpretation of quality of studies. However, to minimize the effect of these limitations, two reviewers extracted the data and reconciled any discrepancies.

The CHEERS checklist, similar to the other checklists available (Drummond et al.'s checklist (74) and CHEC checklist (75)) which aim to assess the quality of EE studies (68) are limited by their failure to capture quality measures such as quality of the evidence included in the evaluation. In addition, the focus of these checklists is primarily on ensuring that all the methodological information has been reported. Hence, the quality of the methodological approach used is a matter for reviewers to decide, which is in turn influenced by their knowledge and experience. Therefore, it is important that future studies on EE reporting and quality checklists focus on developing specific indicators that assesses the quality of the methods as well as data used in the evaluation.

Conclusion

Although of relatively high quality, a limited number of EE studies have been conducted in Ghana. There is no recommended source of data for health service utilization and costs of health care for EEs in Ghana. The majority of studies relied on utilization data from trials and programs and cost data from clinical trials and programs, health facility cost records and the NHIS pricing list for medicines and tariffs to cost health care for the evaluations. Furthermore, the human resources available to conduct HTA, as measured by the number and contribution of authors, is very constrained. If HTA is to be successfully introduced in Ghana, such constraints will need to be addressed through training and collaborations with other researchers and international institutions and by improving data collection and quality.

Supplementary Material. The supplementary material for this article can be found at https://doi.org/10.1017/S0266462320000689

Conflict of Interest. The authors have nothing to disclose.

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