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SYSTEMATIC REVIEWS

Health State Valuation in Low- and Middle-Income Countries: A Systematic Review of the Literature

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ABSTRACT

Objective: Cost-utility analysis is widely used in high-income countries to inform decisions on efficient health care resource allocation. Cost-utility analysis uses the quality-adjusted life-year as the outcome measure of health. High-income countries have undertaken health state valuation (HSV) studies to determine country-specific utility weights to facilitate valuation of health-related quality of life. Despite an evident need, however, the extent of HSVs in low- and middle-income countries (LMICs) is unclear. **Methods:** The literature was searched systematically by using four databases and additional Web searches to identify HSV studies carried out in LMICs. The Preferred Reporting System for Systematic Reviews and Meta-Analysis (PRISMA) strategy was followed to ensure systematic selection of the articles. **Results:** The review identified 17 HSV studies from LMICs. Twelve studies were undertaken in upper middle-income countries, while lower middle- and low-income countries contributed three and two studies, respectively. There were 7 generic HSV and 10 disease-specific HSV studies. The seven generic HSVs included five EuroQol five-dimensional questionnaire, one six-dimensional health state short form (derived from short-form 36 health survey), and one Assessment of Quality of Life valuations. Time trade-off was the predominant valuation method used across all studies. **Conclusions:** This review found that health state valuations from LMICs are uncommon and utility weights are generally unavailable for these countries to carry out health economic evaluation. More HSV studies need to be undertaken in LMICs to facilitate efficient resource allocation in their respective health systems.

Keywords: health state valuation, LMIC, preference, QALY, utility.

Introduction

Health economic evaluations and health technology assessments are performed in many high-income countries to assist decisions about the allocation of health resources. It is unclear, however, whether any low- and middle-income countries (LMICs) have adopted this approach [1]. There appear to be many barriers against the adoption of health economic evaluations as formal tools for decision making in LMICs.

Over the past decade, cost-utility analysis (CUA) has become used extensively in high-income countries to prioritize health care interventions and inform government subsidy decision-making processes [2]. Many health advisory institutions in Western Europe, Canada, and Australia recommend the use of health economic evaluations to inform decisions, and use quality-adjusted life-years (QALYs) [3–5] or disability-adjusted life-years (DALYs) [6,7] as outcome measures. Most applications of DALYs do not use country-specific valuations of health states. A preference for the same health state (e.g., leg fracture/HIV infection/blindness) could be quite different in different countries. Preferences can vary, inter alia, by cultural belief [8], availability of health care, and support from social institutions. Thus, the use of weights derived from preferences of people living elsewhere and differences in methods of deriving utility weights can have a significant impact on the resulting CUA [9,10]. This review focuses on country-specific utility weights for QALYs on the basis that DALYs differ significantly from QALYs as the outcome measure for economic evaluation [8]. The estimation of QALYs requires weights (utility weights) to account for the quality adjustment of survival for different states of health (health states). Utility weights denote the strength of preference or the desirability of a given specific health state. In estimating utility weights, three questions need to be answered: what is to be valued; how is it to be valued; and who is to value it [9]. A set of health states described with the aid of a multiattribute utility instrument (MAUI) is valued by using a preference elicitation

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method such as the time trade-off (TTO) [10], standard gamble (SG) [11], or more recently discrete choice experiments (DCEs) [12]. Usually, the general population of the country where the weights are to be used should provide the valuation [10,13]. There are, however, other dissenting arguments such as valuation by patients [14]. Utility weights developed by using this approach have been made available in high-income countries over the last two decades [13,15–19]. Generic health state valuations (HSVs) such as the EuroQol five-dimensional (EQ-5D) questionnaire and six-dimensional health state short form (derived from short-form 36 health survey) (SF-6D) usually provide a national value set that can be used in health care decision making. Because of a lack of sensitivity of generic MAUIs in specific disease conditions [20], cancer, for example, specific HSVs using disease-specific MAUI should also be considered.

The World Bank classified countries according to their annual per capita income in 2011 as low income (US $1,025 or less), lower middle income (US $1,026–$4,035), upper middle income (US $4,036–$12,476), and high income (>US $12,476) [21]. An LMIC is defined as a country with low-, lower middle- and upper middle-income citizens [21]. In LMICs, the availability of utility weights is of increased importance because these countries require efficient health care resource allocation because of scarce resources and high disease burden [22]. The availability of utility weights could facilitate CUA for efficient health resource allocation in these countries. Utility weights derived from the preferences of a population of a given country have been reported to be different from those derived from other countries [23,24]. Utility weights differ significantly even among high-income countries [23]. Moreover, widely different socioeconomic, cultural, and social conditions between high-income countries and LMICs make it imperative that country-specific utility weights be used in health economic evaluations. For example, the quality of life (QOL) associated with poliomyelitis in an LMIC has far greater consequences, such as physical limitations for the afflicted, than in high-income countries where aids such as motorized wheelchairs and buildings that cater for wheelchair access are commonplace. The perceived unavailability of utility weights using country-specific preferences could be one of the barriers in LMICs to the adoption of health economic evaluation as a formal tool for decision making [1].

Aim

This article presents a systematic review of the literature with the aim of ascertaining HSV studies that have been undertaken in LMICs, and the valuation methods that have been used. This review is important to further develop standardized methods for HSV for use in CUAs. It suggests areas for improvement in the application of the methods and how resource-poor conditions can develop their own HSVs for use in CUAs to improve decision making.

Methods

A comprehensive search of the literature was carried out by using Medline, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and American Economic Association's Electronic bibliography (EconLit) databases. The search was restricted to publications from 1976 to August 2012 for all languages. All four databases were searched, using the same strategy, for the words below appearing in the title, abstract, or full text of the article:

1. "Quality of life"
2. "util*" or "preference*" or "health state*" or "value set"
3. "time trade off" or "TTO" or "time-trade off "or "time trade-off" or "SG" or "standard gamble" or "conjoint analysis" or "DCE" or "discrete choice experiment*"

The search terms were combined by using the Boolean term "AND" (#1 AND #2 AND #3) to achieve the final search result.

In addition, reference searches were carried out in Web sites of the major HSV systems for the EQ-5D questionnaire [25], Assessment of QOL (AQOL) [26], and SF-6D [27]. Last, references in the selected articles from the original search and references of recent reviews and valuation studies from high-income countries were reviewed to identify any further studies from LMICs. Articles were selected according to the following criteria.

Inclusion Criteria

1. Generic or disease-specific HSV studies using a TTO, SG, or DCE from an LMIC (if one LMIC was available in a multiple country study, details for the LMIC were included).

Exclusion Criteria

1. HSV studies from high-income countries. Hong Kong was considered as a high-income zone despite being associated with China, which is an LMIC according to the World Bank [21].
2. Studies using nontrading methods such as the visual analogue scale (VAS). Although the VAS is a valuation method, it is not choice-based and provides rankings only. Thus, it was excluded on the basis that valuations derived from a VAS are not preferences involving explicit trade-offs. None of the VAS studies found was from an LMIC.
3. Nonempirical articles discussing methodological or theoretical issues of preference-based measures, health state descriptive systems, and review studies.
4. Other: articles such as CUA studies that apply existing utility weights.

The review followed the Preferred Reporting System for Systematic Reviews and Meta-Analysis (PRISMA) strategy (Fig. 1), which allows systematic selection of articles and is described in detail elsewhere [28].

The selected articles were categorized into two groups, namely, generic HSV studies and disease-specific HSV studies. The selected generic HSV studies were compared with each other with respect to the descriptive systems used, the number of health states directly valued (total and per subject), the preference elicitation method used, the model used for estimation, dependent and independent variables used, and measurements of the model fit. Disease-specific HSVs were also compared with each other for their methodology, results, and utilities of the specific disease conditions.

Results

Sixteen articles were selected from the database search (Fig.1). The EUROQoL Web site identified one additional relevant article [29], making a total of 17 for inclusion in the review. It was noteworthy that of the 943 selected articles, only 16 (1.7%) were from LMICs (Fig. 1). Nine of the 17 selected studies were sourced from the Asian continent [30–38], four from South America [39–42], three from Africa [29,43,44], and one from Australasia [45]. Twelve studies were undertaken in upper middle income countries [30–33,35–37,39,40–42,44], three in lower middle income countries [34,38,45], and two in low-income countries [29,43]. Table 1 shows that only 11.8% of the countries classified as LMIC have any experience in valuing health states. Compared with low- and lower middle income countries, a higher percentage of upper middle income countries reported HSVs (Table 1).

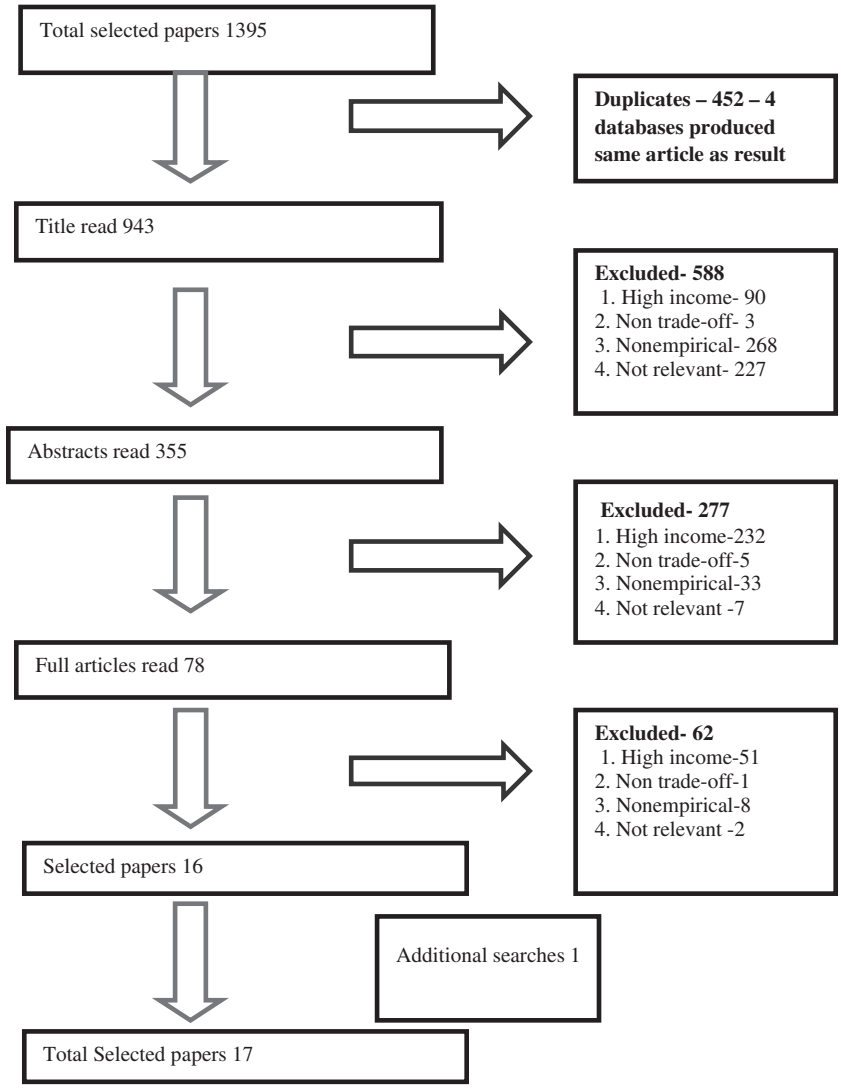

Fig. 1 – PRISMA flowchart for the selection of articles for the review. *1, 2, 3, and 4 relate to the four exclusion criteria. PRISMA, Preferred Reporting System for Systematic Reviews and Meta-Analysis.

Table 2 describes the HSV studies selected for the review. There were seven generic HSV studies [29,30,36,39,40,42,45], including one undertaken in adolescents rather than adults [45]. Of the seven generic HSV studies, five were from upper middle income countries. The remaining 10 articles were disease-specific HSV studies [31–35,37,38,41,43,44]. TTO was the predominant valuation method. It was used 10 times, while the SG was used 7 times (on 5 of these occasions, the SG was used in addition to the TTO). No study used DCEs. One study, however, used willingness to pay as a method additional to TTO [35]. Valuations were undertaken for generic instruments (the EQ-5D questionnaire, SF-6D, and AQOL), and disease-specific states of rheumatoid arthritis, HIV, melasma, colorectal cancer, and glaucoma states.

Table 1 – Number of countries that reported health state valuations in LMICs.

Income group	Number of countries that reported health state valuations	Number of countries in the income group	Percentage
Upper middle	12	54	22
Lower middle	3	54	5.5
Low	2	36	5.5
All LMICs	17	144	11.8

LMICs, low- and middle-income countries.

Generic HSV Studies

Five of the seven generic studies had valued EQ-5D questionnaire health states [29,30,36,40,42] (Table 2). The other two studies valued the SF-6D [39] and the AQOL [45]. Tongsiri and Cairns [30], Yusof et al. [36], Zarate et al. [42], and Augustovski et al. [40] used translated and validated EQ-5D questionnaire descriptive systems in local languages. However, Jelsma et al. [29] used only the English version in Zimbabwe, and their study thus suffers from

Table 2 – Description of the selected health state valuation studies for the review.

Publication	Country class	Country	Sample size	Sample description	Valuation method	Instrument or disease valued	Type of study
Yusof et al. [36]	Upper middle	Malaysia	152	Health professionals	TTO	EQ-5D questionnaire	GHSV
Leeyaphan et al. [35]	Upper middle	Thailand	77	Patients with melasma	TTO/WTP	Melasma	DSHV
Dranitsaris et al. [37]	Upper middle	Malaysia	24	Health professionals	TTO	Colorectal cancer	DSHV
Dranitsaris et al. [38]	Lower middle	India	24	Health professionals	TTO	Colorectal cancer	DSHV
Zarate et al. [42]	Upper middle	Chile	2000	General public	TTO	EQ-5D questionnaire	GHSV
Tongsiri and Cairns [30]	Upper middle	Thailand	1409	General public	TTO	EQ-5D questionnaire	GHSV
Cruz et al. [39]	Upper middle	Brazil	494	General public	SG	SF-6D	GHSV
Moodie et al. [45]	Lower middle	Fiji/Tonga	60	Adolescents	TTO	AQOL	GHSV
Goncalves Campolina et al. [41]	Upper middle	Brazil	200	General public	TTO/SG	RA	DSHV
Augustovski et al. [40]	Upper middle	Argentina	679	General public	TTO	EQ-5D questionnaire	GHSV
Sakthong et al. [31]	Upper middle	Thailand	120	Patients with HIV	TTO/SG	HIV	DSHV
Sun et al.[32]	Upper middle	China	106	Patients with glaucoma	TTO/SG	Glaucoma	DSHV
Levy et al. [33]	Upper middle	China	100	Patients with hepatitis	SG	Hepatitis B	DSHV
Lara et al. 2008 [43]	Low	Uganda	435	Patients with HIV	TTO/SG	HIV	DSHV
Gupta et al. [34]	Lower middle	India	105	Patients with glaucoma	TTO/SG	Glaucoma	DSHV
Bejia et al. [44]	Upper middle	Tunisia	122	Patients with RA	TTO	RA	DSHV
Jelsma et al. [29]	Low	Zimbabwe	2488	General population	TTO	EQ-5D questionnaire	GHSV

Notes: Country class according to World Bank classification per capita income of the countries [21].
The AQOL study [40] reported results from both Fiji and Tonga and is considered here as one study.
AQOL, Assessment of Quality of Life; DSHV, disease-specific health state valuation; EQ-5D, EuroQol five-dimensional; GHSV, generic health state valuation; RA, rheumatoid arthritis; SF-6D, six-dimensional health state short form (derived from short-form 36 health survey); SG, standard gamble; TTO, time trade-off; WHOQOL, World Health Organization Quality of Life assessment instrument [44,45]; WTP, willingness to pay.

Table 3 – Comparison of Generic health state valuation studies.

	Yusof et al. [36]	Zarate et al. [42]	Tongsiri and Cairns [30]	Augustovski et al. [40]	Jelsma et al. [29]	Cruz et al. [39]	Moodie et al. [45]
Country	Malaysia	Chile	Thailand	Argentina	Zimbabwe	Brazil	Fiji/Tonga
Sample	N = 152 convenient	N = 2000 multistage probability	N = 1409 random representative	N = 611 convenient	N = 2384 random	N = 494 random	N = 60 convenient
Age description (y)	Mean 41	Mean 46	Mean 44.6	≥18, mean 43.5	≥15	20–64	12–18
Mode of interview	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face	Class setting
Total directly valued states	45	42	86	24	38	248	30 scenarios
No. of states directly valued per person	15	12	10	13	7	6	10 scenarios
Use of worse-than-death states	Yes?	Yes	No information	Yes	33333 was the only state valued as worse than dead	Yes	Monash protocol [40]
Reliability of data	No data	No data	No data	No data	No data	No data	No data
Exclude logical inconsistencies	Yes	Yes	No	No data	No	No	No data
Regression model	Linear additive	Additive RE	Additive GLS RE	Additive OLS plus Huber White method	Additive REML	Additive RE	Multiplicative
Analysis method	Individual level	Individual level	No information	Individual level	No information	Individual and aggregate	Individual and aggregate
Dependent variable	No information	1-S	1-S	No data	TTO_s* /10	SG_s*	1-S
Independent variables	"Main effect model" N3, D1	"Main effect"	"Main effect model," N3, intercept	16 variable model	"Main effect model"	–	AQOL score demographic variables
Number of independent variables	10 for the main effect	10	11	16	10	16	No data
R^2	0.427 for D1	0.337 for N3	0.448	0.897	No data	No data	No data
MAD < 0.05	Yes	Yes	Yes	Yes	Yes	No	No data
Best utility for a disease state	0.879	0.808	0.766	0.931	0.857	0.82	No data

GLS, generalized least square; MAD, mean absolute difference; OLS, ordinary least square; 1-S, disutility; RE, random effect; REML, residual maximum likelihood linear mixed model; R^2, coefficient of determination; SG, standard gamble; TTO, time trade-off.

* Value of a given health state TTO or SG.

selection bias. Cruz et al. [39] used the Brazilian language for the SF-6D, while Moodie et al. [45] in their AQOL study used English. The reported EQ-5D questionnaire and SF-6D studies generated their respective country population tariffs for utility weights. The AQOL study was a calibration study for adolescents [45]. The methodological approach used by generic HSV studies is summarized in Table 3. The studies used sample sizes ranging from 152 to 2384 in the six studies that collected data from the general population [29,30,36,39,40,42]. The AQOL study included only adolescents (aged 12–18 years with a sample size of 60) [45]. Moodie et al. [45] also undertook the valuation in a classroom setting, which is quite different from the individual level of data collection seen in other TTO valuations.

The number of directly valued health states ranged from 24 to 248. The EQ-5D questionnaire studies directly valued different numbers of health states: 24 [40], 38 [29], 42 [42], 45 [36], and 86 [30]. The SF-6D study valued 248 health states, while the AQOL study valued 30 scenarios. The EQ-5D questionnaire studies reported a range of 7 to 15 valuations per person (Table 3). The SF-6D study used 6 valuations per person, and the AQOL study used 10.

Jelsma et al. [29] reported TTO value/10 as the dependent variable, a deviation from using disutility as the dependent variable [29]. The only SF-6D study described in this review is that by Cruz et al. [33]. They fitted individual- and aggregate-level models to SG valuations and estimated utility weights for all SF-6D health states following the example of Brazier et al [11]. Moodie et al. [45] used TTO scores for the scenarios used as the dependent variable. Except for Augustovski et al., who reported −19 as the lower bound for worse than death states before transformation to interval scale, indicating 6-month TTO increments, others did not report worse than death values before transformation. Yusof et al. [36] and Zarate et al. [42] reported exclusion of logical inconsistencies, while Tongsiri and Cairns [30], Jelsma et al. [29], and Cruz et al. [39] did not exclude them.

All generic HSV studies used regression models with additive functional forms, except for Moodie et al. [45] who used a multiplicative functional form in the model estimation. Tongsiri and Cairns [30] were the only authors to use a generalized least square random effect model [15]. Others [29,40] used variations of linear regression for EQ-5D questionnaire studies. Using the Huber-White method in their model estimation, Augustovski et al. [40] allowed for heteroscedasticity correction for the uneven variance across observations. These studies specified between 10 and 16 independent variables according to the model used. Moodie et al. [45] used demographic variables and AQOL scores for independent variables. In contrast to individual-level analysis in EQ-5D questionnaire studies, Cruz et al. [39] used an aggregate-level analysis. There was general consensus in using the main effects model for the independent variables in the EQ-5D questionnaire studies. It was unclear, however, that the use of a different number of independent variables improved the model fit. Augustovski et al. [40] used a different model, called the "16 variable" model, which incorporated both N3 [15] and D1 models [13]. Cruz et al. [39] used a random effect model to derive their estimates.

The predictive power of a regression model can be seen by how well the model predicts values from an internal sample against an external sample. If the mean absolute difference, a measure of statistical dispersion, is less than 0.05, the model is considered to be robust with good predictive power. All five EQ-5D questionnaire studies [29,30,36,40,42] reviewed here met this criterion. In comparing the best utility for a disease state, the values ranged from 0.766 to 0.931 (Table 3).

Disease-Specific HSV Studies

No study from the selected publications valued health states from an existing validated disease-specific MAUI. Of the 10 disease-specific HSV studies found in the literature, two valued health states in HIV-positive individuals [43,46], two valued health states in glaucoma [32,34], and two in rheumatoid arthritis [41,44]. One study valued chronic hepatitis B [33], one melasma [35], and two studies valued colorectal cancer health states [37,38]. All disease-specific HSV studies were from Asian and African countries and are compared further in their methodology in Table 4.

All seven studies used convenience sampling. The sample size ranged from 24 to 435. The respondents were all patients and health professionals except in the study of Levy et al. [33] who recruited people both with and without hepatitis B infection. The majority of these studies recruited consecutive patients attending clinics, except for that of Lara et al. [43] who recruited from an ongoing trial of HIV-positive patients. In contrast, Dranitsaris et al. opted to have nurses as surrogates to value colorectal cancer health states in two similar studies undertaken in Malaysia [37] and India [38].

Except for two studies [33,43], most other disease-specific HSV studies [32,34,35,41,44,46] used respondent patients' own health state to trade-off against full health. Lara et al. [43] used three HIV health states constructed from World Health Organization HIV stages, and calibrated these with both clinicians and patients. There was no perfect health state for comparison but an improved health state that was given the utility value of 1. Levy et al. [33] developed six hepatitis B health states with the help of experts and used extensive consensual validation, forward and backward translations, linguistic validation interviews, and pilot testing.

Discussion

Overall, this systematic review shows the paucity of HSV evidence available from LMICs. Moreover, only six studies reported HSVs for population norms. Only a handful of upper middle income countries have developed their own utility weights and still fewer lower middle income and low-income countries have done so. LMICs make up the larger proportion of the world's population and have the greatest disease burden [22,47–49]. Utility weights are instrumental in efficient resource allocation in health care. In valuing health states for the EQ-5D questionnaire and the SF-6D, the reported studies generally followed the protocol put forwarded by earlier studies [10,50] but with some variations. The variations included the choice of directly valued health states, use of health states worse than death, and the regression model selected for the model estimation. No article discussed or justified the different independent variables used in the regression models or the interactions between dimensions in their models.

None of the studies gave a rationale for the number or the selection of the directly valued health states. There was no reason given for the different selection of directly valued health states. Nevertheless, it is deemed acceptable to use any number of health states for direct valuation as long as these legitimately represent the EQ-5D questionnaire valuation space and do not include implausible states [17]. It would, however, be better to directly value as many health states as possible without overburdening the respondents, keeping the duration of the valuation exercise to less than 30 minutes [17]. The majority of the studies reported in this review have valued 10 to 15 health states per respondent. It is possible, however, to directly value a larger number of health states in a particular study without increasing the number per respondent [17], while maintaining robust estimates.

In general, the EQ-5D questionnaire studies in this review report their sampling procedure poorly. Usually no or insufficient

Table 4 – Comparison of disease-specific health state valuation studies.

	Sakthong et al. [31]	Lara et al. [43]	Levy et al. [33]	Bejia et al. [44]	Goncalves Campolina et al. [41]	Gupta et al. [34]	Sun et al. [32]	Leeyaphan et al. [35]	Dranitsaris et al. [37]	Dranitsaris et al. [38]
Country	Thailand	Uganda	China	Tunisia	Brazil	India	China	Thailand	Malaysia	India
Disease	HIV	HIV	Hepatitis B	RA	RA	Glaucoma	Glaucoma	Melasma	Colorectal cancer	Colorectal cancer
Sample	120 patients with HIV	276 and 159 patients with HIV	100 patients with hep B/ 100 healthy	122 patients with RA	200 patients with RA	105 patients with glaucoma	106 patients with glaucoma	77 patients with melasma	24 Health professionals	24 Health professionals
Interview	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face	Face to face
Valued health states	Own HIV state vs. risky treatment	3 HIV states and predefined improved health state	Hep B states-scenarios vs. perfect health(death as the gamble)	Own RA state vs. perfect health	Own RA state vs. better health state (death as the gamble)	Own GL state vs. perfect vision (death and blindness as the gamble)	Own GL state vs . perfect vision (death as the gamble)	Own melasma state vs. complete clearing	16 cancer health states vs. full health	16 cancer health states vs. full health
Valuation method	SG	SG /TTO	SG	TTO	TTO /SG	TTO/SG	TTO/SG	TTO/WTP	TTO	TTO
Time horizon	Remaining life expectancy	10 y	No information	Remaining life expectancy	Remaining life expectancy	Remaining life expectancy	Remaining life expectancy	30 y	Varied	Varied

GL, glaucoma; Hep B, hepatitis B; RA, rheumatoid arthritis; SG, standard gamble; TTO, time trade-off; WTP, willingness to pay.

explanations are given for the different sample sizes or choice of convenience sampling. No study reported the power of their sample sizes. A nonrepresentative sample would not produce a reliable decision-making tool. Even if the sample was not random, if it does not vary significantly from the demographic profile of the population it could be argued that the derived values could reasonably be held to represent population-based preferences. Jelsma et al. [29] and Augustovski et al. [40] produce comparisons of their respective samples with the demographic data of their countries in an attempt to validate this approach. Significant interviewer effects were also reported by Jelsma et al. [29]. Thus, it is important to use educated, trained, and calibrated interviewers who can grasp the TTO process and are also capable of training the subjects, especially in LMIC community survey scenarios.

The utility values produced from disease-specific HSV studies in this review cannot be compared with each other because they did not use the same methods. All studies other than Levy et al. [33] valued preferences between a patient's own current health state and undertaking a risky intervention to gain perfect health. The Indian study on glaucoma [34] used immediate death for SG, in contrast to the Chinese study that used blindness as the gamble [32]. It is doubtful that these utilities could be used for any decision-making exercise, but nevertheless serve a descriptive purpose and do allow comparison with other interventions for the same disease. Most of these studies used the presumed life expectancy of the subject as the time horizon. Thus, the denominator in the TTO or SG equation was each person's life expectancy from the age the person was when valuing the health state. Furthermore, in the majority of cases, the trade-offs were made against their own disease state versus perfect health. The preferred method of utility valuation for disease-specific health states is to build disease scenarios with the help of patients and value them in standard conditions by healthy subjects who represent the population [2]. Given the challenge to conduct health state valuations in LMICs, especially in Africa and South Asia, the above disease-specific HSV studies are commendable.

A clear limitation is the lack of local research capacity in many of these countries. Health economic evaluations are very rare in LMICs [21] than in high-income countries. One reason for the dearth of publications from these countries is the limited number of researchers in health economics. Then, there is the question of cost. Unlike the situation in high-income countries, the costs of data collection, including salaries of data collectors and for logistics, are much lower in LMICs. Collaboration with health economists from high-income countries and capacity building of personnel in LMICs can promote the development of country-specific utility weights from LMICs. Subsequently, greater awareness among health decision makers of the value and relevance of utility weights should lead to improved allocation of health resources.

The social and economic aspects of health care may be disregarded in many countries because of the lack of understanding among health professionals and decision makers about these aspects [1]. Changing social expectations may also demand that health benefit packages should include lifesaving interventions irrespective of their cost-effectiveness. An inherent problem of these countries where health resource allocation (and all resource allocations) is more politicized, decision makers could feel their authority challenged if the results of economic evaluations were to be followed [51]. As an example, in Japan, clinicians felt their clinical autonomy challenged when health economic evaluations were proposed [1]. Social institutions would demand that decision makers consider not only the efficiency but also the norms and values in the society, equity, social solidarity, and protection against catastrophic health expenditure. The prevailing health systems in these countries

still revere health professionals, have strong traditions, and are reluctant to discuss economic aspects on the basis of altruism [1]. The comparison of health services with monetary values could still be unacceptable to them. The principles of utilitarianism on which health economic evaluations are based might not be considered ethical, especially in an Asian mindset where "maximum happiness" or "maximum pleasure" would not align with the "middle way" of Buddhism or Hinduism in a philosophical sense [1]. However, Cubbon [52] has counterargued this by saying that it is absurd to think that QALYs matter only to people living in Western liberal democracies, advanced capitalist societies, or welfare states. As the author reasoned, pain and disability have always been the limiting factor in preventing humans achieving their goals. Thus, achievement of the goals of every member of society needs to be promoted. Thus, QALYs become very important where evaluation of life without regard to actual or potential quality would be incomplete [52].

LMICs are challenged by large population growth and huge disease burdens coupled with inefficient, unwieldy health systems [22]. People in these countries could benefit immensely if CUAs were to be used to facilitate health care decision making. CUAs, however, need relevant HSVs because weights from other countries such as those from Western Europe, which are so socioeconomically and culturally different, cannot be applied [23].

The QALY is one of two methods that allow quantification of QOL and survival and is used as a building block of health policy [52]. The other is the DALY [6,7]. CUA is required to make objective health care decisions. It is very much necessary to promote research and application of these approaches in LMICs. One of the foremost actions should be valuation of utility weights for specific countries using reliable and valid MAUI to facilitate future research in this field.

Conclusions

This literature review demonstrates that utility weight valuations from LMICs are rare, compared with high-income developed countries. LMICs have the majority of the world's population and the highest disease burden [22]. There is a need to conduct HSV studies to produce utility scoring algorithms for these countries. It is recommended that the quality of utility weight valuation studies be improved by deriving and validating MAUIs in LMICs. For disease-specific HSV studies, when scenarios are constructed they should be validated prior to use. Moreover, health economic research should focus on validating disease-specific MAUIs, at least for the diseases with the largest public health burden. Greater collaborative research between health economics centers in high-income countries and LMICs could pave the way to capacity building in LMICs. International agencies should be encouraged to increase funding in this regard.

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REFERENCES

[1] Yothasamut J, Tantivess S, Teerawattananon Y. Using economic evaluation in policy decision-making in Asian countries: mission impossible or mission probable? Value Health 2009;12(Suppl. 3):S26–30.
[2] Scuffham PA, Whitty JA, Mitchell A, Viney R. The use of QALY weights for QALY calculations: a review of industry submissions requesting listing on the Australian Pharmaceutical Benefits Scheme 2002–4. Pharmacoeconomics 2008;26:297–310.
[3] National Institute for Health and Clinical Excellence. Technical Guidance for Manufacturers and Sponsors on Making a Submission to a Technology Appraisal. London: National Institute for Health and Clinical Excellence, 2001.
[4] Ministry of Health. Ontario Guidelines for Economic Analysis of Pharmaceutical Products. Toronto, Canada: Ministry of Health, 1994.
[5] Commitee PBA. Guidelines for Preparing Submissions to the Pharmaceutical Benefits Advisory Committee (version 4.3). Canberra, Australia: Department of Health and Aging, 2008.
[6] Edmond KM, Kortsalioudaki C, Scott S, et al. Group B streptococcal disease in infants aged younger than 3 months: systematic review and meta-analysis. Lancet 2012;379:547–56.
[7] Mwaniki MK, Atieno M, Lawn JE, Newton CR. Long-term neurodevelopmental outcomes after intrauterine and neonatal insults: a systematic review. Lancet 2012;379:445–52.
[8] Sassi F. Calculating QALYs, comparing QALY and DALY calculations. Health Policy Plan 2006;21:402–8.
[9] Dolan P. Developing methods that really do value the "Q" in the QALY. Health Econ Policy Law 2008;3(Pt 1):69–77.
[10] Dolan P, Gudex C, Kind P, Williams A. The time trade-off method: results from a general population study. Health Econ 1996;5:141–54.
[11] Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. J Health Econ 2002;21:271–92.
[12] Bansback N, Brazier J, Tsuchiya A, Anis A. Using a discrete choice experiment to estimate health state utility values. J Health Econ 2012;31:306–18.
[13] Shaw JW, Johnson JA, Coons SJ. US valuation of the EQ-5D health states: development and testing of the D1 Valuation Model. Med Care 2005;43:203–20.
[14] Dolan P. Thinking about it: thoughts about health and valuing QALYs. Health Econ 2011;20:1407–16.
[15] Dolan P. Modeling valuations for EuroQol health states. Med Care 1997;35:1095–108.
[16] Tsuchiya A, Shunya I, Naoki I, et al. Estimating an EQ-5D population value set: the case of Japan. Health Econ 2002;11:341–53.
[17] Viney R, Norman R, King MT, et al. Time trade-off derived EQ-5D weights for Australia. Value Health 2011;14:928–36.
[18] Ferreira LN, Ferreira PL, Pereira LN, et al. A Portuguese value set for the SF-6D. Value Health 2010;13:624–30.
[19] Feeny D, Wu L, Eng K. Comparing short form 6D, standard gamble, and Health Utilities Index Mark 2 and Mark 3 utility scores: results from total hip arthroplasty patients. Qual Life Res 2004;13:1659–70.
[20] Rowen D, Brazier J, Young T, et al. Deriving a preference-based measure for cancer using the EORTC QLQ-C30. Value Health 2011;14:721–31.
[21] World Bank. Country and Lending Groups. Available from: http://data.worldbank.org/about/country- classifications/country-and-lending-groups. [Accessed August 25, 2012].
[22] World Health organization. World Health Statistics. Geneva, Switzerland: WHO Press, 2011.
[23] Norman R, Cronin P, Viney R, et al. International comparisons in valuing EQ-5D health states: a review and analysis. Value Health 2009;12:1194–200.
[24] Badia X, Roset M, Herdman M, Kind P. A comparison of United Kingdom and Spanish general population time trade-off values for EQ-5D health states. Med Decis Making 2001;21:7–16.
[25] EuroQol group. EQ5D. 2011. Available from: http://www.euroqol.org/eq-5d/reference-search/reference-search.html. [Accessed October 15, 2011].
[26] AQoL. Assessment of Quality of life. 2011. Available from: http://www.aqol.com.au/research-papers.html. [Accessed October 15, 2011].
[27] The University of Sheffield. Health economics and decision science. 2011. Available from: http://www.shef.ac.uk/scharr/sections/heds/mvh/sf-6d/countries. [Accessed October 15, 2011].
[28] Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J Clin Epidemiol 2009;62:1006–12.
[29] Jelsma J, Hansen K, De Weerdt W, et al. How do Zimbabweans value health states? Popul Health Metr 2003;1:11.
[30] Tongsiri S, Cairns J. Estimating population-based values for EQ-5D health states in Thailand. Value Health 2011;14(8):1142–5.
[31] Sakthong P, Schommer JC, Gross CR, et al. Health utilities in patients with HIV/AIDS in Thailand. Value Health 2009;12:377–84.
[32] Sun X, Zhang S, Wang N, et al. Utility assessment among patients of primary angle closure/glaucoma in China: a preliminary study. Br J Ophthalmol 2009;93:871–4.
[33] Levy AR, Kowdley KV, Iloeje U, et al. The impact of chronic hepatitis B on quality of life: a multinational study of utilities from infected and uninfected persons. Value Health 2008;11:527–38.
[34] Gupta V, Srinivasan G, Mei SS, et al. Utility values among glaucoma patients: an impact on the quality of life. Br J Ophthalmol 2005;89:1241–4.
[35] Leeyaphan C, Wanitphakdeedecha R, Manuskiatti W, Kulthanan K. Measuring melasma patients' quality of life using willingness to pay and time trade-off methods in Thai population. BMC Dermatol 2011;11:16.
[36] Yusof FAM, Goh A, Azmi S. Estimating an EQ-5D value set for Malaysia using time trade-off and visual analogue scale methods. Value Health 2012;15(1, Suppl.):S85–90.

[37] Dranitsaris G, Truter I, Lubbe MS, et al. Using pharmacoeconomic modelling to determine value-based pricing for new pharmaceuticals in Malaysia. MJMS 2011;18:32–43.
[38] Dranitsaris G, Truter I, Lubbe MS, et al. Improving patient access to cancer drugs in India: using economic modeling to estimate a more affordable drug cost based on measures of societal value. Int J Technol Assess Health Care 2011;27:23–30.
[39] Cruz LN, Camey SA, Hoffmann JF, et al. Estimating the SF-6D value set for a population-based sample of Brazilians. Value Health 2011; 14(5, Suppl. 1):S108–14.
[40] Augustovski FA, Irazola VE, Velazquez AP, et al. Argentine valuation of the EQ-5D health states. Value Health 2009;12:587–96.
[41] Goncalves Campolina A, Bruscato Bortoluzzo A, Bosi Ferraz M, Mesquita Ciconelli R. Validity of the SF-6D index in Brazilian patients with rheumatoid arthritis. Clin Exp Rheumatol 2009;27: 237–45.
[42] Zarate V, Kind P, Valenzuela P, et al. Social valuation of EQ-5D health states: the Chilean case. Value Health 2011;14:1135–41.
[43] Lara AM, Wakholi BN, Kasirye A, et al. Utility assessment of HIV/AIDS-related health states in HIV-infected Ugandans. AIDS 2008;22(Suppl. 1): S123–30.
[44] Bejia I, Salem KB, Touzi M, Bergaoui N. Measuring utilities by the time trade-off method in Tunisian rheumatoid arthritis patients. Clin Rheumatol 2006;25:38–41.
[45] Moodie M, Richardson J, Rankin B, et al. Predicting time trade-off health state valuations of adolescents in four Pacific countries using the Assessment of Quality-of-Life (AQoL-6D) instrument. Value Health 2010;13:1014–27.
[46] Sakthong P, Schommer JC, Gross CR, et al. Health utilities in patients with HIV/AIDS in Thailand. Value Health 2009;12:377–84.
[47] Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2224–60.
[48] Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2197–223.
[49] World Health Organization. Country health system profile. 2012. Available from: http://www.searo.who.int/en/Section313/Section1524_10882.htm. [Accessed February 14, 2012].
[50] Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. J Health Econ 2002;21:271–92.
[51] Teerawattananon Y, Russell S. A difficult balancing act: policy actors' perspectives on using economic evaluation to inform health-care coverage decisions under the Universal Health Insurance Coverage scheme in Thailand. Value Health 2008;11(Suppl. 1):S52–60.
[52] Cubbon J. The principle of QALY maximisation as the basis for allocating health care resources. J Med Ethics 1991;17:181–4.