



iDSI Workshop on Cost-Effectiveness Thresholds: Conceptualisation and Estimation

26 June 2015 – London, UK

SUMMARY REPORT

Produced by CHE, University of York

Table of contents

Executive summary	3
Background	5
Session 1: Cost-effectiveness thresholds – conceptual bases	6
Session 2: Towards empirical estimation of the threshold	10
Session 3: Empirical estimation of the thresholds	11
Session 4: Final reflections and consequences for policy	13
Appendix 1: Further research activity speculation	15
Appendix 2: Workshop attendees	16
Appendix 3: Workshop agenda	18

Executive summary

On 26 June 2015, a group of 50 researchers and international policymakers interested in resource allocation and cost-effectiveness thresholds (CETs), came together in London in order to present different perspectives on the conceptualisation of thresholds; to present empirical research; to estimate thresholds; and to agree appropriate guidance on the use of thresholds.

Main outcomes

- The intended use of GDP-based CETs as broad brush 'markers of interest' was clarified and their current use in cost-effectiveness analysis was discussed. It was highlighted that these measures have often been used to directly inform the allocation of healthcare budgets; which is beyond their purpose and applicability.
- Research into the use of willingness-to-pay (WTP) ('demand-side') approach to determining CETs was presented and the challenges of these approaches discussed. Attendees determined that these approaches should not be used when deciding upon the allocation of scarce healthcare resources, but acknowledged that they can be informative in setting healthcare budgets.
- The case that CETs should reflect the opportunity costs associated with healthcare resources, in terms of the health gains resources could generate if used for other purposes, was presented and discussed. This was termed a 'supply-side' approach to determining CETs. The need for further research into developing empirically derived supply-side CETs to inform resource allocation decisions in low- and middle-income countries (LMICs) was highlighted.
- Attendees provided their thoughts and opinions on the Bill & Melinda Gates Foundation's (BMGF) suggestion to use thresholds in its future work. The advantages and disadvantages facing the BMGF by using thresholds in two key areas: 1) research and development, and 2) delivery, was discussed. Several attendees advised against the BMGF disclosing its threshold to the public.
- The possibility of introducing cost-effectiveness into the Global Fund's new funding model was discussed. There was debate over how estimates of CETs could assist the Global Fund in allocating resources both across countries and between programmes, and it was acknowledged that the Global Fund's projects with iDSI and the [Results for Development Institute \(R4D\)](#) could assist in developing appropriate methodologies.
- Ensuring research is motivated by the policy needs of LMICs – which can then allow for future engagement with policymakers – was recognised as a priority for future iDSI research. It was acknowledged, however, that researchers should be afforded an element of autonomy in their exploratory research so as to formulate coherent guidance for policymakers.
- The issue of ambiguity and over-generality relating to use of the term 'cost-effectiveness threshold' was highlighted, since 'threshold' can convey various meanings for different types of metrics and purposes. It was proposed that in future, a more descriptive terminology could help to improve understanding and dissemination of 'cost-effectiveness threshold' research.



Photo by Ryan Li, NICE International

Future work

Although no formal agenda for future work was discussed or officially agreed upon by attendees, the meeting's discussions highlighted a number of potential 'topics of interest' for future action by iDSI members.

Further research and investigation could be undertaken into alternative methods by which CETs are estimated, other than GDP-based approaches. It was recommended, by some attendees, that guidance on cost-effectiveness analysis for policymakers should avoid the use of GDP-based CETs in the future. It will also be important to ensure that all future discussions, recommendations and guidance pertaining to cost-effectiveness analysis are made accessible to non-economists, in particular implications of such material should be clear to decision-makers and other end-users of cost-effectiveness analysis.

iDSI may wish to further support resource allocation in countries where a local resource allocation institution does not currently exist or where there is limited capacity to carry out resource allocation.

It was recommended by some attendees that relationships between iDSI researchers and global health advocates (e.g. international NGOs such as Oxfam, Action Aid and Medecins Sans Frontieres), should be strengthened, in order to gain support for current and future research directions.

iDSI researchers could assist with strengthening accountability in situations where engagement with policymakers is not successful, and iDSI could work towards producing more detailed guidance on the research projects currently being funded.

Future questions

- What should replace GDP-based CETs? How will this be defined? And who should be involved in developing this/these approaches?
- What is the role of academics in future engagement with policymakers?
- How should, and can, accountability of researchers and policymakers be enhanced?

Background

iDSI

The International Decision Support Initiative (iDSI) is an innovative global partnership between leading government institutes, universities, and think tanks in the field of healthcare priority setting. It provides unique intellectual insights with hands-on field expertise, and delivers peer-to-peer support to policymakers and international funders.

iDSI is jointly funded by: the Bill & Melinda Gates Foundation; the Rockefeller Foundation; and the UK Department for International Development.

For further information about iDSI and its current work, please visit: www.idsihealth.org/.

Cost-effectiveness thresholds

Cost-effectiveness analysis is being (and has potential to be more widely) used to guide resource allocation decisions in LMICs and, as part of this analysis, the CET is the central means currently used to assess the value for money of interventions on the basis of their estimated incremental cost-effectiveness ratios (ICERs).

Increasingly, there is a need for clear guidance on appropriate thresholds for different settings; however, there is a lack of research on estimating appropriate thresholds, and disagreement within the literature on both what is relevant and how any given thresholds should be applied.

Thresholds workshop

There were three main objectives:

1. To take stock and identify the current state of research into the conceptualisation and estimation of CETs.
2. To present and discuss empirical research estimating CETs for LMICs, highlighting unresolved issues and identifying pathways for advancing research to resolve them.
3. To prioritise topics for further research relating to CETs in low- and middle-income settings that are aligned with policy needs.

The workshop sessions focused upon three themes (please see Appendix 3).

Session 1: Cost-effectiveness thresholds – conceptual bases

Presentations:

- The use of GDP thresholds in WHO-CHOICE - **Jeremy Lauer (JL)**, WHO
- Value of Statistical Life (VSL)-derived thresholds and resource allocation (\$100,000 QALY in the US) – **Stephen Resch (SR)**, Harvard School of Public Health
- Valuing a QALY in Asia - **Montarat Tharorncharoensap (MT)**, HITAP and Mahidol University, and **Ataru Igarashi (AI)**, Graduate School of Pharmaceutical Sciences, The University of Tokyo
- The threshold study for the English NHS and the relevance of the methods and result for LMICs - **Karl Claxton (KC)**, CHE, University of York

Jeremy Lauer from WHO opened Session 1 with an overview of the history and use of GDP per capita-based thresholds in WHO-CHOICE, followed by a reflection on the interpretations of the GDP-based CETs at their inception compared to the present day. Originally derived from figures calculated using Value of Statistical Life (VSL), JL explained how the GDP-based CET (<1 x GDP and <3 x GDP) were intended to be used only as generic “rules of thumb” to guide resource allocation in LMICs.

JL noted that the GDP-based CETs have never been recommended by WHO-CHOICE for national-level decision making; rather WHO-CHOICE advocates an approach based upon health maximisation. JL noted the importance of the work required to tailor generic guidance about global norms to specific country needs and local barriers to implementation. In WHO-CHOICE, the establishment of norms and objectives is referred to as ‘priority setting’ whereas their translation to specific measurable goals and targets is referred to as ‘strategic planning’ – different methods and approaches are required for each.

JL’s presentation was followed by **Stephen Resch** from the Harvard School of Public Health who traced the origins of the <1 x <3 GDP per capita CET ratios (used frequently in healthcare decision making in the United States and LMICs) back to calculations using VSL figures derived from willingness-to-pay (WTP) calculation methods.

SR discussed the criticism of using these ratios (calculating any healthcare intervention as being cost-effective) and the detrimental impact this can have upon a (LMI) country’s healthcare budget and system. SR acknowledged, however, the value of understanding the level of importance society places upon health improvements.

SR also explored the origins and limitations of the \$50,000 per QALY threshold used in the US and the attempts to translate a VSL value to that of a Statistical Life Year (VSLY).

Researchers from HITAP, Mahidol University and The University of Tokyo – **Montarat Thavorncharoensap** and **Ataru Igarashi** – then presented the results from the first HTAsiaLink collaborative research project; comparing the WTP value of a QALY across Korea, Japan, Malaysia, and Thailand, in three distinct situations: quality of life enhancing in mild, moderate and severe conditions; life extending in terminal illness; and life saving for short term full health.

MT provided an overview of the research methodology and summarised the results from Korea, Malaysia and Thailand, before AI discussed the findings from Japan. MT and AI revealed that there were differences in the WTP per QALY value across the four nations and between the different types and sizes of QALY. AI noted that the Japanese results showed that a substantial proportion of the respondents possessed a 'zero-WTP value', and that severity can affect respondents' WTP value. This value was also revealed, by AI, not to be fixed, thereby making it challenging to estimate a fixed WTP per QALY threshold for Japan.



Photo by Ryan Li, NICE International

The final presentation was delivered by **Karl Claxton** from the Centre for Health Economics at University of York. KC discussed the outcomes of the Claxton et al. (2013) study estimating the CET per QALY for the UK. It was explained how the final estimate of £12,936 per QALY was achieved; using an instrumental variable approach to determine the relationship between changes in expenditure by Primary Care Trusts (PCT) in the UK National Health Service (NHS) in 2008/2009, and the resultant mortality-rate changes between 2008-2011. KC also speculated how this approach could be applied to LMIC settings, such as basing estimates on available cross-country data as access to the level of granular data used in the Claxton et al. (2013) study is unlikely to be available in all LMICs.

KC stressed the importance of understanding the supply side of threshold theory (i.e. derived from real health care expenditures) in order to shortlist the possible interventions for meeting a society's agreed health objectives with the available resources. KC also discussed the value of considering the estimated health lost owing to the additional costs of new interventions as well as the expected health gained, when estimating CETs.

Session 1 discussion: summary

Attendees raised some brief clarification questions about the Session 1 presentations. There was discussion over the potential decrease in the UK CET estimated by Claxton et al. (2013) in the wake of a theoretical increase in the budget allocated to the NHS and allocation and technical efficiency. It was also speculated whether data on the marginal productivity of the Programme Budget Categories (PBC) used in Claxton et al. (2013) are sufficient to support disinvestment in any of these categories.

Supply vs. demand

Attendees discussed the importance of considering the 'supply side' in estimating CETs. There were questions raised over the generalisability of the supply side approach to LMICs, considering the limited access to detailed expenditure and outcome data. Some attendees proposed the use of panel data from across-countries, thereby enabling cross-sectional analyses, as a solution to this issue. Others speculated about the applicability of the Claxton et al. (2013) approach to current work in HIV, as data on donor and domestic expenditure on HIV treatment and the resultant health outcomes is readily available. The issue of operationalising the supply side theory was also discussed, with challenges such as differing views on the rate of productivity of alternative approaches, being noted by some attendees.

Attendees also discussed the impact upon CET estimation of the private health market and Universal Health Care (UHC), the latter of which can be described as wealth re-distribution mechanisms in LMICs. It was suggested that researchers should revisit the literature on fiscal federalism as a source of work which has previously explored the issues of corruption and limited access to data.

There was some debate over whether the value of the supply side should be expected to be the same as those coming from the demand side, and how to reconcile the differences.



Photo by Ryan Li, NICE International

Several attendees pointed out that the supply and demand figures should not be equal as they reflect different factors: societal value and personal value. Others noted the role of political economy in financial allocation.

One recurrent concern was the 'overgeneralisation' of the term cost-effectiveness threshold, and the majority of attendees agreed that using precise terminology, such as 'marginal productivity' and 'consumption value', is of paramount importance going forward.

Across-/within-country resource allocation

Attendees discussed how cost-effectiveness analysis can inform resource allocation by international funders (e.g. the Global Fund, the UK Department for International Development (DIFD)) across-countries and whether CETs can be just as useful for this purpose as for within-country resource allocation. One particular challenge relates to the funding of vertical disease programmes within countries, in which a number of interventions are delivered, rather than simply the choice of particular health technologies. Also the channels through which interventions are funded may affect how efficiently they are provided.

Some attendees argued that thresholds for across-country guidance may be a blunt tool in comparison to country-specific or disease area-specific thresholds, as they may not necessarily take account of country specific priorities and challenges, and how these can change, and may result in policy makers attempting to overstretch their resources.

Other attendees countered that for international organisations which operate across multiple and varied jurisdictions, it is difficult to understand well and engage in country-level processes. Rather, a CET for specific intervention processes would be more useful e.g. a threshold for vaccines.

Value of WTP

There was a discussion about the reliability of WTP data, owing to the challenges associated with phrasing WTP survey questions and the potential impact of the 'ceiling effect' upon survey result. Despite these issues, many attendees acknowledged the value of WTP data when supporting decision makers, although most agreed that researchers should primarily focus upon demonstrating the current health outcomes of decision makers' healthcare systems.

Risk aversion and insurance

Attendees discussed the importance of considering 'risks' and individuals' inherent risk aversion when estimating CETs, particularly frequent, cost-effective risks which are typically uninsurable. Some attendees suggested that the NHS's PBCs make these statistical risks more 'real' e.g. it is possible to estimate how many heart-attacks or new cancer cases will occur a year.

The role of public and private insurance was also discussed, with some attendees stressing the importance of considering the likelihood of individuals in LMICs paying for private insurance if they are not covered by UHC, as an indication of the commitment of the local government to securing the health of society's poorest.

Session 2: Towards empirical estimation of the threshold

Presentations:

- The problem with thresholds in evaluating the cost-effectiveness of global health programs – **Elliot Marseille (EM), Health Strategies International**
- Investigating the use of cost-effectiveness thresholds in vaccine introduction decisions – **Mark Jit (MJ), London School of Hygiene and Tropical Medicine**

Elliot Marseille from Health Strategies International led the first discussion of Session 2. EM presented an argument on the limitations of using GDP-based CETs when evaluating health interventions, including: not taking into account the differences between locally relevant options and the resultant variations within a cost-effectiveness category; the ease at which a cost-effective value is achieved by using GDP-based CETs; affordability and the limitations of a healthcare budget not being taken into account; and the thresholds' weak underlying theoretical basis.

EM suggested two alternative approaches to using GDP-based CETs, and explored their advantages and disadvantages. Benchmark interventions were proposed by EM as a more accurate method which reveals a country's actual WTP values. He also presented the pros and cons of using league tables. Developed for specific budgets, EM argued that extended league tables take account of a country's budget and more accurately reflect the cost-effectiveness of individual interventions. However, EM acknowledged that they also require incremental cost-effectiveness ratio (ICER) data which may be unavailable. EM concluded by detailing some solutions to these disadvantages.

The second and last Session 2 presentation was delivered by **Mark Jit** from LSHTM, who discussed whether GDP per capita-based thresholds can reflect funding decisions on the introduction of the HPV vaccine in LMICs, and therefore be used to predict future intervention decisions.

By comparing past HPV vaccine introduction decisions around the world and the cost-effectiveness of vaccination in different countries, MJ suggested that a GDP per capita-based threshold did have some power in discriminating between countries which had and had not yet introduced vaccination. However, the most likely thresholds LMICs appeared to be substantially lower than 1 - 3 x GDP per capita. The most likely thresholds in high-income countries (HICs) appeared to be considerably higher (even when expressed as a percentage of GDP per capita) than those in LMICs.

Session 2 discussion: summary

There was some concern raised by attendees over the challenges associated with extended league tables, and it was felt that further research is required in order to dispel the uncertainty associated with this approach. It was recognised that league tables do not offer a 'cure all' for the difficulties associated with thresholds analysis, and there is a need for transparency in regard to the use of ICER in league tables.

Session 3: Empirical estimation of the thresholds

Presentations:

- Threshold estimation on the basis of cross-country evidence of the impact of health care spending on health – **Marc Suhrcke (MS)**, CHE, University of York
- Threshold estimation on the basis of within-country evidence of the impact of health care reforms on health – **Ryota Nakamura (RN)**, CHE, University of York

Session 3 opened with a presentation on the current work on threshold estimates for LMICs being conducted by researchers at the University of York, delivered by **Marc Suhrcke** from CHE. MS discussed the first step of this research; utilising published cross-country data on the estimated effect of public health expenditure on mortality and broader health outcomes.

The researchers' use of two approaches in the literature on estimating the mortality outcome effects of health expenditure, illustrated in papers published by Bokhari et al. (2007) and Moreno-Serra and Smith (2015), was explored in detail. MS explained how the York team were able to supplement gaps in the papers' published datasets with Years Lived with Disability (YLD) and Years of Life Lost (YLL) data obtained from WHO, and estimate DALYs as a result.

MS concluded by discussing how a maximum and minimum CET was estimated for each country, by comparing the estimated YLL and DALY averted (calculated from each papers' mortality results) with the directly estimated costs of YLL and DALY averted presented in the Bokhari et al. (2007) dataset.

Ryota Nakamura from CHE then delivered a presentation on the second step of York's planned future work on estimating LMIC thresholds; using within-country data to estimate a national level CET, similar to the study by Claxton et al. (2015). RN explained how the researchers will overcome the relative scarcity of data in LMICs by using household survey data detailing health outcomes and healthcare use, and exploiting data on current health coverage expenditure to evaluate the health outcomes of past health insurance reforms. RN detailed the intervention policies to be used, including: evaluating the Generasi grant programme - a large-scale field experiment on healthcare spending in Indonesia; and conducting a quasi-experimental evaluation of two voluntary government health insurance expansion schemes – the Askeskin and Jamkesmas programmes in Indonesia.

RN concluded by exploring the strengths and weaknesses of the approach, and speculated about the next stage of the research.

Session 3 discussion: summary

Application of research outputs

The CHE researchers discussed their aims for their research outputs over the next five years, and how these may be realised: obtaining estimates from cross-country work which will inform more precise national thresholds; and realising a more credible causal estimate from within-country work to enable LMICs to set-up, collect, develop and analyse data. Attendees discussed potential challenges associated with achieving these outputs, including how to ensure the findings are useful to policy makers.



Photo by Ryan Li, NICE International

In response to concerns raised by a number of attendees over the credibility of the available cross-country data, the discussion panel issued reassurance that the research will distinguish and communicate high quality research rather than simply undertake a data mining exercise.

Attendees also debated whether the 'ideal' threshold (acting as 'counterfactual') could be used to help to draw normative conclusions. The UK was used as

an example of a country where the national threshold is publically stated and the cost per QALY can be calculated, which can then act as reference points when reviewing empirical estimates. Some attendees noted, however, that not all LMICs have empirical estimates.

Acceptance of CET

Attendees discussed the current challenges with accepting and using the UK CET, and how these may predict barriers to implementing a national CET in LMICs. There was concern among some attendees over how to work with other countries to revise their threshold as required. Some recommended adopting a 'supply-side' centred communication style which focuses upon opportunity costs rather than ICERs and thresholds, in order to facilitate interpretation and understanding among policymakers and to ensure greater accountability.

Several attendees argued that open engagement is key to ensuring CETs are adopted by policymakers and the health industry. Transparency regarding CET estimation methods was praised by some as a means of supporting decision makers in their negotiations with proponents of higher thresholds, such as pharmaceutical and patient organisations. This discussion fed into concerns raised by some attendees that pharmaceutical companies were starting to set country-specific prices, and that CETs help these country identify their WTP for new health technologies and, therefore, their threshold for the maximum amount to spend which may not reflect the actual budget constraints countries face.

However, there was debate over the level of involvement of policymakers in primary research. Some attendees advocated policymaker engagement from the inception of a research study so as to ensure the research outputs meet their needs, while others defended maintaining a degree of separation between researchers and policymakers in order to retain objectivity.

Session 4: Final reflections and consequences for policy

Key messages

- The meaning of GDP-based thresholds as used by WHO-CHOICE should be clarified and research into developing CETs which take greater account of real resource constraints should be conducted.
- The Bill & Melinda Gates Foundation (BMGF) is considering using thresholds in two areas: 1) research and development, and 2) delivery.
- Unpacking what data sources can be used and advocating a broader approach to data access is fundamental to managing healthcare.
- There is a need for iDSI researchers to make explicit links from modelling exercises to the issues and decisions politicians will face. Researchers should bear the target audience of future research in mind from the beginning since many will not understand technical economics.
- iDSI and its partners need to gain a better understanding of the extent to which CETs are actually used in current decision-making processes in LMICs.
- Researchers should acknowledge the substantial differences between the policy and informational needs of low-income countries and middle-income countries.
- It should be recognised that disinvestment and investment are not equal in practice; the differences and role of political economy should be considered by researchers.

Reviewing the use of GDP-based CETs

The Panel discussed the various points raised throughout the meeting about the issues with using GDP-based CETs, and expressed support for investigation into alternative approaches to estimating CETs. Many attendees supported the view that these approaches should be accessible to non-economists as well.

This discussion concluded with several questions posed to attendees:

- What are the alternatives to GDP-based CETs? What approaches should be used to investigate these alternatives? How should the results of these investigations be disseminated?
- How can iDSI researchers and their partners continue to support countries in making decisions that consider the opportunity cost of investments in the absence of GDP-thresholds based decision frameworks?
- How should cost-effectiveness be brought to decision and policy makers?

BMGF's use of thresholds

The ways in which the BMGF uses thresholds was presented and its current development of its Integrated Portfolio Evaluation Tool - a matrix of cost or DALY and the probability of technical or regulatory success (PTRS) - were discussed. Attendees also considered what an appropriate CET would be for BMGF and how it would be practically applied, with some attendees considering the advantages and disadvantages of 'low CET values' such as \$100USD per DALY.

Questions pertaining to the BMGF's use of thresholds for research and development and decision allocation, and the benefits and disadvantages of revealing the BMGF threshold publically, were also debated by attendees. Several supported the notion of the BMGF operating a threshold. Others, however, raised concerns over the potential risk of the threshold being prescribed for LMIC governments. Some attendees considered that the BMGF should not broadcast an explicit threshold, considering that using a range of estimates that could be narrowed as more evidence emerges would be more beneficial. There was disagreement from some attendees, however, arguing that the BMGF could use its threshold as leverage to obtain better value for healthcare spending in LMICs.

Attendees also discussed who, apart from researchers, is currently using thresholds, and it was suggested that an 'opportunity cost calculator' might be useful to policymakers and organisations such as the BMGF.

Use of CEA and CET by LMICs

Attendees considered how to better support Ministries of Finance (MoF) and Ministries of Health (MoH) in using cost-effectiveness tools in their health budget allocations, and discussed programmes currently trying to achieve this, such as the Collaborative Africa Budget Reform Initiative (CABRI), and the use of health technology assessment to inform MoF and MoH investments.

Some attendees noted that the notion of disinvestment often concerns decision makers in LMICs, and several attendees suggested that more work was needed to build the confidence of policy makers in making these types of decisions using CEA and CET. Attendees considered the challenges with communicating with MoF and MoH about the value of cost-effectiveness research and thresholds; it was reiterated that clarifying CEA terminology and considering the types of questions posed by MoF and MoH is important to this task.

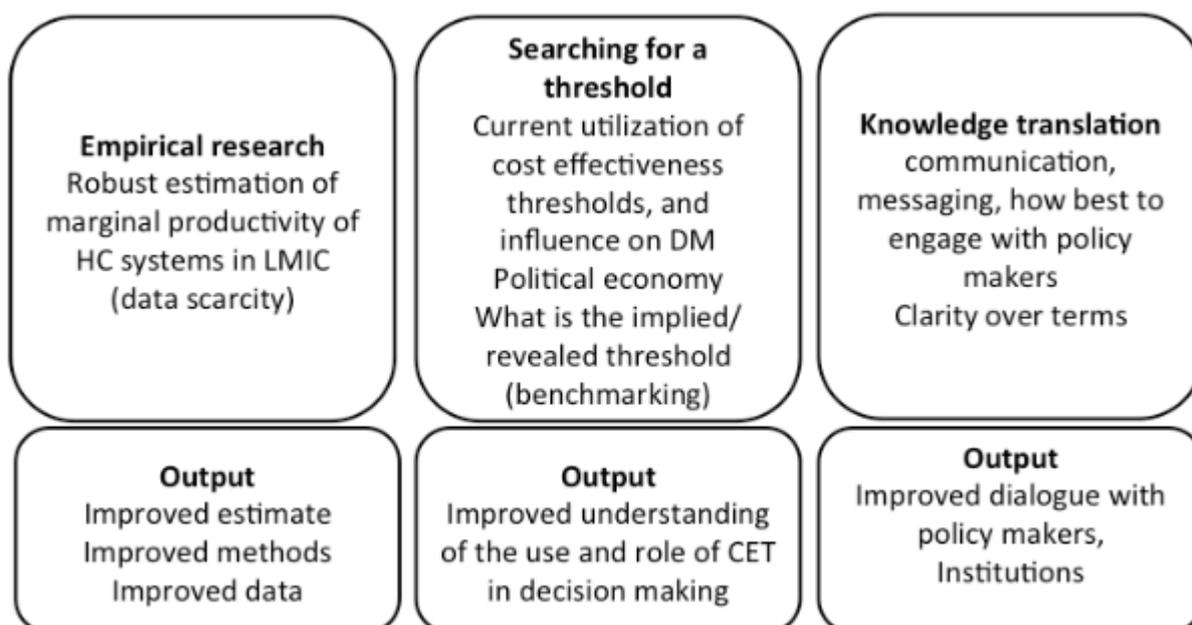
Role of political economy

Attendees debated how to continue to support countries 'graduating' from programmes such as GAVI, as several attendees had concerns that LMICs operating on their own often do not fund the most cost-effective solutions. There was speculation as to whether this was owing to reliance upon donor funding, and differences in stated aims and observed actions in countries.

There was disagreement about the use of donor funding; while some attendees speculated whether it should ideally be spent on expanding a country's healthcare budget, others argued that it could be used to 'go the extra mile' and fund interventions which are highly expensive but worth doing e.g. eradication of guinea worm.

Appendix 1: Further research activity speculation¹

At the end of Session 4, an interpretation of key areas for potential future research was verbally presented in line with the figure below.



¹ Designed by Tommy Wilkinson (NICE International)

Appendix 2: Workshop attendees

Abigail Colson	The Center for Disease Dynamics Economics & Policy, USA
Alec Morton	University of Strathclyde, UK
Alexandra Rollinger	Centre for Health Economics, University of York, UK
Alex Winch	The Global Fund, Geneva
Amanda Glassman	Center for Global Development, USA
Andrew Mirelman	Centre for Health Economics, University of York, UK
Andrew Phillips	University College London, UK
Ataru Igarashi	Graduate School of Pharmaceutical Sciences, The University of Tokyo, Japan
Beth Woods	Centre for Health Economics, University of York, UK
Brenda Waning	UNITAID, USA
Carleigh Krubiner	Johns Hopkins Berman Institute of Bioethics, USA
Damian Walker	Bill & Melinda Gates Foundation, USA
Elliot Marseille	Institute for Health Policy Studies and the Center for AIDS Prevention Studies at the University of California, USA
Francis Ruiz	NICE International, UK
Iain Jones	Department for International Development, UK
James Khan	Department of Epidemiology and Biostatistics (DEB) School of Medicine, University of California, USA
James Lomas	Centre for Health Economics, University of York, UK
James Raftery	University of Southampton, UK
Jan Olsen	Institute of Community Medicine, University of Tromsø, Norway
Jeremy Lauer	World Health Organisation, Geneva
Jessica Ochalek	Centre for Health Economics, University of York, UK
Julia Watson	Department for International Development, UK
Kalipso Chalkidou	NICE International, UK
Karl Claxton	Centre for Health Economics, University of York, UK
Marc Suhrcke	Centre for Health Economics, University of York, UK
Mark Jit	London School of Hygiene & Tropical Medicine, UK
Mark Sculpher	Centre for Health Economics, University of York, UK
Mead Over	Center for Global Development, USA
Melanie Bertram	World Health Organisation, Geneva
Michael Borowitz	The Global Fund, Geneva
Michelle Remme	London School of Hygiene & Tropical Medicine, UK
Montarat Thavorncharoensap	The Health Intervention and Technology Assessment Program (HITAP), Thailand, and Mahidol University, Thailand
Paul Revill	Centre for Health Economics, University of York, UK
Peter Smith	Imperial College London, UK
Pieter van Baal	Erasmus University, The Netherlands

Ranjeeta Thomas	Imperial College London, UK
Raymond Hutubessy	World Health Organisation, Geneva
Rebecca Dittrich	NICE International, UK
Rodrigo Moreno-Serra	University of Sheffield, UK
Ruth Lopert	Center for Pharmaceutical Management, USA
Ryan Li	NICE International, UK
Ryota Nakamura	Centre for Health Economics, University of York, UK
Sarah Boulton	Department for International Development, UK
Stephane Verguet	Harvard School of Public Health, USA
Stephen Resch	Harvard School of Public Health, USA
Sue Hill	World Health Organisation, Geneva
Takeru Shiroiwa	Center for Public Health Informatics, National Institute of Public Health, Japan
Tommy Wilkinson	NICE International, UK
Tony Culyer	Centre for Health Economics, University of York, UK
Virginia Wiseman	School of Public Health and Community Medicine, University of New South Wales, Australia

Appendix 3: Workshop agenda

Time	Session	Speaker
08.30	Welcome coffee	
09.00 – 09.15	Introduction <ul style="list-style-type: none"> Overview of meeting schedule and aims Setting the scene: iDSI, the Reference Case and the iDSI methods working groups Introductory comments 	<ul style="list-style-type: none"> Tony Culyer, Chair Tommy Wilkinson, NICE International Sue Hill, WHO
09.15 – 10.30	Session 1: Cost-effectiveness thresholds – Conceptual bases (WTP vs opportunity cost vs aspiration) <ul style="list-style-type: none"> WHO-CHOICE and GDP per capita Value of Statistical Life (VSL)-derived thresholds and resource allocation \$100,000 QALY in the United States 	<ul style="list-style-type: none"> Jeremy Lauer, WHO Stephen Resch, Harvard
10.30 – 11.00	Break	
11.00 – 12.15	Session 1 (continued) <ul style="list-style-type: none"> Valuing a QALY in Asia The threshold study for the English NHS and the relevance of the methods and results for LMICs, CHE Research Paper 109 Panel discussion with Session 1 presenters 	<ul style="list-style-type: none"> Montarat Thavorncharoensap, Mahidol/Ataru Igarashi, Tokyo Karl Claxton, York All
12.15 – 13.00	Session 2: Towards empirical estimation of the threshold <ul style="list-style-type: none"> The Problem with Thresholds in Evaluating the Cost-Effectiveness of Global Health Programs Investigating the use of cost-effectiveness thresholds in vaccine introduction decisions 	<ul style="list-style-type: none"> Elliot Marseille, Health Strategies International Mark Jit, LSHTM
13.00 – 14.00	Lunch	
14.00 – 15.30	Session 3: Empirical estimation of the threshold <ul style="list-style-type: none"> Threshold estimation on the basis of cross-country evidence of the impact of health care spending on health Threshold estimation on the basis of within-country evidence of the impact of health care reforms on health Group discussion / Q&A 	<ul style="list-style-type: none"> Marc Suhrcke, York Ryota Nakamura, York All
15.30 – 16.00	Break	
16.00 – 17.30	Session 4: Final reflections and consequences for policy <ul style="list-style-type: none"> Perspectives from International Organisations Final comments from around the room 	<ul style="list-style-type: none"> Sue Hill, WHO Julia Watson, DFID Damian Walker, BMGF Michael Borowitz, GF
17.30	Close	