MAIMON RESEARCH LLC

ARTIFICIAL INTELLIGENCE LARGE LANGUAGE MODEL INTERROGATION

REPRESENTATIONAL MEASUREMENT FAILURE IN HEALTH TECHNOLGY ASSESSMENT

AUSTRALIA: THE MAIMON RESEARCH HTA RECONSTRUCTION PROGRAM

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INTRODUCTION

Recent interrogations of HTA knowledge bases in Australia, New Zealand and a growing number of other jurisdictions have identified a consistent pattern of measurement inversion. Across reimbursement agencies, academic research centres and educational programs there is little evidence of systematic engagement with representational measurement, scale theory, unidimensionality, ratio measurement, latent attribute possession or scientific falsification. At the same time, HTA continues to generate an expanding array of quantitative claims regarding therapy impact, cost-effectiveness and resource allocation. This apparent contradiction raises an important question: how did HTA arrive at a position where quantitative claims are routinely advanced without first establishing whether the quantities involved satisfy the requirements of measurement?

The curriculum assessments undertaken in Australia and New Zealand suggest a clear answer. Measurement inversion is not simply the result of concepts being absent from the curriculum. It is the consequence of a curriculum that has evolved around the requirements of the reference case. For more than four decades HTA education, research and professional development have focused upon the skills required to construct, interpret and defend reference-case assessments. Students are taught utility estimation, QALY construction, economic modelling, simulation methods and cost-effectiveness analysis. They are rarely exposed to the prior question upon which all quantitative claims depend: do the quantities entering these analyses satisfy the requirements of measurement?

This distinction is critical. The curriculum is not merely incomplete. It is structured around a framework that itself fails the standards of measurement. The reference case begins with preference scores, transforms those scores into utilities, combines utilities with time to create QALYs and then projects hypothetical future outcomes through simulation models. At each stage the framework depends upon assumptions regarding quantities whose measurement status has never been established. The result is not simply a methodological weakness. It is a systematic departure from the principles that govern quantitative claims throughout the sciences.

The consequence has been the emergence of a self-reinforcing curriculum. The concepts required to implement the reference case are emphasized. The concepts required to evaluate the validity of the reference case are neglected. Scales of measurement, representational measurement, unidimensionality, manifest and latent attributes, ratio measurement and falsification occupy a peripheral role because they are not required for the operation of the reference case itself. Over time, generations of students and researchers have been trained to accept the outputs of the framework while remaining largely unaware of the standards by which those outputs should be judged.

CURRICULUM RECONSTRUCTION

This is not a proposal for curriculum reform. It is a proposal for curriculum replacement. The deficiencies of the current HTA curriculum are not the result of isolated omissions that can be corrected through the addition of a few measurement concepts or methodological refinements. They are structural. The curriculum is built around the reference case framework, a framework

that begins with the valuation of health states and proceeds through utilities, QALYs and simulation models to generate claims regarding cost-effectiveness and resource allocation. Because the foundation of the framework rests upon preference-based measures that fail the requirements of measurement, every subsequent stage inherits that failure. Measurement inversion is therefore not an accidental feature of contemporary HTA; it is embedded in the logic of the reference case itself.

Under these circumstances there is no realistic pathway to improvement through incremental modification. A framework that begins with quantities that lack the properties required for measurement cannot be transformed into a scientific enterprise through increasingly sophisticated statistical methods, more elaborate simulation models or revised reporting standards. The problem lies at the point of departure. If measurement fails at the beginning, it cannot be recovered later through arithmetic manipulation or modelling assumptions.

The recommended curriculum framework therefore starts from a different foundation. It abandons the reference case and the educational assumptions that sustain it. In its place it introduces a curriculum organized around attributes, representational measurement, manifest and latent attributes, ratio measurement, Rasch measurement, prospective claims assessment and scientific falsification. The objective is to establish the conditions under which quantitative claims can be regarded as lawful, evaluable and capable of contributing to the evolution of objective knowledge.

The proposed framework is intended to provide the educational foundation for a post-reference-case HTA. It recognizes that the future of therapy assessment lies not in the continued refinement of numerical constructions derived from health-state valuations but in the development of measurement-based approaches capable of generating empirical evidence regarding therapy impact. The choice is therefore not between competing methodological preferences. It is between retaining a framework whose foundations guarantee measurement failure and replacing it with one grounded in the standards of measurement and normal science.

MAIMON RESEARCH RECONSTRUCTION PROGRAM

The curriculum assessments undertaken in Australia and New Zealand point to a clear conclusion. Measurement inversion is not simply a methodological problem confined to reimbursement agencies and research centers. It is the consequence of an educational framework that has, for more than four decades, prioritized the requirements of the reference case while neglecting the principles of measurement upon which scientific inquiry depends. The result is a profession trained to construct utilities, QALYs, simulation models and cost-effectiveness claims, but with limited exposure to the concepts necessary to determine whether those constructs satisfy the standards required for quantitative claims.

The Maimon Research Program was developed as a direct response to this deficiency. Its purpose is not to reform the existing HTA curriculum but to provide a replacement educational framework for those who recognize that the current model is unsustainable. The program accepts a simple proposition: if measurement inversion is rooted in curriculum design, then reconstruction must begin with curriculum reconstruction.

The program is organized as a structured nine-unit sequence that takes participants from the foundations of measurement to the assessment of therapy impact claims. The starting point is the identification of attributes, empirical structures and numerical structures. Participants are introduced to the scales of measurement, the axioms of representational measurement, unidimensionality, admissible transformations and dimensional homogeneity. These concepts provide the intellectual foundations for understanding why measurement must precede arithmetic and why quantitative claims cannot be separated from the measurement properties of the quantities involved.

The program then distinguishes between manifest and latent attributes. Manifest attributes support direct observation and linear ratio measurement. Latent attributes require a different approach and introduce participants to Rasch measurement as the necessary and sufficient framework for the development of latent attribute measures. The construction of Rasch logit ratio scales, calibration, invariance, specific objectivity and latent attribute possession are treated as central components of therapy assessment rather than specialist methodological topics.

Building upon these foundations, the program addresses the evaluation of prospective therapy impact claims. Particular attention is given to the distinction between scores and measures, the limitations of ordinal summation, the failure of composite indices and the standards required for lawful quantitative claims. The final units place HTA within the broader framework of normal science, emphasizing empirical evaluation, replication, falsification and the contribution of evidence to the continuing evolution of objective knowledge.

The program is intended for faculty members, researchers, reimbursement agencies, formulary committees and policy analysts who have concluded that the reference case framework has reached the limits of its intellectual credibility. It offers a practical pathway from a system dominated by numerical constructions and assumption-driven simulations to one grounded in measurement, empirical observation and scientific assessment.

The significance of the Maimon Research Program lies not simply in the topics it covers but in the framework it rejects. The reference case is not treated as a foundation to be refined. It is recognized as a framework whose dependence upon health-state valuations guarantees measurement failure at the outset. The purpose of the program is therefore to provide the conceptual and practical foundations for a post-reference-case HTA; a discipline capable of generating evaluable, replicable and falsifiable claims regarding therapy impact and thereby contributing to the growth of objective knowledge.

PROGRAM STRUCTURE