

A conceptual framework for quantifying the value and prioritization of digital and data investments for health

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BACKGROUND

As investments in digital and data technologies (DDTs) to support healthcare and health systems management have proliferated, policymakers seeking to advance their country's Universal Health Coverage aspirations are challenged in deciding which DDTs to invest in and how to prioritize.

The value of different DDTs, however, are not being accurately defined or measured. This has resulted in an inability to use economic evaluation methods to prioritize DDT investments.

OBJECTIVES

(a) Define the problem with existing evaluation, comparison and prioritisation techniques applied to DDTs, and (b) introduce metrics and methods as potential solutions, highlighting their individual strengths and weaknesses.

METHODOLOGY

In 2019, a literature review of current health technology assessments of DDTs was done, and in 2024, a series of roundtable discussions were held where digital health experts and stakeholders discussed how DDTs were and should be valued and prioritized. Findings from these efforts were used to guide a desk-review to describe key challenges surrounding the value and prioritization of DDTs, and to propose possible solutions in a conceptual framework.

FINDINGS

DEFINING THE PROBLEM



Evaluation – DDTs have value propositions that are different than other health technologies – (a) their value is both incremental (technology added to an existing health service like SMS-based appointment reminders added to an antenatal care service), (b) extend to beyond service delivery into efficiency gains in health system management and societal improvement, and (c) they generate data that are beneficial for other secondary purposes. These perspectives are inadequately accommodated in current health technology assessment methods and metrics.



Comparison – Any new methodologies or metrics developed to capture the value of DDTs must also be applicable to traditional medical interventions, to allow for direct comparisons not just across different DDTs, but between DDTs and traditional interventions as well.



Prioritisation – Must consider how new methodologies or metrics can be adopted by a variety of decision-making bodies, to ensure that all medical interventions, including DDTs are being represented by their true value, when allocative efficiency and prioritisation decisions are being made, in the context of health spending.

POTENTIAL SOLUTIONS – METHODOLOGIES AND METRICS

Existing economic evaluations, like extended cost-effectiveness analysis, multi-criteria decision analysis (MCDA), and cost-benefit analysis could be used for DDTs. Each approach has strengths and weaknesses, and none of them effectively allow cross-comparisons. Therefore, new metrics like a digital-DALY, a time-based efficiency metric, or a standardised MCDA could be introduced, however, with a compound challenge, and numerous partial solutions already in use, consolidated research and stakeholder collaboration must be emphasized, to ensure that existing fragmentation is not compounded.

METHODOLOGY	OVERVIEW	STRENGTHS	WEAKNESSES
Extended CEA – Disease Control Priorities (DCP)	By summarizing HTA data, DCP presents 218 essential UHC interventions	<ul style="list-style-type: none"> Easy to calculate Familiar and widely adopted Equity and financial protection as secondary benefits 	<ul style="list-style-type: none"> Does not take other secondary benefits of DHI into account DHIs not currently included for prioritization
Extended CEA - Impact inventory	Compliments CEA by presenting non-health outcomes of DHIs in disaggregated tabulated form (natural units)	<ul style="list-style-type: none"> Begins to capture secondary DHI benefits 	<ul style="list-style-type: none"> Data not universally captured Extra capacity to build impact inventory Secondary DHI benefits not directly comparable Only useful for DHIs with direct health benefits
Extended CEA – Cost consequence analysis	All costs & benefits presented separately, then decision maker chooses relevant ones	<ul style="list-style-type: none"> Familiar and validated method DHI benefits captured in a more comparable way 	<ul style="list-style-type: none"> Data not universally captured Extra capacity to quantify all costs & benefits Weights may introduce bias and limit cross-comparisons
Multiple-criteria decision analysis (MCDA)	Decision maker chooses and weights costs & benefits, then aggregates to single metric	<ul style="list-style-type: none"> Familiar and validated method 	<ul style="list-style-type: none"> Data not universally captured High capacity to conduct evaluation Weights may introduce bias and limit cross-comparisons
Cost benefit analysis (CBA)	All costs & benefits in monetary terms, then distilled to a single monetary figure	<ul style="list-style-type: none"> Familiar and validated method 	<ul style="list-style-type: none"> Data not universally captured High capacity to conduct evaluation Not cost-effective to conduct in all settings
METRIC	OVERVIEW	STRENGTHS	WEAKNESSES
Digital-DALY	Questionnaire used to quantify the secondary benefits of DHIs, then adjust the DALY	<ul style="list-style-type: none"> Easy to calculate and capture secondary benefits Minimal extra capacity required Could be developed & piloted quickly 	<ul style="list-style-type: none"> Adjusting the already adjusted DALY introduces noise Not yet validated, may need to be corrected/discounted Only useful for DHIs with direct health benefits
Time-based	Time-in-motion/ digital timestamps to show improved efficiency across entire health system	<ul style="list-style-type: none"> Common metric (time) to compare value across entire health system Machine-generated timestamps may decrease data collection burden 	<ul style="list-style-type: none"> Only focuses on a single (but important) secondary benefit Not yet fully developed or validated Data required is not universally captured
Standardized MCDA	MCDA, where criteria & weights predetermined by experts, then 'locked-in'	<ul style="list-style-type: none"> Decision weights and criteria standardized for cross-comparisons Novel, but validated methodology 	<ul style="list-style-type: none"> Data not universally captured extensive global coordination and stewardship required

CONCLUSION AND RECOMMENDATIONS

As DDTs become a ubiquitous part of health system investments, decisions about how to value and prioritize them are being made. In resource constrained settings, every dollar spent on a DDT is one that is potentially not spent on other health technologies like malaria bed nets. DDT investment need to earn their keep just as any other health system investment. To facilitate conversations about value and prioritization of DDTs, new metrics are needed. This conceptual framework proposes two such metrics for further discussion and validation.