

## BACKGROUND & OBJECTIVE

- Despite a proliferation of cost-effectiveness analyses (CEAs) to assess value and inform resource allocation decisions, there is limited research on how study characteristics may influence cost-saving findings.
- This analysis explores how CEA characteristics are associated with cost-saving findings.

## METHODS

### Data Sources

- CEAs published between 1990 and 2021 from the Tufts Medical Center CEA Registry
- Country-specific global burden of disease (GBD) estimates between 1990 and 2021 from the Global Burden of Disease Study
- Region and income group classification from the World Bank (2021)

### Analysis

- We identified 3,398 cost-effectiveness publications in the CEA Registry across 197 countries, totaling 27,246 country-level ratios.
- CEAs were linked to global burden of disease estimates by country, GBD Tier 1 causes [non-communicable diseases (NCDs), communicable, maternal, neonatal, and nutritional disease (CMNNs), and injuries], and year.
- We fit a generalized linear model to examine associations between cost-saving findings and various CEA characteristics. Multiple imputations were used to adjust for missing "Not Reported" data.

- Only 17% (n = 4,685) of included CEA ratios had cost-saving findings (Table 1).
- 58% (n = 15,791) of CEA ratios were for evaluations of interventions to address NCDs, 29% (n = 8,032) for CMNNs, and 13% (n = 3,423) for injuries.

**Table 1. Included CEA Ratios by Ratio and Publication Characteristics (n = 27,246)**

	CEA Ratios n(%)	CEA Ratios n(%)	
<b>Cost-Saving Findings</b>		<b>Primary Disease GBD Tier 1</b>	
No	22,561 (83%)	Non-communicable diseases	15,791 (58%)
Yes	4,685 (17%)	Communicable, maternal, neonatal, and nutritional diseases	8,032 (29%)
		Injuries	3,423 (13%)
<b>Intervention Type</b>		<b>Income Group</b>	
Pharmaceutical	3,871 (14%)	HUMIC	24,097 (88%)
Immunization	2,102 (8%)	LLMIC	3,149 (12%)
Medical Procedure/Surgical/Device	1,416 (5%)		
Multiple	3,146 (11%)	<b>Region</b>	
Other	2,063 (8%)	North America	8,416 (31%)
Screening/Diagnostic	2,101 (8%)	East Asia & Pacific	5,227 (19%)
Not reported	12,502 (46%)	Europe & Central Asia	9,790 (36%)
		Latin America & Caribbean	1,102 (4%)
<b>Comparator Type</b>		Middle East, North Africa, Afghanistan & Pakistan	346 (1%)
None/Do Nothing	6,361 (23%)	South Asia	584 (2%)
Immunization	81 (< 1%)	Sub-Saharan Africa	1,781 (7%)
Medical Procedure/Surgical/Device	179 (< 1%)	<b>Publication Year</b>	
Multiple	337 (1%)	1990 - 1999	176 (< 1%)
Other	14,868 (55%)	2000 - 2009	3,237 (12%)
Pharmaceutical	1,144 (4%)	2010 - 2021	23,833 (87%)
Screening/Diagnostic	336 (1%)	<b>Time Horizon</b>	
Not reported	3,940 (14%)	Long-Term	10,402 (38%)
		Both	11,567 (42%)
<b>Time Horizon</b>		Short-Term	3,182 (12%)
Long-Term	10,402 (38%)	Not reported	2,095 (8%)
Both	11,567 (42%)	<b>Perspective</b>	
Short-Term	3,182 (12%)	Health Care Payer	18,992 (70%)
Not reported	2,095 (8%)	Health Care Sector	709 (3%)
		Societal	5,236 (19%)
<b>Pediatric Target</b>		Not reported	2,078 (8%)
No	19,162 (70%)	<b>Industry Funding</b>	
Yes	2,915 (11%)	No	11,998 (44%)
Not reported	5,169 (19%)	Yes	6,911 (25%)
		Not reported	8,337 (31%)
<b>Target Gender</b>		<b>Target Gender</b>	
All Genders	18,404 (67%)	All Genders	18,404 (67%)
Female	4,579 (17%)	Female	4,579 (17%)
Male	1,880 (7%)	Male	1,880 (7%)
Not reported	2,383 (9%)	Not reported	2,383 (9%)

- Ratios for pediatric target populations were associated with reduced likelihood (0.82x) compared to non-pediatric targets (Table 2).
- CMNNs and injuries were both associated with reduced likelihood (0.81x, 0.59x) compared to those for NCDs.
- Low and lower-middle income countries (LLMICs) were associated with reduced likelihood (0.62x) compared to high and upper-middle income countries (HUMICs).
- CEAs from a societal perspective were associated with increased likelihood (1.41x) compared to CEAs from the health care payer perspective.
- Ratios from industry funded papers were associated with increased likelihood (1.71x) compared to non-industry funded CEAs.

## RESULTS

**Table 2. Univariable and Multivariable Analyses of Independent Variables on the Likelihood of Cost-Saving Findings (n = 27,246)**

	Univariable	Multivariable
<b>Intervention Type</b>		
Pharmaceutical	Reference	Reference
Immunization	0.78 (0.01) [0.65, 0.93]	1.15 (0.3) [0.88, 1.5]
Medical Procedure/Surgical/Device	1.03 (0.81) [0.79, 1.35]	1.07 (0.62) [0.82, 1.38]
Multiple	1.07 (0.48) [0.88, 1.3]	1.32 (0.01) [1.09, 1.59]
Other	1.29 (0.03) [1.03, 1.62]	1.66 (< 0.001) [1.31, 2.1]
Screening/Diagnostic	0.86 (0.19) [0.68, 1.08]	0.99 (0.95) [0.79, 1.24]
Joint Significance	P < 0.001	P < 0.001
<b>Comparator Type</b>		
None/Do Nothing	Reference	Reference
Immunization	1.82 (0.02) [1.09, 3.05]	1.27 (0.39) [0.74, 2.18]
Medical Procedure/Surgical/Device	2 (< 0.001) [1.37, 2.92]	1.73 (0.01) [1.14, 2.64]
Multiple	1.29 (0.11) [0.94, 1.76]	0.97 (0.86) [0.71, 1.34]
Other	1.42 (< 0.001) [1.3, 1.54]	1.24 (< 0.001) [1.11, 1.38]
Pharmaceutical	1.55 (< 0.001) [1.31, 1.82]	1.23 (0.06) [0.99, 1.52]
Screening/Diagnostic	1.13 (0.42) [0.83, 1.54]	1.1 (0.61) [0.77, 1.57]
Joint Significance	P < 0.001	P < 0.001
<b>Time Horizon</b>		
Both	Reference	Reference
Long-term	0.63 (< 0.001) [0.59, 0.68]	0.75 (< 0.001) [0.68, 0.84]
Short-term	0.95 (0.29) [0.86, 1.05]	1.15 (0.04) [1.01, 1.3]
Joint Significance	P < 0.001	P < 0.001
<b>Pediatric Target</b>		
No	Reference	Reference
Yes	0.7 (< 0.001) [0.62, 0.79]	0.82 (0.01) [0.71, 0.96]
<b>Target Gender</b>		
All Genders	Reference	Reference
Female	0.6 (< 0.001) [0.52, 0.71]	0.71 (< 0.001) [0.61, 0.83]
Male	0.57 (< 0.001) [0.48, 0.69]	0.65 (< 0.001) [0.55, 0.77]
Joint Significance	P < 0.001	P < 0.001
<b>Primary Disease GBD Tier 1</b>		
Non-communicable diseases	Reference	Reference
Communicable, maternal, neonatal, and nutritional diseases	0.75 (< 0.001) [0.69, 0.8]	0.81 (< 0.001) [0.72, 0.91]
Injuries	0.57 (< 0.001) [0.51, 0.64]	0.59 (< 0.001) [0.51, 0.7]
Joint Significance	P < 0.001	P < 0.001
<b>ln(DALY) †</b>	1.03 (< 0.001) [1.01, 1.04]	0.96 (0.01) [0.94, 0.99]
<b>Income Group</b>		
HUMIC	Reference	Reference
LLMIC	0.51 (< 0.001) [0.45, 0.57]	0.62 (< 0.001) [0.5, 0.76]
<b>Region</b>		
North America	Reference	Reference
East Asia & Pacific	0.66 (< 0.001) [0.61, 0.73]	0.73 (< 0.001) [0.66, 0.81]
Europe & Central Asia	0.85 (< 0.001) [0.79, 0.92]	0.81 (< 0.001) [0.73, 0.89]
Latin America & Caribbean	0.79 (0.01) [0.67, 0.94]	0.97 (0.79) [0.81, 1.17]
Middle East, North Africa, Afghanistan & Pakistan	0.9 (0.44) [0.68, 1.18]	1.27 (0.14) [0.93, 1.75]
South Asia	0.31 (< 0.001) [0.23, 0.43]	0.57 (< 0.001) [0.39, 0.84]
Sub-Saharan Africa	0.5 (< 0.001) [0.43, 0.58]	0.9 (0.38) [0.72, 1.14]
Joint Significance	P < 0.001	P < 0.001
<b>Publication Year †</b>	1.03 (< 0.001) [1.02, 1.04]	1.02 (< 0.001) [1.01, 1.03]
<b>Perspective</b>		
Health Care Payer	Reference	Reference
Health Care Sector	1.07 (0.54) [0.86, 1.32]	0.97 (0.8) [0.78, 1.21]
Other	0.75 (0.16) [0.5, 1.12]	0.86 (0.46) [0.57, 1.29]
Societal	1.39 (< 0.001) [1.25, 1.55]	1.41 (< 0.001) [1.28, 1.55]
Joint Significance	P < 0.001	P < 0.001
<b>Industry Funding</b>		
No	Reference	Reference
Yes	1.64 (< 0.001) [1.46, 1.85]	1.71 (< 0.001) [1.53, 1.93]

Formatted as OR (P-Value) [95% CI]  
† ln(DALY) and publication year are continuous variables

## Key Points

- Gaps in CEA availability exist between several key regions and LLMICs compared to North America, Europe, East Asia, and HUMICs.
- This exploratory analysis highlights the meaningful impact of several CEA characteristics on likelihood of cost-saving findings.
- While GBD cause had a meaningful impact on likelihood of cost-saving findings, disease burden (DALYs) for the given disease had little to no impact in the multivariable analysis.
- This analysis supports previous research highlighting the impact of industry funding on cost-saving findings.<sup>1</sup>

## CONCLUSION

This exploratory analysis demonstrates that cost-saving vary by intervention, comparator, time horizon, disease, geography, publication year, perspective, and funding. Such variation suggests that study design and contextual factors play an important role in shaping reported economic outcomes, necessitating further research into reporting criteria, potential publication bias, and consequences for resource allocation.

## REFERENCES

1. Haslam, A., Lythgoe, M. P., Greenstreet Akman, E., & Prasad, V. (2021). Characteristics of Cost-effectiveness Studies for Oncology Drugs Approved in the United States From 2015-2020. *JAMA Network Open*, 4(11), e2135123. <https://doi.org/10.1001/jamanetworkopen.2021.35123>

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For more information on the CEA Registry, contact [CEA.Registry@tuftsmedicine.org](mailto:CEA.Registry@tuftsmedicine.org).