# Sentiment Analysis of Clinical Evaluations in HTA: Evidence from Canada, England, Scotland, Sweden, France and Germany



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### Introduction

- HTA agencies vary significantly in their methodology, interpretation of clinical evidence and reporting of recommendations.
- This analysis builds on established frameworks for assessing HTA outcomes built by the founders of HTA Hive and allows for deep insights into the drivers of HTA decisions.
- Preliminary analysis was conducted on 786 reports (spanning 2009-2024). Prioritising drug indication pairs available in 4 or more of the countries.
- A sentiment analysis model VADER using the natural language toolkit (nltk) package in Python was applied to the uncertainties to assess sentiment severity across agencies.
- A manual inspection was carried out on lemmatization results, found that negative uncertainties were being given a compound score of O. Some manipulation was needed to allow more context for each uncertainty by removing fewer stop words, allowing inclusion of "no" and "won't", for example.



Here we propose a novel approach towards characterising and comparing clinical issues raised by HTA agencies, using numerical methods to assess the severity of comments and allow for large scale analysis of extremely detailed reports.

## Methods

- HTA data from Canada, England, Scotland, Sweden, Germany, and France was extracted from HTA-Hive database, constructed using a validated and published framework for the assessment of HTA outcomes.
- Uncertainty severity was assessed across multiple factors, including agencies, orphan drug status, oncology drug status, type of uncertainty, and size of the pharmaceutical company organised by market cap. For analysis, post-trial followup was merged with clinical evidence due to low sample size.
- Clinical issues are categorised as follows: magnitude of clinical benefit, long-term clinical evidence, study design, generalisability, potential adverse events, comparators, and indirect comparisons.

#### Results

There were total of 3,272 clinical uncertainties in the sample. ulletThe most common clinical uncertainty raised related to



magnitude of clinical benefit (22.6%), while issues relating to appropriateness of comparator were the least frequent (8.3%). The average compound sentiment across all clinical uncertainties was 0.11. The category with the lowest average sentiment was adverse effects (-0.209) highest was clinical benefit (0.34). ● CADTH ● HAS ● INESSS ● IQWIG ● NICE ● pCODR ● SMC ● TLV



• Sentiment scores were highly variable across manufacturers with more than 10 reports (0.015 - 0.205). We found that the uncertainty with the most variable sentiment score with respect to company size was ITCs, with a range of 0.24. Post Trial Follow-up was ignored due to low sample size (n=28)

Large Mid Small







- Natural Language Processing (NLP) techniques can help shed light on the severity of clinical issues raised in the context of HTA, which tend to vary according to HTA agency, type of uncertainty, therapeutic area and disease area.
- This research using a publicly available model for sentiment analysis • allows us to explore more nuanced differences between HTA bodies and shows the potential for more complex approaches.
- The methodology can allow for even deeper insights into differences between specific drugs and disease areas in the context of HTA.

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