MSR33

Are economic models in R that Shiny? Making cost-effectiveness models “Shinier” by integrating artificial intelligence applications

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BACKGROUND AND OBJECTIVE

- R and Shiny applications have emerged as powerful alternatives to traditional economic models developed in Microsoft Excel, offering enhanced flexibility, interactivity, and reproducibility .[1-3]
- However, opportunities remain to improve further automation and the overall user experience of R Shiny models. Integrating artificial intelligence (AI) features offer the potential to bridge the gap between highly specialized modeling tools and end users, transforming models from static tools into a “collaborator” that can enhance efficiency and stakeholder engagement.[4]
- This research aimed to showcase the integration of agent-based AI into cost-effectiveness modeling in R and R-Shiny, aimed at enhancing its development, usability, and dissemination across the pharmaceutical product evidence generation life cycle.

METHODS

- An R-based modular cost-effectiveness modeling framework was developed to evaluate the economic value of a novel hypothetical diagnostic/screening strategy from a healthcare system perspective.
- The back-end architecture included modules for the decision model engine and sensitivity analyses, reactive model inputs, and user-defined settings. Additional modules were included to integrate AI features.
- These modules were integrated into an R Shiny interface, enabling real-time interaction with dynamic result visualizations, modification of inputs, testing of structural assumptions, and automated output generation.
- A multi-agentic AI approach using context engineering was used and incorporated via an application programming interface (API) to provide a chat-based interaction feature and an AI-powered report generation feature.

RESULTS

- The model consisted of 11 distinct modules, along with an engine and integration code in the back-end architecture.
- The combination of R, R Shiny, and multi-agent generative AI enabled the development of a dynamic, interactive, and user-friendly model (**Figure 1**).
- The AI-enhanced model improved the user experience by facilitating the interpretation of the modeling framework and engagement with the model and its results via a contextual chat and a report generator feature within the same environment (**Figures 2** and **3**).
- Leveraging R as an open-source software environment allowing AI feature integrations fostered transparency, reproducibility, and accessibility, representing an improvement over simple R Shiny applications.

CONCLUSIONS

Making Shiny models “Shinier” with agentic AI opens new opportunities for health economic modeling and can be a relevant tool to enhance the dissemination of economic evidence by supporting policymakers in the decision-making process and ultimately improving patient outcomes.

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This project demonstrates how AI can enhance cost-effectiveness modeling in R and Shiny. We developed a modular, interactive framework that integrates a multi-agentic AI approach to support real-time interpretation, on-demand assistance, and dynamic live report generation. The framework improves usability, transparency, and efficiency compared with simpler R Shiny applications. This approach highlights how AI can help make health economic models more accessible and impactful for decision-makers in the pharmaceutical industry and can be leveraged for additional applications beyond cost-effectiveness modeling.

Figure 1. R Shiny model interface

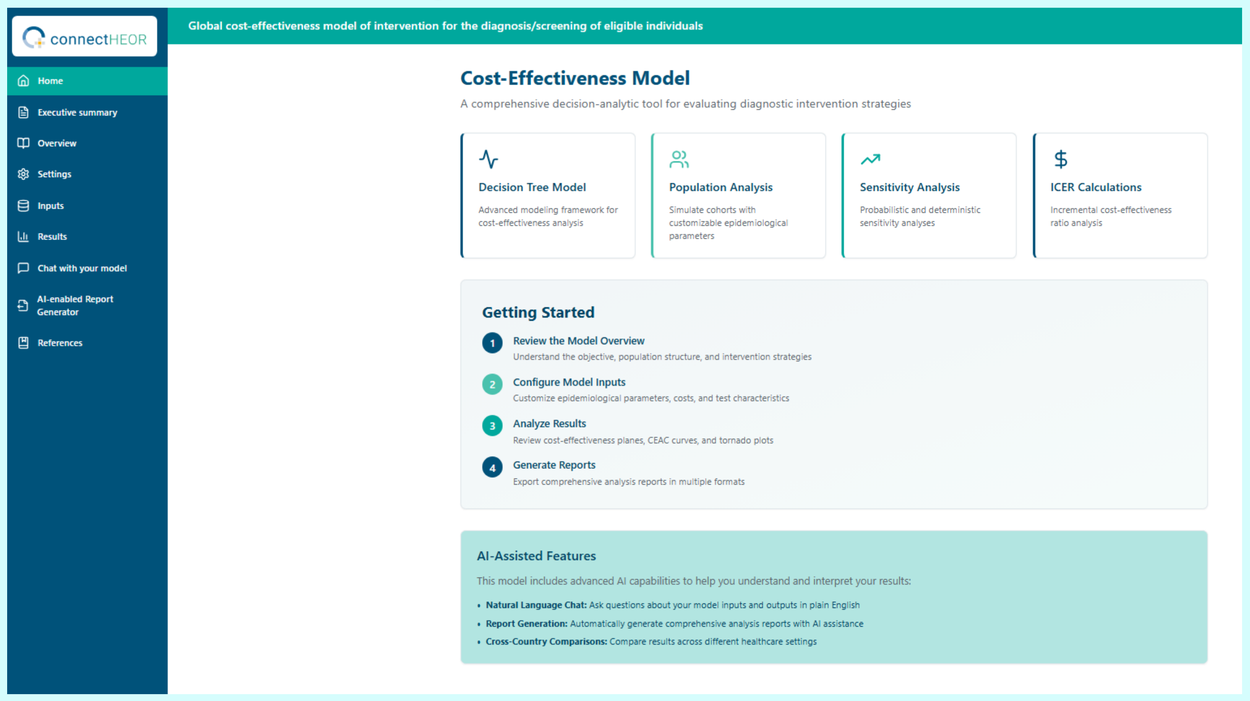


Figure 2. Agentic-based contextual chat feature

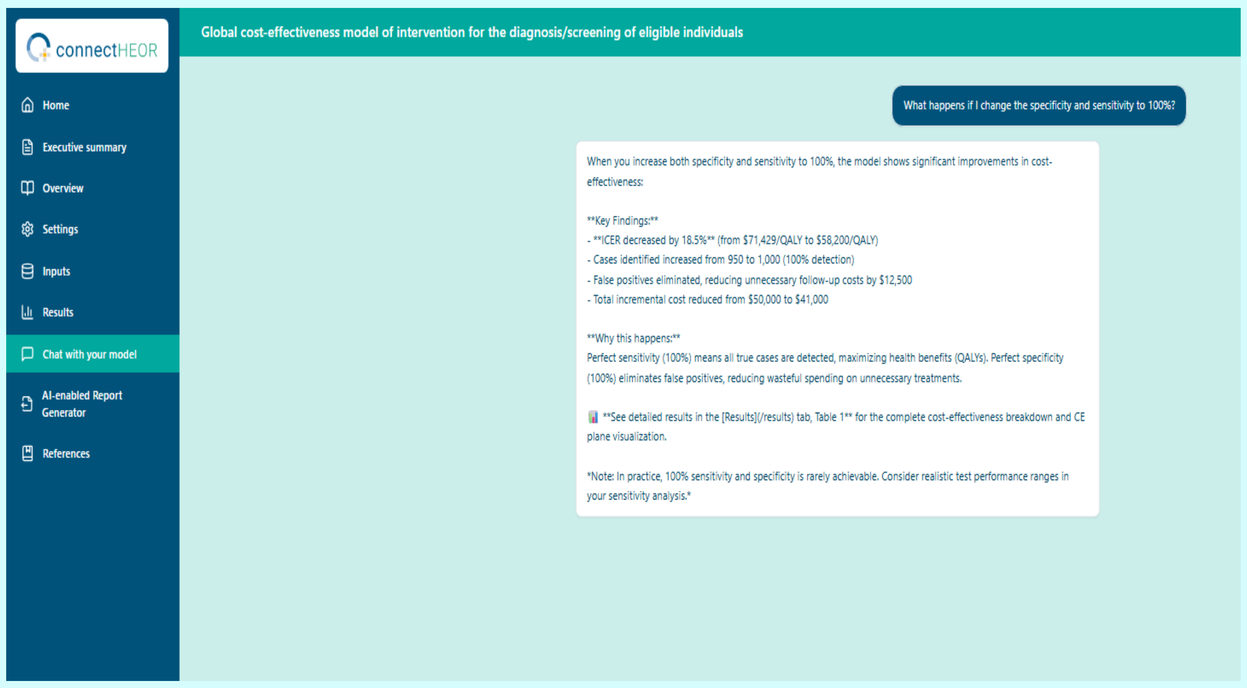
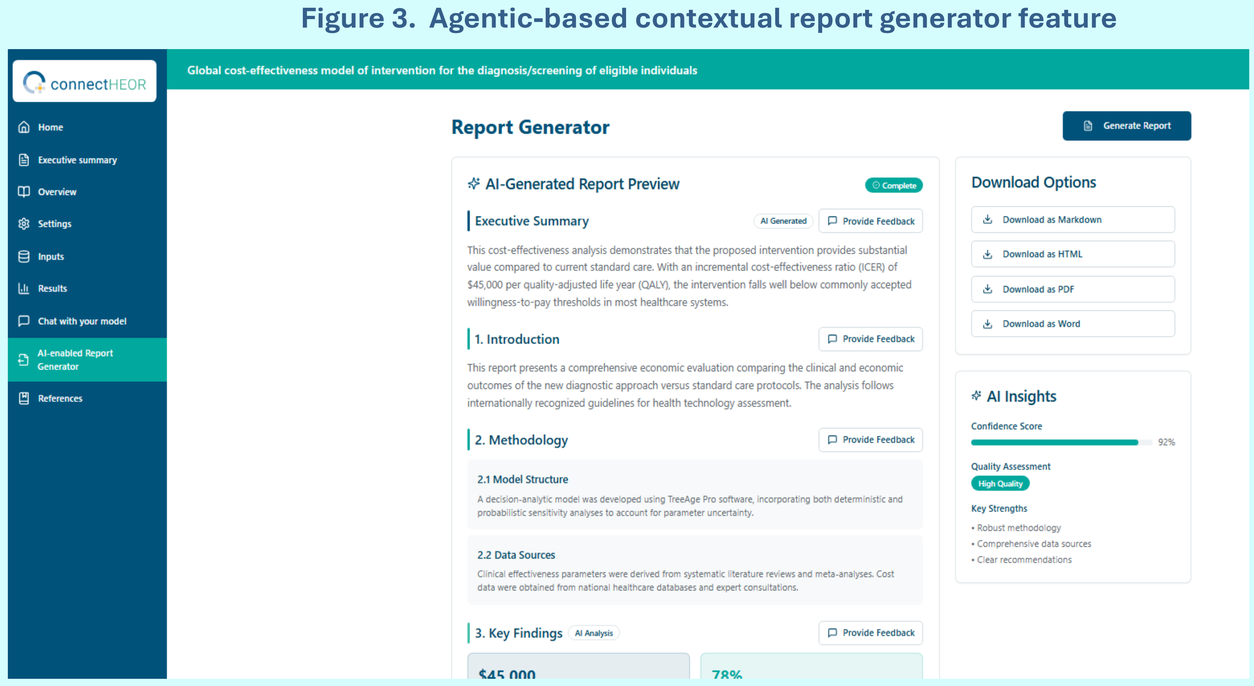


Figure 3. Agentic-based contextual report generator feature



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