Modeling The Impact of Patient and HCP Influence on Prescribing Behavior

Multi-Agent Interaction Analysis (MAIA)

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Abstract

Patient empowerment in healthcare decision-making is at an all-time high. But while both parties have a say in deciding which treatment will be prescribed, the healthcare provider remains the gatekeeper. This paper explores how Multi-Agent Interaction Modeling (MAIA) is being applied to provide marketers with a more accurate measurement of each stakeholders' role in the decision to grant a prescription for a brand.

The Challenge

While the American Medical Association and other health organizations oppose the use of direct-to-consumer (DTC) advertising, the US pharmaceutical industry spent over $8 billion dollars on DTC advertising in 2022. From the patient point of view, DTC educates and empowers patients to play a greater role in their healthcare decisions.

The opposing HCP view is often that DTC advertising can provide patients with misleading information, rather than focusing on evidence-based decision-making.

Regardless of which side of the argument you are on, DTC in the US is here to stay. As a result, patients ask their healthcare providers for a specific drug each day, and hundreds of thousands of prescriptions are written.

As marketers, we understand the need to influence all stakeholders who contribute to getting a prescription written. We also agree that each audience requires different marketing tactics, whether one is targeting HCPs or specific patient types. When planning marketing initiatives, inevitably, one question arises…

"How much influence do physicians and patients have over the decision to prescribe a treatment?"

The short answer is: "it depends." We know that the sphere of influence for some drugs, such as "lifestyle drugs," may be more driven by patient requests, while drugs that treat some rare diseases, for instance, are more likely to be recommended by HCPs.

Meet Maia

Maia is a 60-something female diagnosed with an addressable condition. Maia represents the ideal target for Brand X. She's affluent, educated, proactive about her health, engaged in her treatment decisions, and is not shy about asking her doctor for what she thinks is best for her. Maia had an appointment with a specialist last week, and it just so happens that she recently saw your DTC ad in Prevention magazine. With that ad in hand — and the messages around quality of life, efficacy and safety fresh in her mind — Maia headed out the door to her appointment, fully intending to ask her doctor about your brand.

Meet Dr Stubborn. Dr S. has been practicing medicine for nearly 40 years. He's approaching retirement but not yet ready to give up his practice. He is a constrained traditionalist: set in his ways, reliant on prescribing habits developed over many years, and not up to date on new treatments. "Change is good, but you go first" — he is a cautious watcher from the sidelines and a late adopter.

With ad in hand, Maia asked Dr. S. to prescribe Brand X. However, Dr. S. did not feel Brand X was right for Maia, and he denied her request.

Disappointed, yet determined, Maia sought a second opinion, and a few days later met with Dr. Grant. Dr G. is a younger physician working in the Center of Excellence, which is laser-focused on Maia's condition.

Dr G. is a confident authority when it comes to the latest and greatest treatments, and is aware that "waiting things out," or initiating patients on older and less effective treatments, could ultimately do more harm than good for his patients. Dr. G. has a cutting-edge mindset and considers himself "ahead of the curve." Fortunately for Maia (and the pharmaceutical company), Maia was granted her request the second time around.

Maia's journey illustrates the varying spheres of influence that contribute to fulfillment of a prescription. Regardless of which audience initiates the discussion and asks for or recommends a specific treatment, understanding the influence of each stakeholder is key to the planning and allocation of marketing spend.

While measuring the impact of marketing tactics deployed for distinct audiences is nothing new, the ability to model the interactions between these audiences can provide marketers with a more realistic view of decision-making in categories where multiple stakeholders influence a single decision. That's where an analytic technique called Multi-Agent Interaction Analysis (MAIA) can help.

Multi-Agent Interaction Modelling

Ipsos has a team of data scientists that specialize in developing and bringing to market cutting-edge analytic approaches for prescription pharmaceuticals and medical devices. Often these developments are based on algorithms in which market dynamics are replicated thousands of times to simulate how specific markets behave. One of the techniques in use to enhance our understanding of healthcare systems is Multi-Agent Interaction Analysis (MAIA), a form of evolutionary game theory in which simulated market agents are endowed with behavioural properties and then allowed to interact with each other.

Agent-based simulation modelling of this kind is not new. A common limitation cited for this approach is that they have limited use in situations where the data on the parameters needed for the model are difficult to find in the available literature. However, by pairing this approach with primary and secondary research designed specifically to measure the parameters needed, we can leverage MAIA for insight into situations previously out of reach for healthcare analysts.

A prime example of such multi-stakeholder decision-making is the conversation between a patient and their physician, where both parties are likely to have some degree of influence on the treatment decisions being made. To simulate this conversation, we have to articulate a formal model of how patients and physicians are likely to interact. As in all modeling, we aim to use the simplest model dynamics while still capturing the essence of the situation, but MAIA can be extended to accommodate additional agents and complexity where relevant and necessary.

MAIA has the patient and physician agents interacting in a formal sequence of moves that result in one of five outcomes. Two of these outcomes result in a prescription being written, and three of them result in no prescription being written. The MAIA approach analyzes patient and physician datasets that ask each type of respondent their likelihood of taking certain actions: asking for a script, granting a patient request, etc. Drawing on these datasets, MAIA randomly selects one physician and one patient,

and simulates the likely outcome of that individual interaction using the specific probabilities of each action. The simulation then replicates this process thousands of times, each time generating probabilities of outcomes. The simulations are then aggregated to create a description of the market. The model can be made more realistic by imposing restrictions on which patients interact with which physicians. For example, we can create more interactions with those physicians who see more patients in a typical month. Or we can restrict patients and physicians interacting only if they are in the same geography (and hence face the same reimbursement realities).

5 Possible Outcomes

Illustrative example of MAIA Input and output
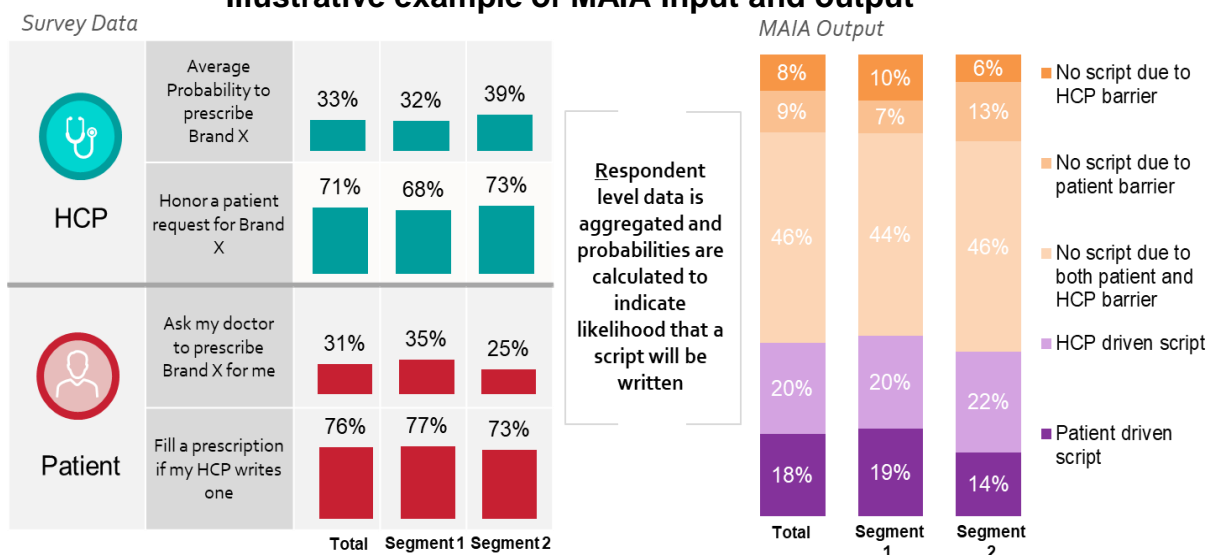
Summary

This whitepaper illustrates how applying Multi-Agent Interaction Modeling can influence the interaction of each stakeholder and the resulting outcome. This view of the decision-making process and outcomes enables marketers to better plan their audience-specific tactics and better project the anticipated share that will be garnered in-market. Additional questions that can be addressed include:

- How much relative influence do patients and physicians have on a prescription decision — and therefore, where should you put more marketing investment?

- To what extent is the patient campaign increasing patient activation to ask for particular treatments, and are physicians reacting positively to that activation?

- Are there specific barriers (on the patient or physician side) that are preventing greater adoption?

This approach can be extended to model more subtle dynamics as well. In the launch phase of a product, physicians' early clinical experiences of a new treatment can have a dramatic impact on speed of adoption. Using MAIA, we can formally determine how sensitive a new product is to this phenomenon and, based on clinical trial evidence, provide a more nuanced assessment of how early adopters might react. We can also model peer-to-peer information sharing in disease states where physicians often interact with each other to determine how important word-of-mouth advocacy might be.

Using MAIA to model the interactions between patients and HCPs is a powerful tool for assessing the outcome of the nearly 900 million doctor visits that occur each year in the US.

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