# A Tool for Analyzing State Market-Oriented Reforms: the Health Insurance Market Simulation Model[*]

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January 31, 1995

This paper describes the rationale for, current status of, and future development plans for a stochastic policy simulation model of health insurance dynamics. The health insurance market simulation model (henceforth, referred to simply as "the model") is a tool for estimating at the state level the ultimate policy outcomes generated by reform proposals that seek to alter the way insurance plans, business establishments, and family members interact in the private market for health insurance.

The paper is organized into three sections. The first section presents reasons why a new kind of model is needed to respond to analytical issues now facing policy makers. The second section describes the high-level logical structure of the model and concludes with a brief description of its current computer implementation. The final section of the paper presents two directions for future work with the model: development that expands the range

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[*]This research is being supported by a technical assistance grant from the Robert Wood Johnson Foundation to The RAND Corporation. This grant is part of the Foundation's State Initiatives in Health Care Finance Reform program.

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of policy reforms that can be analyzed with the current establishment-data version of the model, and development that extends the model's capabilities by integrating state-level family data with the establishment data.

# 1   Why a Model is Needed

Several recent developments have increased the need for a policy simulation model that explicitly represents the uncertainty facing plans, establishments, and families as they make private health insurance decisions from year to year.

With the growing prominence of market-oriented reform proposals, the complexity of policy analysis has increased. There is considerable distance between market-oriented policy actions and resulting policy outcomes. Since the effect of a policy action is mediated by the complex operation of the private health insurance market, the ultimate outcome is difficult to predict without an appropriate analysis tool. This increased analytical complexity can be seen in a broad range of reforms including proposals for different kinds of community rating in the pricing of health insurance, proposals for risk adjustment mechanisms intended to manage any adverse selection problems generated by community-rated pricing, proposals for health insurance purchasing pools or alliances, proposals for various kinds of subsidy schemes to encourage the purchase of private health insurance, proposals to change self-insurance options under ERISA, etc.

The policy analysis experience during the recent national reform effort underscores the difficulty of analyzing market-oriented initiatives with existing policy simulation models. Existing models are based largely on national family data. Data on business establishments and their health insurance situation are either lacking or attached to the family data. As a result, the logical structure of existing models does not explicitly represent the decision-making process of market participants, which means that neither the effect of market-oriented policy actions on participant decisions nor the process by which resulting changes in participant decisions translate into policy outcomes can be explicitly modeled. The use of national data, which is appropriate for analysis of single-payer style reforms, actually hampers analysis of market-oriented reforms since health insurance markets and most market-oriented reform proposals are regional in nature. And the existing models do not explicitly represent the uncertainty facing market participants, which is

particularly significant in the small group and individual sub-markets, and therefore, cannot analyze the market dynamics that are generated by plan, establishment, and family reactions to uncertainty.

The shortcomings of existing policy simulation models was evident even before the rise in prominence of market-oriented reform proposals. A National Academy of Sciences panel that reviewed the state of the art in policy simulation models at the end of the 1980s identified the limits of this earlier generation of health policy simulation models. In the panel's final report, Citro and Hanushek [1, Chapter 8] discuss the need to move to a second generation of models that explicitly characterize the behavioral responses of market participants as well as the market interaction of supply-side and demand-side decisions.

Development of the health insurance market simulation model described in this paper will not only allow better policy analysis of state market-oriented reform proposals for the reasons just mentioned, but also increase the productivity of health insurance policy research for two additional reasons.

First, recent history shows how fast the focus health insurance reform can change. This experience suggests the wisdom of developing broad, general-purpose analytical tools rather than special-purpose analyses of policies currently in vogue. Such special-purpose analysis can quickly become out-dated and fail to provide a foundation for subsequent policy analysis when relevant reform options change. As the National Academy of Sciences report emphasizes, a policy simulation model that has been well designed and implemented is an effective general-purpose analysis tool that provides a foundation of survey data and estimated behavioral relationships that can be enhanced relatively quickly to analyze new reform proposals.

And second, development of the model would also increase the productivity of a broad program of health economics research in two ways. The model would provide a sophisticated policy analysis focus for survey data collection and the use of those data in estimating the behavioral responses of market participants to market conditions and policy actions. The model integrates the survey data and numerous estimated behavioral relationships produced by a research program into a flexible policy analysis tool. Ongoing development of the model produces both a deepening in analysis capabilities and a broadening in analytical scope through the incorporation of new data and estimation results. And, in addition, the policy analysis requirements of this ongoing model development provide guidance to researchers on what

kinds of data collection and behavioral estimation need to be undertaken. The model can be used to conduct sensitivity tests that indicate the relative policy-analysis value of alternative kinds of new data and estimates, thus providing the information necessary to weigh the benefits and costs of alternative research tasks.

# 2   Current Model Structure

The model has been designed to represent explicitly the major market participants, the decisions they make regarding health insurance, and the market interaction of their decisions. This explicit representation of participants, their decisions, and their market relations enables the model to characterize how market-oriented policy actions affect decisions and then to estimate the ultimate policy outcomes by tracing the effects of the changed decisions through market interactions. It is the absence of an explicit representation of all market participants and their decisions and market relations that handicaps existing policy simulation models in the analysis of market-oriented reform proposals.

The opportunity to develop this kind of model has been provided by the collection of both family and establishment data at the state level in the Robert Wood Johnson Foundation Family Health Insurance Survey and Employer Health Insurance Survey, which were conducted in ten states during late 1993 and early 1994. The design of the model is intended to integrate these data and behavioral relationships estimated with them into a flexible policy analysis tool.

Figure 1 on page 5 presents the high-level structural logic of the model. Each box represents a market participant, a market relationship between participants, or government policy actions. The arrows between boxes represent key relationships between market participants and the nature of the relationships indicate the kinds of decisions that each participant is assumed to make in the model.

Health insurance plans are underwritten by insurers and have a benefit package and cost-sharing provisions. Plans can be offered to establishments, cooperatives (i.e., purchasing pools or alliances), or families. Cooperatives can then make offers to establishments or families that have different premium terms than the offers plans made to them. And, of course, establishments routinely translate offers made to them into offers to the families of
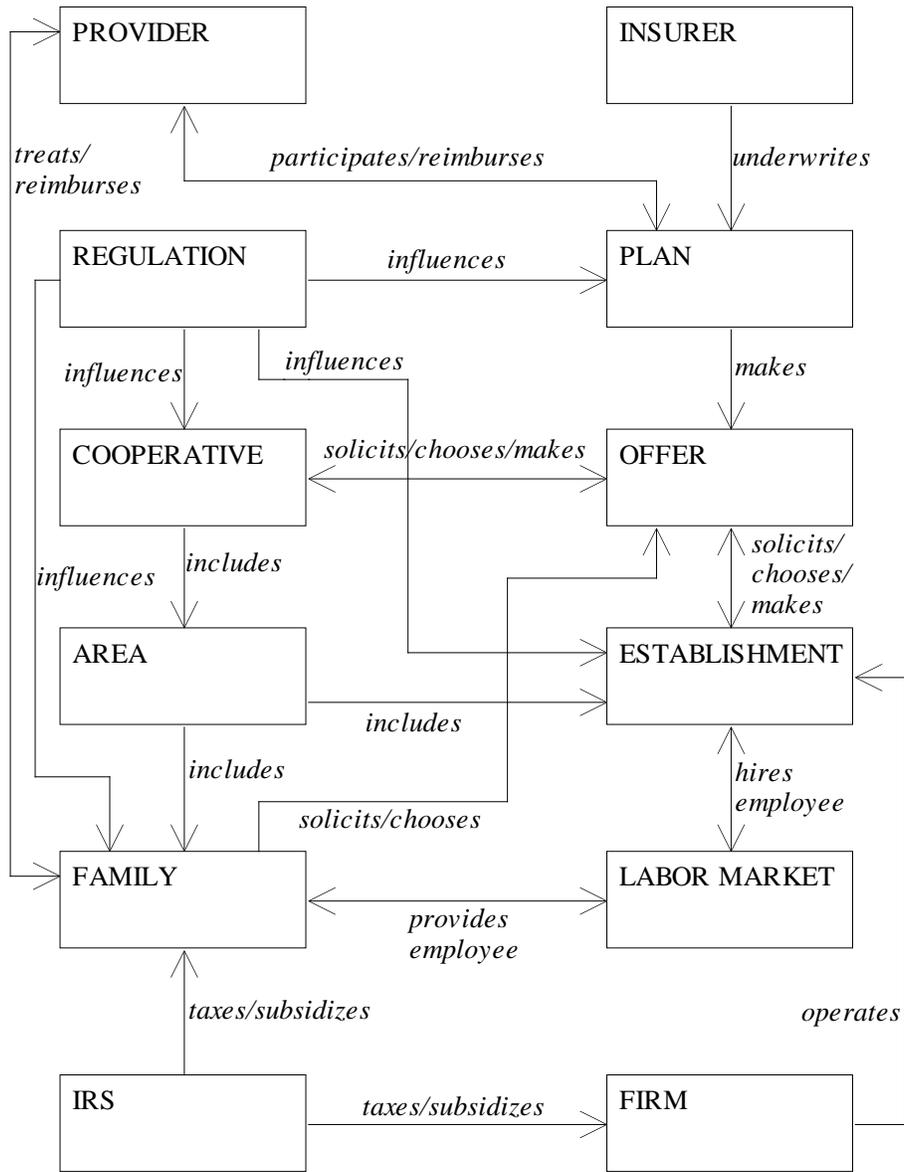
Figure 1: High-Level Structural Logic of the Model

their employees that have different premium terms. The offer is an explicit object in the model since the same plan is routinely offered at different prices in an experience-rated insurance market and since the premium terms associated with a plan change along the sequence of offers that originates with the plan and terminates with the family. The solicitation of, choice among, and making of offers constitute the key decisions facing participants in market.

Government regulation of the private health insurance market can have an immediate effect on plan, cooperative, establishment, or family decisions depending on the regulatory policy being analyzed with the model. The ultimate outcome of a regulatory change will be determined by how it affects offer decisions and how the altered offer decisions interact in the market.

The area — represented as a county — plays a significant role in the model. Families and establishments are located in an area and plans and cooperatives operate in a list of areas. This feature of the model exploits the regional nature of the state data and enables the model to analyze local variations in policies and market behavior.

The labor market represents the relationship between employed family members and establishment employee groups. A strength of the model design is the ability to represent this employment relationship using statistical matching techniques to link employed family members in the Family Survey data with establishment employee groups in the Employer Survey data. This richness of this linkage will enable the model to recognize the complex set of offers that face families with multiple employed members and whether these situations play a significant role in reducing the demand for employer-sponsored health insurance at some kinds of establishments.

And finally, the IRS represents any government entity that may be envisioned as administering health insurance subsidies, regardless of whether the subsidy policy is targeted to establishments or families.

The model has been implemented on a high-end personal computer using the object-oriented programming capabilities of the C++ language. The model's input data has been organized as a relational database that can be easily accessed by policy analysts using a mouse-driven graphical interface. The model reads input parameters and survey data from the relational database, performs the simulation, and writes the results to text files. These result files are formatted in a manner that allows them to be easily imported into any spreadsheet or statistical analysis program. This flexibility ensures that subsequent analysis of the results and preparation of presentation graphics is conducted with software that is well suited to the task and is familiar

to the policy analyst.

# 3   Future Model Development

The model has reached a point where it would be advantageous to pursue a two-pronged development strategy. One line of development would proceed in the context of the current establishment-data version of model. The goal of this first line of development would be to increase the number of participant decisions that are explicitly represented in the model, and therefore, to expand the range of market-oriented reforms that can be analyzed with the model. The other line of development, which would proceed in parallel with the first, would involve extending the model so that family data can be utilized along with establishment data. The goal of this second line of development would be to incorporate family decisions and market interactions into the model so that the model could analyze market-oriented reform proposals that are aimed at changing family decisions in the private health insurance market.

The first line of development would extend the work we have already done in the context of the establishment-data version of the model. Preliminary policy analysis results for several kinds of market-oriented small group reforms are described in our recent paper [2]. There are a number of promising directions for this first line of development.

One direction would be to develop the model's representation of the offer-making decision process of plans so that a premium offer to a particular establishment depends in part on that establishment's prior year utilization. This extension would allow the model to produce the year-to-year premium fluctuations that characterize the current experience-rated small group market. It would also allow the model to be used to study the roots of underwriting cycles that are also characteristic of the small group market. By enabling the model to simulate these kinds of market dynamics, a number of market-oriented reform strategies aimed at ameliorating these adverse market dynamics can be analyzed.

Another promising direction for the first line of model development would involve extending the establishment's range of health insurance options to include self-insurance. Regardless of the regulatory environment, establishments that self-insure are essentially buying experience-rated health insurance. The ability of establishments to self-insure under ERISA is recognized

at the state level as a major problem for reforms that seek to move plans closer to community rating or that create public or private alliances.

This self-insurance model development activity would be closely related to extending the representation of establishment plan choice to situations in which several different kinds of plans are available in the marketplace. A major challenge in this area is to represent how establishment decisions are influenced by both the price and the quality aspects of plan offers from HMOs and PPOs as well as from traditional fee-for-service plans. These price-quality decisions are increasingly important in the private health insurance market and the sensitivity of decisions to these two factors would have a significant impact on the effectiveness of various reform proposals that seek to alter the tax-advantaged status of more expensive plans.

The second line of model development can be pursued simultaneously with the first and would involve extending the model to use family survey data. Since there is no survey linkage between the family and establishment data, statistical matching techniques would be used to associate each employed family member with an establishment employee group. There is a long history of using statistical matching to merge disparate data for use in policy simulation models. Our work in this area would build on the excellent review of that history conducted as part of the National Academy of Sciences assessment of policy simulation models.

The integration of family data into the model would permit a descriptive analysis of the uninsured population that would provide a better understanding of their employment situation and of their employer's status. It would be particularly interesting to determine the extent to which the employed uninsured work in establishments whose employees appear to have little interest in health insurance because they have access to insurance through another employed family member.

After extending the model to include family data, estimated behavioral relationships for plan choice and services utilization would be used to represent the key decisions facing families in the health insurance market. After the model is fully extended to include family data and to represent family decisions, a wide range of market-oriented reform proposals would be able to be analyzed. For example, the ultimate policy outcomes of various family-targeted insurance-purchasing subsidy programs would be able to be analyzed. And the interaction of such subsidy programs with other market-oriented reforms (such as purchasing pools or alliances) would be able to be analyzed in an integrated fashion using the model.

The detailed tasks mentioned in this discussion of the future development of the health insurance market simulation model are meant to be suggestive. We welcome ideas about alternative tasks that could be undertaken within this two-pronged model development approach.

# References

[1] Citro, Constance F., and Eric A. Hanushek (editors), *Improving Information for Social Policy Decisions: The Uses of Microsimulation Modeling, Volume I: Review and Recommendations*, Washington, DC: National Academy Press, 1991.

[2] Holmer, Martin R., Stephen H. Long, and M. Susan Marquis, "The Effects of Small Group Reform on Employers' Decisions to Offer Insurance: Some Preliminary Results," paper presented at the American Economics Association meetings, Washington, DC, January 7, 1995.