The appropriate way of increasing a risk pool is to extend it over time to enable a site to have a number of years to pay back any overspends. For other sites to take on this risk creates a problem of moral hazard. It undermines the underlying rationale of giving practices budgets, which is that they are responsible for the economic consequences of their decisions.

Exceptional catastrophic risks—for example, forensic psychiatry—do not naturally form part of practice budgets. These risks ought to be shared with health authorities and financed by a general levy, with payments authorised by a committee representing contributors. In general, therefore, our analysis supports basing total purchasing sites on single practices. We are interested to see whether experience with total purchasing bears this out.

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Commentary: Models can be powerful tools for making decisions about effective and efficient health care

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Max O Bachmann and Gwyn Bevan explain a method for making informed decisions about the size of a total purchasing site to manage the risks of rare costly referrals. A randomised controlled trial is clearly not practicable for obtaining the necessary information. They suppose that the occurrence of rare referrals can be mimicked by a mathematical model called a Poisson process. The key assumptions that point to a Poisson process are that rare referrals occur at random and that such referrals are independent within each category and between categories. The assumption of independence seems reasonable for the categories selected, so the chosen mathematical model for describing the referrals is reasonable. This mathematical model does not cover dependent referrals—for example, for infection, which increases the risk of further referrals in the area served by a general practice.

Bachmann and Bevan simulated referrals and calculated the resulting cost with the help of a standard program on a computer. Computer simulations are often but not always needed for obtaining information from mathematical models for health care. Some models are simple enough to be solved through a combination of mathematical and numerical analysis. Complex models require careful simulations. A Poisson process is a simple model and the information on cost that is required is the sum of the costs of the various types of referrals. The data of Bachmann and Bevan suggest that the variation in the total cost can be predicted analytically without using a computer simulation. People who are not mathematicians may find it easier to accept results from a computer simulation rather than the results that follow from a combination of mathematical and numerical analysis. Table 1 shows the predictions obtained from mathematical and numerical analysis, together with the results of the simulation of Bachmann and Bevan for 100 000 person years. The results are similar, which corroborates the simulation.

Table 1—*Distributions of referral costs for 100 000 person years at risk through mathematical analysis and computer simulation*

	Centile of referral cost					
	5	25	50	75	95	Variation
Mathematical prediction	897331	1062898	1177979	129306	1458626	48
Simulation*	887486	1074556	1184946	1287445	1439343	47

*See table 2 of Bachmann and Bevan.

The structure of models permits rational use of data from various sources, including randomised controlled trials.[1] The common problem of unreliable data may be handled by a careful sensitivity analysis, and Bachmann and Bevan considered errors in referral rates and costs. Modern computers can solve quite detailed models, and these models can be linked to patient data collection systems in general practice. Evaluating and monitoring care for a particular disease—for example, asthma—or predicting the use of resources for a defined group are two of the many possible benefits that can be obtained from models.[2 3]

The particular example of the assessment of financial risk illustrates a general point that appropriate models are powerful tools for making informed decisions about effective and efficient health care.

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