CCBIO on Economics:

# The Economics of Cancer Biomarkers

**JOHN CAIRNS //** There are several dimensions to the economics of biomarkers: including the analysis of the pharmaceutical market, the economic evaluation of biomarkers, and the study of how biomarkers influence behavior.

An example of the first dimension is an analysis of the economic incentives to invest in biomarker-based diagnostic tests. The development of a diagnostic test is valuable from a social point of view if the aggregate cost of testing (including the development cost) is lower than its corresponding social value. The latter has a number of elements, such as reduced costs in the group of patients who would not respond to treatment, and the health gain as a consequence of adverse treatment effects. One important question, for instance, is - how likely is it that the current market structure for biomarker-based diagnostic tests and their companion treatments will produce the optimal amount of R&D for biomarker-based diagnostic tests? And if the current situation is sub-optimal, what policies could be introduced to improve it?

There are several important questions that economic evaluation can address. Where there is a choice of diagnostic tests which is most cost-effective? Where in the clinical pathway is it best to test? A further example concerns whether it is more cost effective to test all patients with a particular condition and treat selectively, or to treat all patients.

One question of major interest is the effect of biomarkers on the cost-effectiveness of treatments. The use of a biomarker may improve the cost-effectiveness of a treatment, assessed by comparing the incremental costs to the incremental benefits (usually measured in terms of QALYs or quality-adjusted life-years). Although the mean cost per patient will generally increase because of additional testing costs and increased treatment costs (e.g. because of increased progression-free survival), the mean QALY per patient will increase if it becomes possible to target therapies on those who are likely to receive greater benefit. If the incremental QALYs increase proportionately more than incremental cost the cost-effectiveness of the treatment will improve (that is, the incremental cost per QALY will fall).

Addressing these questions will (almost) always involve evaluation of treatment and testing, and not just evaluation of the diagnostic test. Diagnostic tests are rarely of value in themselves and

their value lies in their implications for treatment. Thus the cost-effectiveness of biomarkers will also be influenced by how biomarkers influence behaviour of clinicians and patients, for example, the extent to which treatment decisions or adherence to treatment are influenced by additional diagnostic information.

In short, the development and use of cancer biomarkers raises a wide range of economic questions and provides exciting opportunities for economists to work collaboratively to improve understanding in this rapidly evolving sphere.