A Dynamic Balanced Scorecard for Managing Health Systems Performance

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Abstract

Health system performance management is a dynamically complex problem, affected by a large number of factors which interact to produce health outcomes over time. A brief review of current health system performance assessment instruments, including the balanced scorecard, demonstrates only a limited ability to deal with the dynamic complexity of this problem. These are limitations that can be overcome with the incorporation of system dynamics methods. We propose a dynamic balanced scorecard for managing regional health system performance in New South Wales, Australia. Central to this scorecard will be an understanding of the dynamic interactions of cost, quality and access and how these affect population health. Preliminary mapping suggests that the way the gap in resources required to provide medical services is managed will play an important role in balancing these objectives.

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Overview of Health System Performance

The goal of any health system is to improve health for the population that it covers. Health system performance management is the means by which a health system measures progress towards this goal and provides a mechanism to inform decision making about corrective action that needs to be taken when the system's progress deviates from the goal.

While this sounds simple, nothing could be further from the truth. First let us consider what is involved in improving health. The World Health Organisation in its constitution defines health as '*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*' (WHO 2006).

This is a very broad definition which demonstrates how a multitude of factors interact to produce health. These factors might include access to services, education, clean water, adequate nutrition, sanitation, paid employment, pest control, stress management, adequate shelter and protection from criminal activity and violence. There are environmental factors to consider such as levels of pollution, exposure to second hand cigarette smoke, the presence of fluoride in the water supply, quality of food and the quality of roads and transport infrastructure which reduce accidents. There are also numerous individual factors which contribute to health such as level of fitness, obesity, genetic factors and risk taking behaviour such as smoking, drinking or unsafe sex practices. On top of this there is also government intervention to improve health.

This list could go on, and all these are in addition to the provision of medical services. Ultimately this means that the responsibility for improving health rests with everybody which makes performance management very difficult.

Improving health is a dynamically complex problem with many contributing factors and time delays between the implementation of policy and when results are observed. A health system is "*all actors, institutions and resources that undertake health actions - where the primary intent of a health action is to improve health*" (WHO 2003, p 7). The focus of the research presented in this paper will be on managing performance in the context of a regional health system.

A number of performance management and measurement systems have been developed for the health system with the focus being to improve health. We will review some of the more sophisticated performance management systems in use. To varying extents these all appreciate the systemic interactions that are required to achieve the goal of improving health. However, these could be strengthened with the use of system dynamics to understand the dynamic complexity of health system interactions and the knowledge to improve health.

This paper will briefly overview the components of health system performance by examining a number of health system performance assessment instruments. It will them

move to consider the balanced scorecard as an instrument for health system performance management. The limitations of the scorecard are also identified and how these can be overcome by incorporating system dynamics methodology. Finally we will propose the development of a dynamic balanced scorecard for use in Area Health Services, which are responsible for the regional health system performance in the Australian state of New South Wales. We will also consider the dynamics of health systems performance which will be central to the development of a scorecard.

World Health Organisation Health System Performance Assessment Framework

The World Health Organisation's (2003) Health System Performance Assessment (HSPA) framework focuses on three intrinsic goals of a health system. These are to improve health, to be responsive to those who interact with it and the fairness of financial contribution.

There are two dimensions to health and responsiveness, the first being the level or quality and the second being the distribution or equity. So healthcare should be of high quality and be highly responsive when interacting with the user. In addition it should also be equitably distributed across the population covered by the health system, providing those who reside in rural areas with the same quality of care as those who are in metropolitan areas and similarly the same level of responsiveness for the rich as for the poor.

The final goal, fairness of financial contribution is designed to ensure that all households pay an equitable amount for healthcare in proportion to their means. This goal is the responsibility of governments. In Australia this is mostly handled by the federal government with programs such as Medicare and the Pharmaceutical Benefits Scheme, which provide citizens with subsidised healthcare and prescription medications respectively. However this is beyond the scope of a regional health system and will not be considered here in any great detail.

The HSPA (WHO 2003) considers four functions which contribute to the achievement of the intrinsic goals. These are financing the health system, the provision of healthcare services, the generation of resources (such as training medical personnel and investment in infrastructure) and stewardship.

The WHO HSPA was originally focused on benchmarking member countries against each other, but this was widely reported as a ranking of countries on their health system performance. Many participants in the Western Pacific regional forum on the HSPA framework (WHO 2003) felt this ranking was not useful and instead the framework should be adapted more for internal use to improve or supplement each counties own performance framework. They also identified the problem of the time and expense that is required to gather the data required for the HSPA.

Health Metrics Network

The Health Metrics Network (HMN) is an initiative of the World Health Organisation and aims to improve health thorough the provision of better health information based on the premise that better information will lead to better decision making and improved health outcomes (WHO 2007). At the present time HMN is working on the development of Health System Metrics (HSM), which aims to provide users with "*a minimal set of core indicators, that are comparable between populations and over time, and identify the key measurement issues and strategies required to report regularly on the status of the health system*." (Health Metrics Network 2006, p 6) The goal is that the information on the dashboard can then be used for health system improvement.

The Health System Metrics will present a dashboard of indicators of the inputs and output of the health system. This will focus on the three intrinsic goals considered by the HSPA discussed previously, in addition to health system coverage, efficiency, quality and safety.

The HSM will measure the following inputs of the health system: governance and leadership, financing human resources, health information, service provision (including availability and quality) and the coverage of services.

Presently the HMN is in the process of developing indicators for the various inputs and outputs described above, with the exception of those already developed by the HSPA.

Balanced Scorecard in Health

The balanced scorecard (BSC) developed by Kaplan and Norton is perhaps one of the most well known multi-dimensional performance management systems which views performance as more than simply the bottom line. Derived from an organisation's vision and strategy a balanced scorecard focuses on the long and short term drivers of performance, by viewing performance from four different perspectives: that of the customers, that of the stakeholders, from the perspective of what internal business processes the business must excel at in order to achieve their vision and strategy and organisational growth and learning how to perform better (Kaplan and Norton 1996).

Although originally developed for use in the private for-profit sector, Kaplan and Norton's (1996) method can also be used in the pubic and not-for-profit sectors, where the financial perspective rather than being viewed as a goal, now comes to represent the financial and resource constraints within which these organisations must operate.

The balanced scorecard has been used to manage performance in public health. Sometimes the scorecard is implemented in its pure form as set out by Kaplan and Norton (Kaplan and Norton 1992), however many people have proposed modified scorecards (eg Linard et al. 2000) and others have proposed more radical transformations, which though they were inspired by the BSC look very different to it. Such alternations are generally to ensure fitness for purpose.

For example Linard et al (2000) propose a template for a dynamic balanced scorecard for the Australian public sector. This template identified three customers: the Minister as the representative of government for the implementation of policy, the auditor-general and parliament in respect of good governance and finally the customers with whom the public sector agency or departments deal.

The scorecard used for performance management in public hospitals in Ontario, Canada (Paul, Blackstien-Hirsch, and Brown 2006), was the basis for the development of the Performance Assessment Framework in the UK NHS (Chang, Lin, and Northcott 2002) and Queensland Health in Australia is currently in the process of developing a balanced scorecard.

To a large extent the WHO's HSPA and the HMN's HSM are instruments which approximate the beginnings of a balanced scorecard. Each has a focus on customers, providing quality healthcare, system responsiveness and equity of healthcare. Each has a focus on finance or the resources that are available in order to realise the goal of health improvement. There is consideration of efficiency, an internal business processes perspective and growth and learning, with efforts to improve stewardship and health information.

Limitations of the Balanced Scorecard

The balanced scorecard is not without its limitations, some of which can be overcome with system dynamics.

The scorecard is based on a series of cause and effect relationships, where improving performance on one or another indicator will increase desired outcomes (Kaplan and Norton 1996).

This is an overly simplistic and unidirectional view of causation. In complex systems it is more likely that there is bi-directional causality with multiple contributors (Akkermans and van Oorschot 2002). The scorecard view also ignores the effect feedback.

The BSC also ignores the time lag between cause and effect (Linard 2001; Akkermans and van Oorschot 2002). Major reform in public health policy takes time to implement and there will be a time delay before the results begin to appear. For example recently in the state of New South Wales, Australia, the government has placed significant restrictions on smoking in pubs and clubs, however we would expect there to be a significant time delay between the implementation of that law and seeing a drop in people suffering the effects of passive smoking.

The scorecard also lacks a rigorous means for the selection and validation of performance indicators and policy decisions or business rules which respond to performance gaps (Linard 2001). Typically indicators for the scorecard are chosen by consensus among the stakeholders and it is further assumed that presenting decision makers with information

on the scorecard will lead to good decision making. This is not so, especially when faced with the dynamically complex problems of managing organisational performance.

System dynamics (SD) can help to overcome these limitations. SD provides a framework by which we can understand dynamically complex causal relationships. In addition to this models can be constructed to test hypotheses of casual relationships and the effectiveness of indicators and policy to correct performance deviations from targets (Linard 2001; Akkermans and van Oorschot 2002). The application of system dynamics to the balanced scorecard results in what has been called a *dynamic balanced scorecard*.

Developing a dynamic balanced scorecard to manage health system performance

This present research will focus on the development of a dynamic balanced scorecard (DBSC) for an area health service (AHS) within the state of New South Wales, Australia. New South Wales is divided up into eight AHSs, each being responsible for the delivery of healthcare in their region, including health promotion, disease prevention, primary health care, community health services, home care, hospital services and nursing home care.

NSW Department of Health Performance Framework

The New South Wales Department of Health has four strategic goals for the state health system (NSW Department of Health 2000, 2005). These are:

- To keep people healthy (*health outcomes for the population*)
- To provide the health care people need (*access)*
- To deliver high quality health services *(quality)*
- To manage health services well (*cost)*

These four areas represent the most important outcomes for the New South Wales Health system. The Department of Health requires the area health services (AHS) who are responsible for delivering health services to report their performance and outcomes against these indicators derived from these four strategic goals. AHS also receive incentive funding for meeting targets set by the department of health.

The interaction of Cost, Quality and Access

Central to the operation of the dynamic scorecard will be an understanding of the interaction of cost, quality and access to produce health outcomes for the population covered by the AHS.

It has been generally said that a health system in improving population health can provide two but never all three of these goals. It could produce high quality care which is highly

accessible, but this would be very costly. It could produce high accessibility at a low cost, but with poor quality.

This makes is especially important to understand this dynamic as the health system comes under increasing pressure, with increasing costs and increased demand for medical services generated by the ageing Australian population and advances in medical technology. This raises some very important policy questions looking to the future. How will this impact of the quality of healthcare? How will it impact on the ability of people to access healthcare when they need it? How will these in turn impact on population health?

A health system under pressure

Increasing cost of Healthcare

The cost of providing healthcare is increasing. For the ten years between 1994-95 and 2004-05 the rate of inflation for healthcare costs has exceeded general inflation by on average 0.4% per year (Australian Institute of Health and Welfare 2006), with total healthcare expenditure now reaching 10% of GDP.

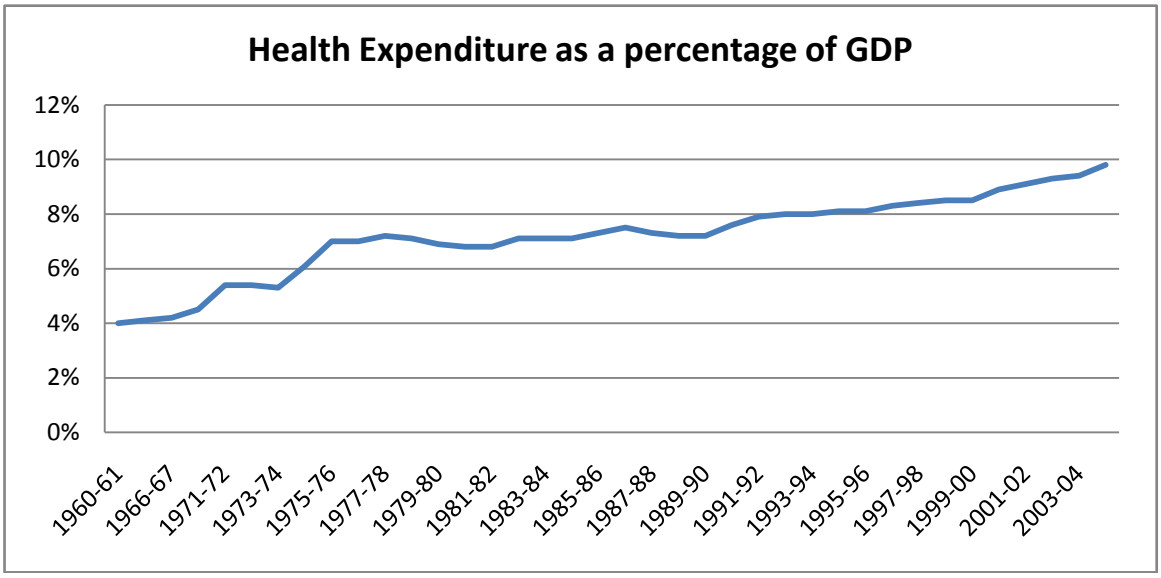

Figure 1 - Australian Healthcare Expenditure from all sources as a percentage of GDP (Australian Institute Of Health and Welfare 2006).

While the above graph shows an increasing trend, there will be a limit to how much health spending can grow. Governments can contain spending by increasing out-of-pocket expenses paid by people accessing medical services and also by rationing medical services.

According to the Australian Productivity Commission (2005) the two main drivers of real growth in healthcare expenditure is due to advances in medical technology and the ageing population.

Ageing Australian Population

Placing a large strain on the Australian Health System is the ageing of the Australian population. It is projected that the number of people aged over 65 will double by 2045 to comprise around 25% of the total population. In the next two decades the rate of ageing will increase to four times the long term average (Productivity Commission 2005).

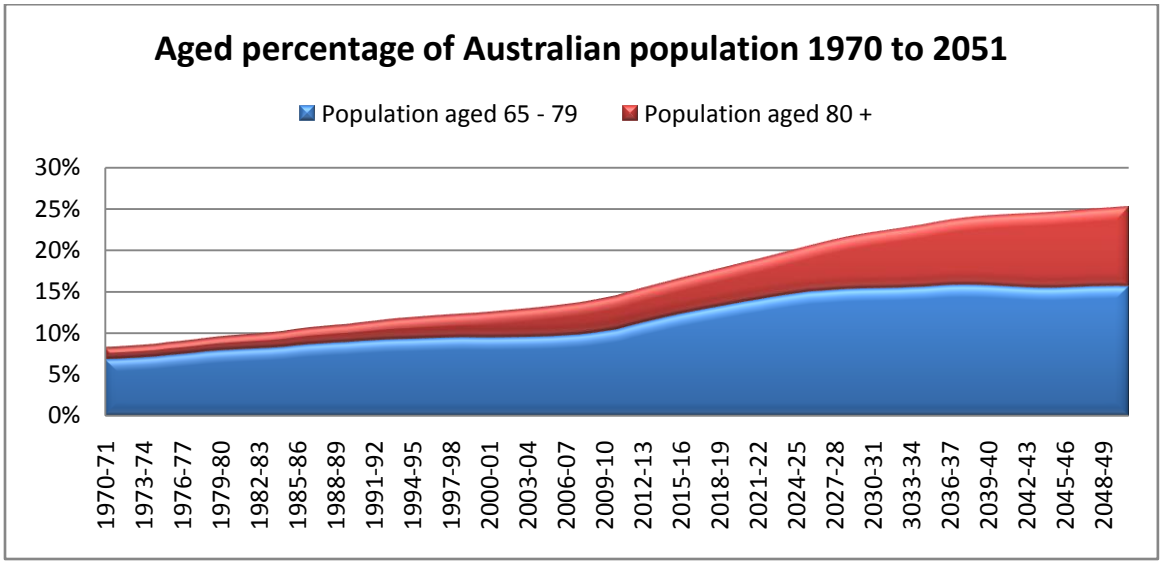

Figure 2 – Aged percentage of Australian Population (Productivity Commission 2005)

The incidence of disability and illness increases with age, as does the demand for medical services. This places strain on the resources available to provide medical services and contributes to increasing costs.

Similarly population ageing also places strain on many other parts of the Australian community. The Productivity Commission (Productivity Commission 2005) has projected that as the population ages, workforce participation will decrease, as will productivity, growth in GDP and government revenue from taxation. At the same time government spending on healthcare, pensions and aged care will increase.

Increasing demand for Medical Services

Demand for medical services is increasing. The number of medical services claimed under Medicare per person per year has increased from 10.4 in 1994-95 (Australian Institute of Health and Welfare 1998) to 11.69 in 2005-06 (Australian Institute of Health and Welfare 2006)

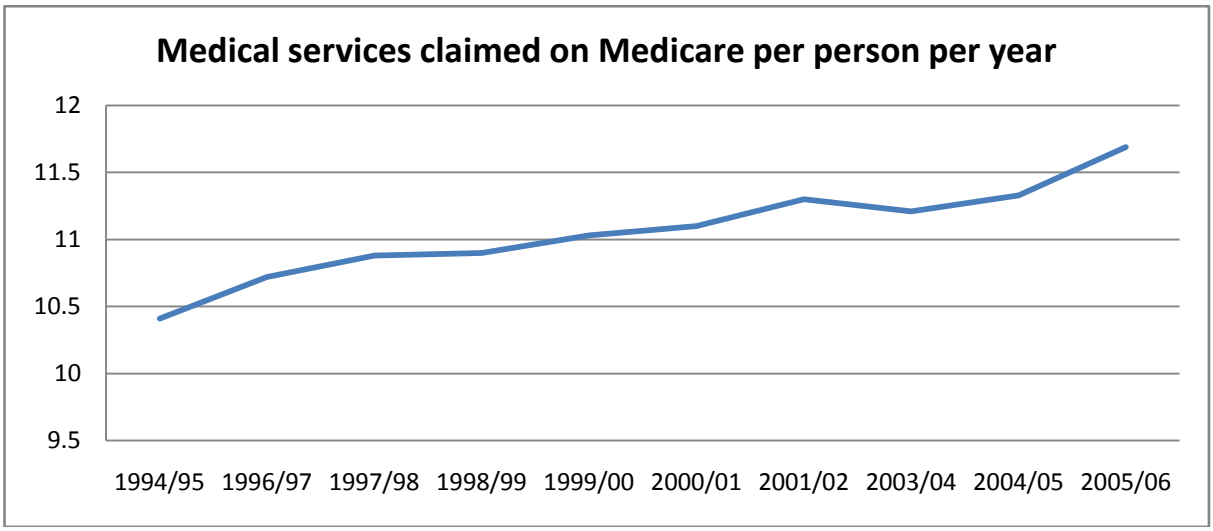

Figure 3 – Medical services claimed on Medicare per person per year (Australian Institute of Health and Welfare 1998, 2002, 2006)

Similarly the rate of hospitalisation is also increasing, with the rate of hospital separations increasing from 236.8 separations per 1,000 population in 1991-92 (Australian Institute of Health and Welfare 2003) to 348 separations per 1,000 population in 2005-06 (Australian Institute of Health and Welfare 2007).

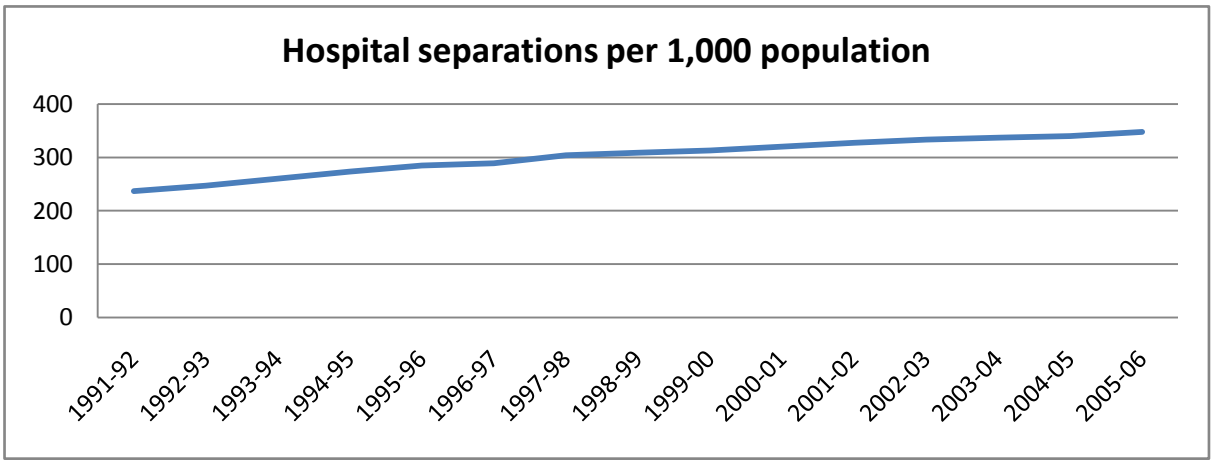

Figure 4 – Hospital separations per 1,000 population (Australian Institute of Health and Welfare 2003, 2006, 2007).

Advances in Medical Technology

Advances in medical technology provide many benefits to the community. However technological advances do not come cheaply and also create more demand for medical services. As better treatments are made available, more people seek treatment where they may not have previously, and in general the public expectation of medical services is increasing. Over the last ten years medical technology has caused around one-third of real growth in health spending (Productivity Commission 2005)

Advances in technology are allowing people to live longer and enjoy a greater quality of life. This further feeds back into the ageing population. While people are living longer, they are also living for more years with disability (Duckett 2004), meaning that during that last years of life more medical services will be required than previously.

The report by the Productivity Commission did however express the opinion that on the whole these benefits outweighed the additional costs (Productivity Commission 2005).

Out-of-Pocket Expenses

Australia has a publicly funded universal healthcare system called Medicare, which subsidizes medical costs for Australian citizens. However, as the cost of providing healthcare has increased, so too has the out-of-pocket contribution borne by the recipient of the service.

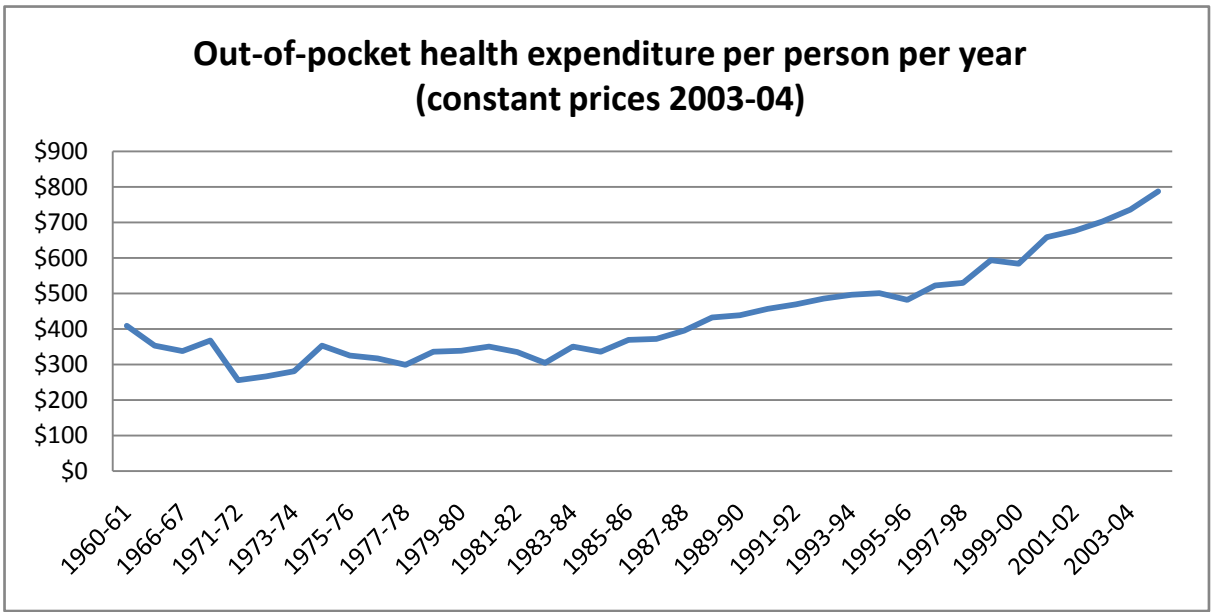

Figure 5 – Out-of-pocket health expenditure per person per year in constant prices (2003-04) (Australian Institute Of Health and Welfare 2006)

Out-of-pocket expenses are an important factor in assessing the equity and accessibility of the healthcare system. The idea of universal healthcare is to provide healthcare to all citizens, however increasing co-payments and out-of-pocket expenses make it less accessible for those from lower socioeconomic backgrounds.

Dynamic Hypothesis – the interaction of Cost, Quality and Access

The causal loop diagram depicts our dynamic hypothesis of the interactions of cost, quality and access.

The *Cost balancing loop* (balancing loop) shows that the system will respond to increasing costs by either increasing funding, increasing costs to patients or by rationing medical services.

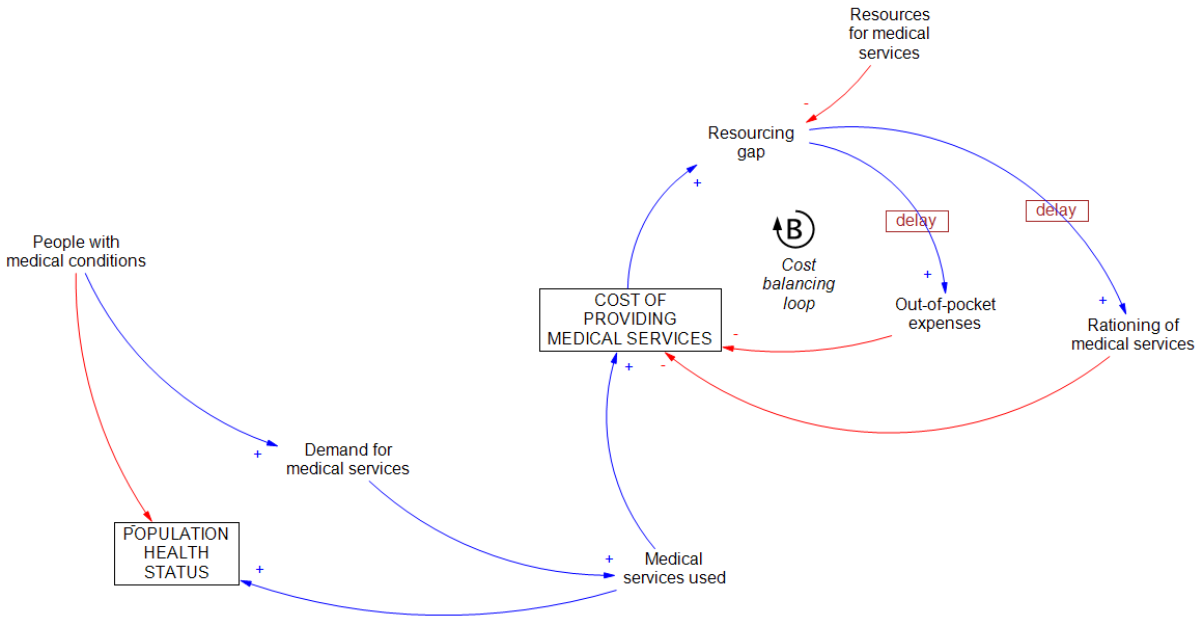

Figure 6 – Cost balancing loop

The *Cost access loop* (balancing loop) shows how as costs increase, the systems response to decrease costs will also decrease the ability for people to access medical services.

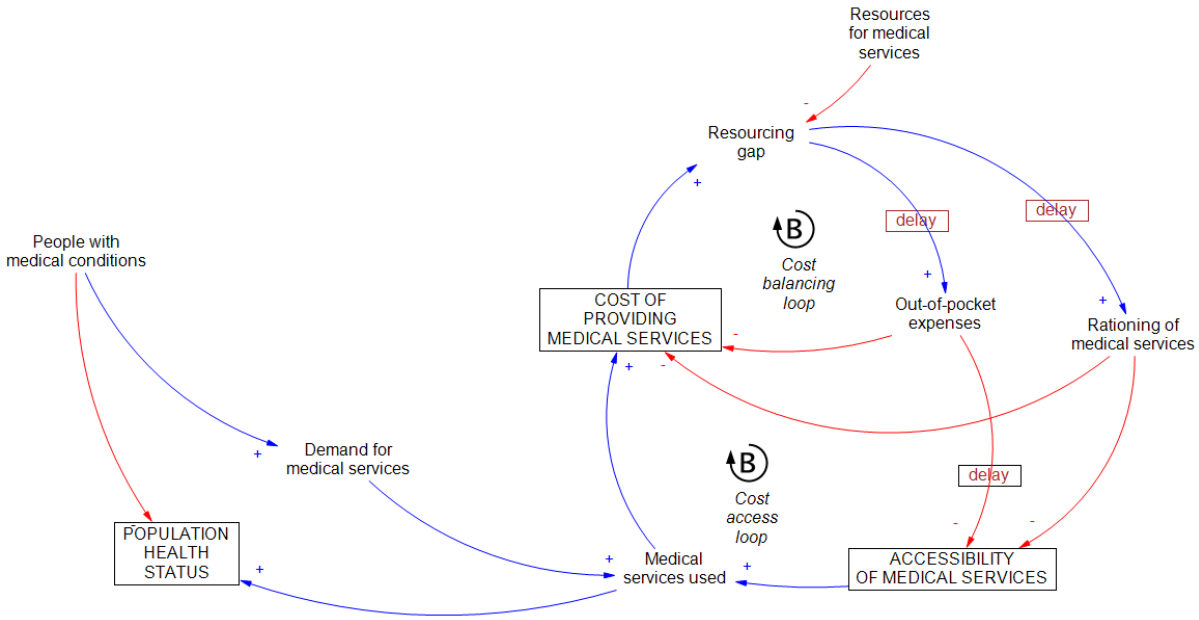

Figure 7 - Cost access loop

The *Declining quality loop* (reinforcing loop) show how as the resourcing gap increases this places pressure on the available resources. Quality declines resulting in re-work and with a greater demand for medical services the resource gap continues to increase.

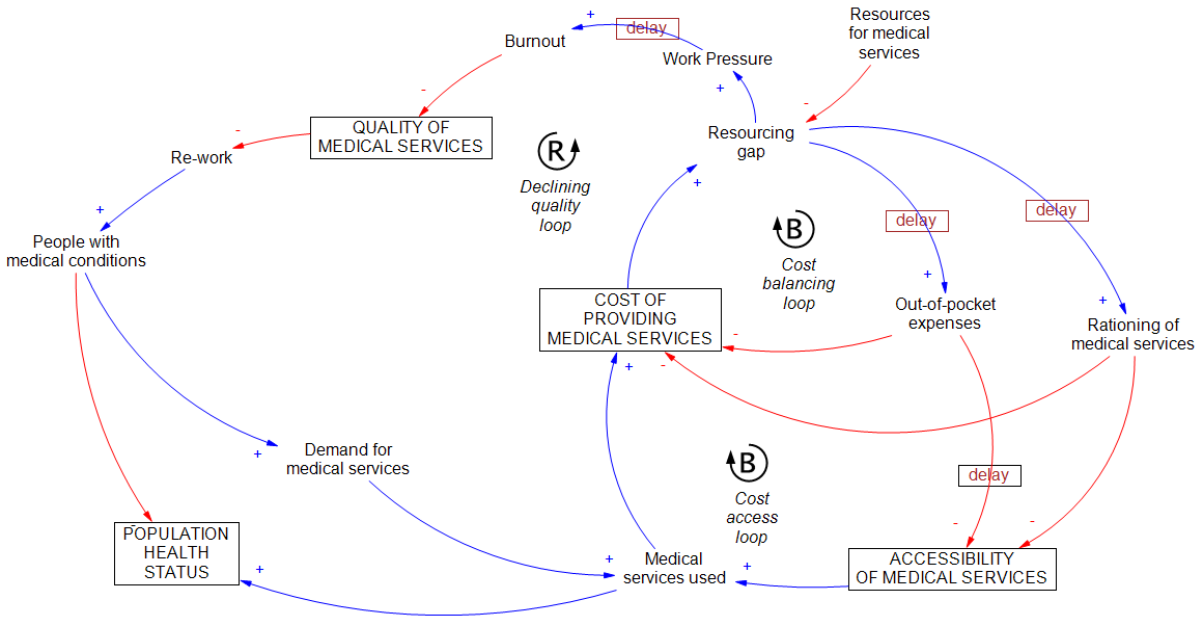

Figure 8 - Declining quality loop

Advances in medical technology increases the quality of medical services, but also increases the costs of providing these services and also increases the demand for medical services.

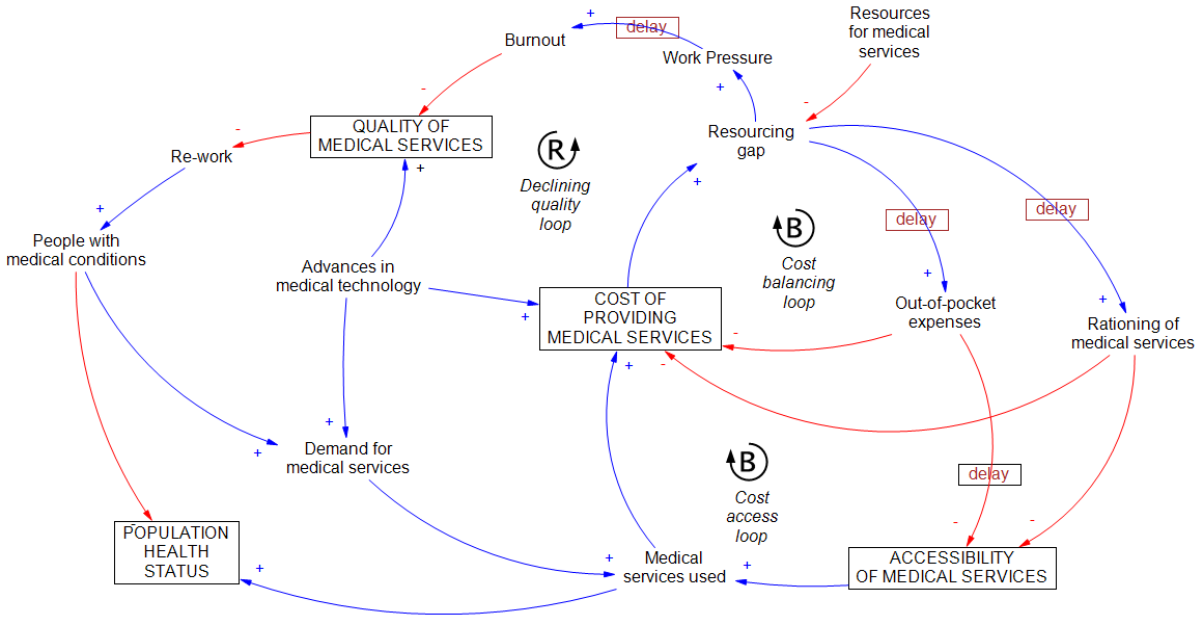

Figure 9 - Advances in medical technology

The ageing population increases the number of people living with medical conditions, which in turn increases the demand for medical services. Also as the population ages, the workforce participation rate decreases and this decreases the government revenue

generated from taxation. This in turn reduces the amount of money that can be spent on providing medical services.

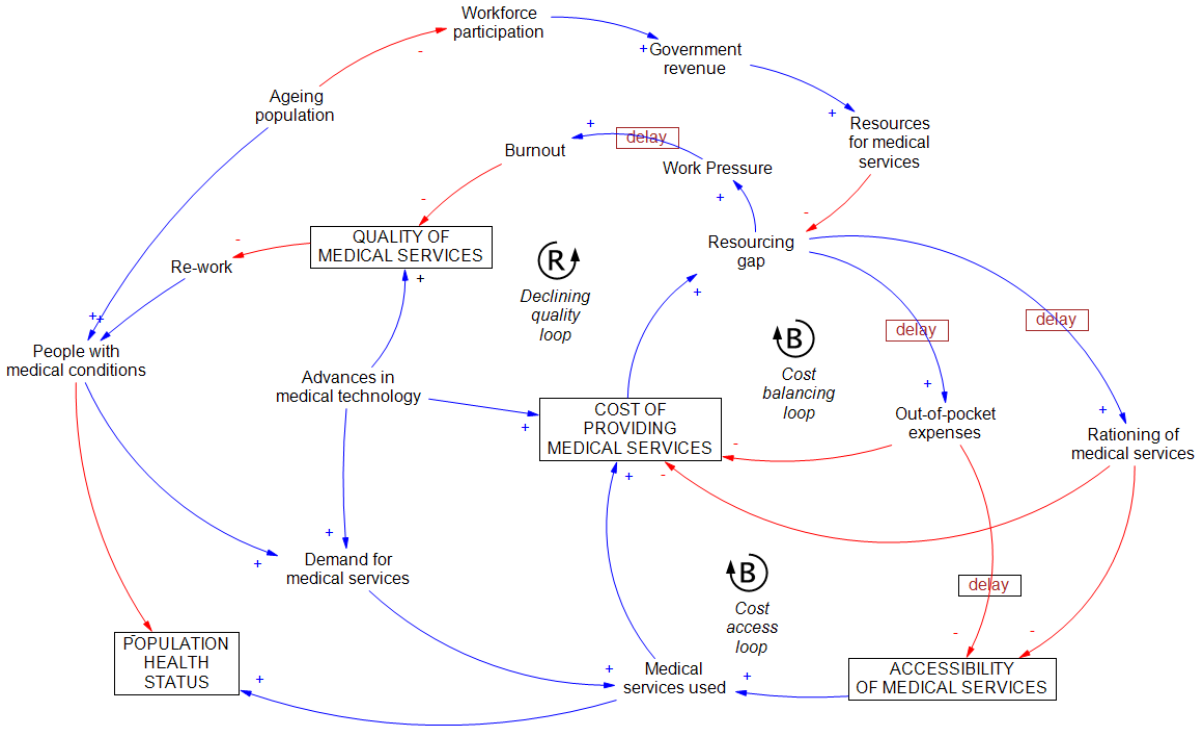

Figure 10 - Ageing population

Governments also have a choice as to how to divide health expenditure between providing medical services and funding public health programs. Medical services has a short term focus on treatment of medical conditions, money allocated to providing medical services reduces the amount of funds available for public health programs. However over the long term public health programs have the potential to reduce the number of people with medical conditions.

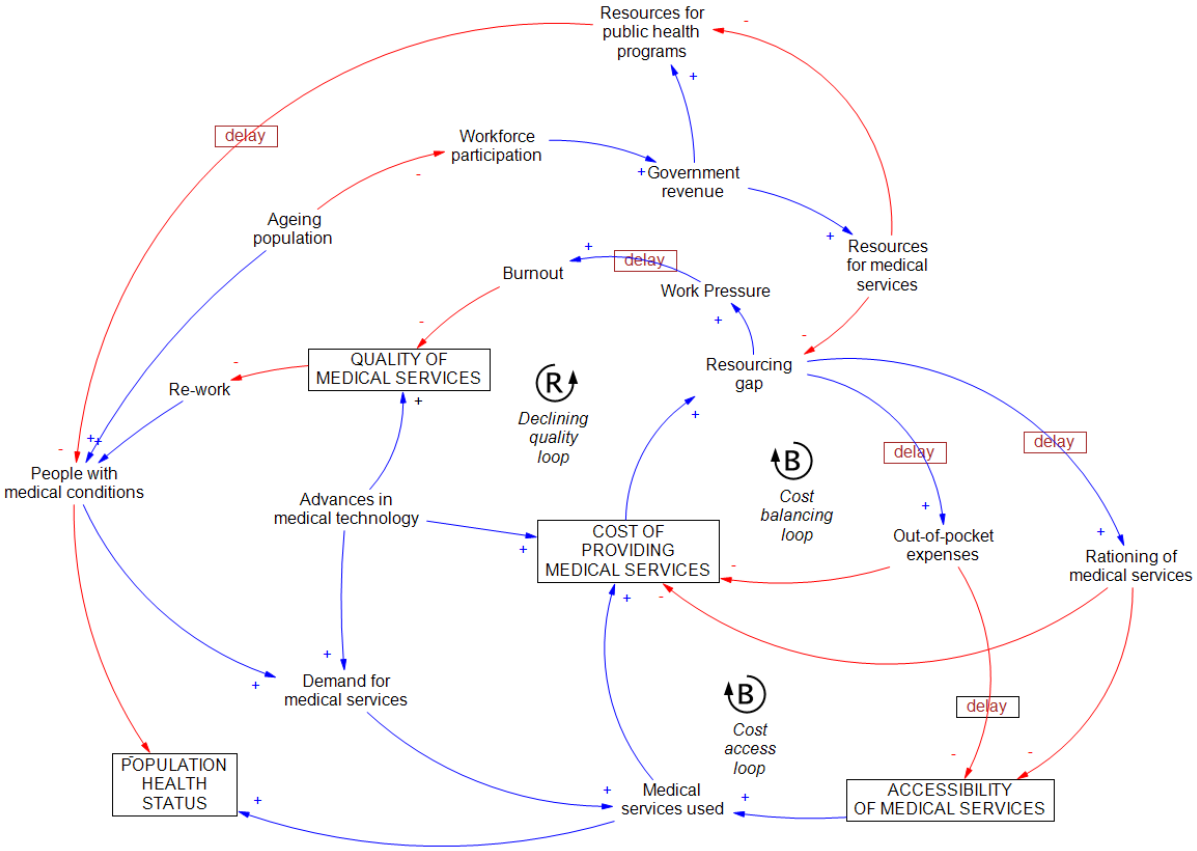

Figure 11 - Publich health programs

The diagram shows that the *resourcing gap* is an important determinant of quality and accessibility. When the gap increases, a policy decision can be taken to ration services or shift more cost onto the individual, both of which decrease accessibility. If the government revenue is available they may decide to allocate more to medical services. However if nothing is done then quality will decline.

The next step will be to formulate a quantitative model to test this dynamic hypothesis. Once confirmed, this can then be used as the basis for the dynamic balanced scorecard to help policy makers and health executives manage the trade off between cost, quality and access.

Conclusion

Health system performance management is a dynamically complex task, due to the number of factors that contribute to improving health, the interaction and feedback among factors and the time delays between the implementation of public policy and achieving results and feedback.

A number of different performance management systems have been reviewed. Each to varying extents focus on measuring inputs and outputs of the health system to determine performance. What is common to all is that all measure multiple dimensions of health system performance. The common categories for health system performance are quality healthcare, equitable access to healthcare and health system responsiveness to users. Each acknowledges that health systems are characterised by limited resources and the need to manage these well.

The balanced scorecard has been used in the health field and was also considered that while the scorecard itself has limited ability to adequately deal with dynamic complexity, the application of system dynamics methods to the development of a BSC can overcome these limitations and provide a robust basis for the testing of policy interventions designed to close any performance gaps.

For the New South Wales health system it will be necessary to develop an understanding of the dynamic interactions produced by cost, quality and access in delivering population health. This is especially important in light of increasing costs of healthcare, due to advanced in medical technology and the ageing population and the decreasing workforce of nurses, so that we gain an understanding of what this will mean for the quality and accessibility of the healthcare system and ultimately population health.

Preliminary mapping suggests that how policy makers and healthcare executives manage the resource gap will have important implications for health system performance. Increasing out-of-pocket expenses and rationing healthcare reduce the accessibility of the system, while failing to reduce the resource gap will lead to declining quality over the long term.

It is hoped that the development of a dynamic balanced scorecard for New South Wales area health services will provide a tool by which to gain understanding of the dynamics which affect health system performance and make explicit and understand the tradeoffs between cost, quality and access with the end result of this knowledge being improved decision making about health system performance and improved population health.

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