REVIEW OF
DVA HEALTH EXPENDITURE PROJECTION MODELS

Australian
Government
Actuary

1 Introduction

1.1 The Department of Veterans Affairs (DVA) has asked the AGA to review the models they use for preparing forward estimates of Budget expenditures on the health programs within the DVA portfolio.

1.2 This is the first of two reports which AGA intends to provide to fulfil its obligations. It provides an overview of the methodology and data used in the existing models and reviews the validity of the approach. It concludes that while there are some areas where improvements could be made, the general approach is not unreasonable, particularly given the data constraints.

1.3 In the longer term, however, the inadequacies in the available data are likely to constrain the extent of improvements that can be achieved. It would therefore be worthwhile for DVA to explore what additional data resources could be utilised for the purposes of modelling health program expenditures.

1.4 The other major area for potential improvement of the current models relates to the variables actually modelled. In particular, there is scope to look at modelling the demand and cost components more directly than the current trend analysis based on expenditure.

1.5 The second report will explore in more detail how such an approach might be implemented and the data which would be required to do so.

1.6 These reports do not comment explicitly on the accuracy of the figures produced by the models and should not be taken as endorsing or condemning the projections themselves.
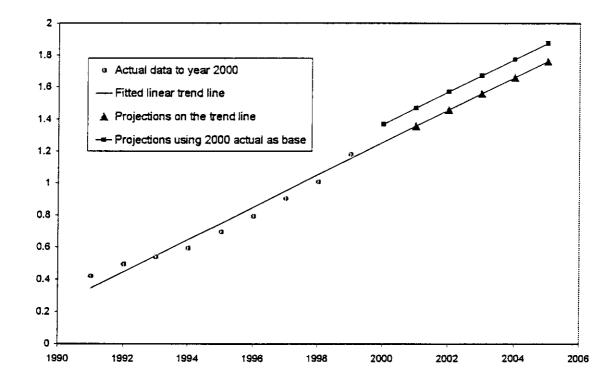
2 Description of the Models

2.1 DVA provided AGA with the spreadsheet model for LMO expenditure as being typical of the approach adopted in their models of health expenditures.

2.2 DVA has developed these spreadsheet models from spreadsheets initially provided by the Department of Finance and Administration (DoFA). The original models made no attempt to explicitly base the projections on historical experience. Instead, growth factors were the subject of negotiation between DVA and DoFA. These original models had serious shortcomings in that there was no empirical basis for the projections, nor any sensible way of analysing the projections against subsequent experience.

2.3 Under modifications subsequently made by DVA, an attempt has been made to model separately the changes in demand (that is, the number of services provided), wage/cost inflation and additional price inflation above that expected due to wage/cost inputs (referred to as 'drift' by DVA). Linear regression techniques have been applied to historical data on the percentage changes in demand and drift to derive an expected rate of change for the future years.

2.4 The starting point for the models is the previous year's actual or, in the case of Budget estimates, anticipated expenditure. This base figure is then adjusted for changes in demand, drift and wage/cost inflation to give projections of future expenditure assuming no policy changes. Finally, adjustments are made to reflect new policy decisions impacting on future years' expenditure.

2.5 A limitation of the model is that it shows only the impact of the changes on total expenditure rather than the impact on the components of expenditure, that is, number of services provided and the average cost per service. This information is implicit in the results presented in the spreadsheet but it would be instructive to produce these intermediate figures as part of the modelling process.

2.6 The three components of the model considered in this report are the base to which the changes are applied, the method of adjusting for demand and the determination of drift. The report does not consider the adjustments for wage/cost inflation or new policy proposals which are assumed to be exogenous to the model.

2.7 A major issue of concern for DVA is that the models have persistently underestimated future expenditure. Analysis of year to date expenditure against the figures produced at the time of the Additional Estimates in 2000, suggests that the changes in the models made by DVA may have resulted in a mix of under- and over-estimates for the various health components. Nonetheless, there are still significant deviations between outcomes and estimates apparent for individual program elements.

3   Setting the Base for Forward Estimates

3.1   One issue that warrants some comment is the use of the previous year's expenditure as the base for projections of forward estimates.

3.2   It can be argued that since a trend estimate is being determined, the previous year's expenditure may be a point above (or below) the trend line and thus should not be used as the base for the following year. On this argument, the best estimates of future expenditure will lie on the trend line derived from the analysis of the underlying data and the previous year's outcome should not influence the projections (except to the extent that its inclusion in the data used for analysis affects the derived trend line).

3.3   Figure 1 illustrates in very simplified terms how the choice of base could affect the projections.

Figure 1: Impact of Base on Forward Estimates

3.4   However, as noted above, DVA is not modelling service usage or cost per service directly but rather looking at the percentage change in these measures and fitting a straight line to the resulting figures. As a result, a trend line of past service usage, cost per service or total outlays is not produced as part of the modelling process.

3.5   This could potentially lead to problems. For example, if there were an abnormally large increase in either the number of services or average cost per service in the last year, this would both increase the actual percentage increases used to project future increases and increase the base to which these projected increases would apply.

3.6   In practice, the DVA models have persistently underestimated future outlays. Using the previous year's outlays as the base for projections was one mechanism to attempt to compensate for this underestimation.

3.7   The situation is further complicated for Budget estimates by the fact that the expenditure for the year leading up to the Budget is not known at the time the estimates are being prepared. At present, DVA determines the base expenditure by pro-rating up expenditure to date. This method of estimating full year expenditure should not lead to material errors provided there is no significant seasonality in the data. Where there is seasonality, a non-linear method of adjusting expenditure to date will be required to derive a reasonable full year estimate.

3.8   The question of what is the appropriate base is essentially one of the relative credibility of the trend based on a series of historical outcomes and the most recent outcome. Use of the most recent outcome effectively assumes that more weight should be given to this figure than the underlying trend estimates of service usage and average costs.

3.9   This is clearly not ideal. If the projections were more robust, actual outlays could be expected to fall above and below the projections. In these circumstances, it would be more appropriate to use the projections without giving any additional weight to the most recent outcome. However, until a more accurate projection model can be implemented, the current approach being taken by DVA may be justified.

4   Projection of Trends in Demand

4.1   The DVA models disaggregate changes in demand into change in the treatment
        population and changes in the numbers of services used by the treatment
        population. Allowance has also been made in some of the spreadsheets for an
        ageing factor to impact on demand, but this does not appear to have been
        implemented due to inadequate data.

4.2   The projections of the size and age distribution of the treatment population are
        prepared by the Statistics Section of DVA. I have discussed the population
        projection models with the statistics area of DVA and am satisfied that the models
        follow accepted demographic principles and provide reasonably accurate
        projections of the treatment population.

4.3   The DVA treatment population is now declining and, in the absence of any major
        conflict involving Australian troops, is expected to continue to do so in future.
        This is acting to depress demand.

4.4   The critical issue, in terms of demand, is therefore the usage rates by the
        members of the treatment population.

4.5   DVA looks at trends in total numbers of services provided. This analysis would be
        more instructively done by examining the number of services per member of the
        treatment population. The use of linear regression techniques to model the
        change in total services provided is likely to lead to particular problems in a
        situation where a turning point in usage is expected. This will be discussed
        further in the second report.

4.6   Usage of health services could be expected to depend upon the veteran's type
        and level of disability. That is, the treatment population is not a homogenous
        group with constant average usage rates per member. In particular, as the
        treatment population ages and becomes more disabled, usage rates would be
        expected to increase. Given suitable data, it should be possible to model the
        expected increase in services provided due to changes in composition of the
        treatment population. The information needed to analyse usage rates directly
        (the unit record HIC data on services used by card holders) is not currently
        accessible by DVA. I strongly recommend that measures be taken to ensure that
        this data is available for analysis in future.

4.7   Ideally, such compositional analysis would be able to explain the majority of the
        change in total usage and there would be only a relatively small residual which
        may show some underlying trend in usage patterns due to changing social or
        medical practice patterns.

4.8   The second report will whether there are any steps that might be taken in
        advance of the availability of HIC unit record data to improve the modelling of
        usage rates.

4.9   In our view, some work could be usefully done using projections of the age distribution of the population and possibly the level of disability pension. The population model does not currently provide details of the level of disability pension. This is done at an aggregate level by the Budget Section. However, I note that Budget Section has asked the Statistics Section to take over this function.

4.10   AGA has also undertaken some analysis of progression through the different rates of disability pension. This analysis suggests that duration of pension rather than age may be a useful predictor of degree of disability for pension purposes. The possibility of modelling the treatment population (taking into account levels of disability pension and duration on pension) as an input for predicting demand for health services may also therefore be explored.

4.11   Our second report will also discuss how the analysis could be improved when the HIC data becomes available.

5   Drift

5.1   DVA uses the term 'drift' to refer to increases in average cost per service over and above some expected inflationary increase due to prices and wages. Such superimposed inflation could be expected to result from the use of more expensive services, prescriptions etc.

5.2   DVA uses linear regression techniques to look at the trend in historical drift figures and derive projections of future drift. Superimposed inflation is notoriously difficult to model as it depends upon external factors such as advances in medical treatments and changes in technology which are very difficult to predict from past trends.

5.3   In the circumstances, a regression type approach such as that adopted by DVA is probably no worse than any other. DVA may wish to explore whether there is any other relevant data (for example, on general health cost inflation in Australia and overseas) that might inform the estimates.

5.4   We would further suggest that the implicit projections of average costs be made explicit in the model. One way of doing this is to model the natural logarithms of the average cost per service (after deflating for the expected increase due to wage and price inflation). Fitting a straight line to the logarithms of the average cost effectively assumes that costs are increasing exponentially. This appears to be justified for many of the items being modelled.

6 Conclusion

6.1 The model structure adopted by DVA follows a fairly standard approach of looking separately at the volume of services and average cost per service. This is appropriate.

6.2 Overall, given the constraints, the current structure is considered to be a reasonable approach to projecting future outlays.

6.3 However, it models percentage changes in these factors rather than the factors themselves. This is partly a presentational issue but a better understanding of the system may be obtained by modelling its sub-components directly.

6.4 Using actual outlays as the base for future projections seems justified in circumstances where the projections are persistently underestimating actual outlays. This approach may, however, need to be revised if it becomes apparent that this bias has been ameliorated by other changes in the model structure.

6.5 Linear regression analysis of aggregate services provided is unlikely to provide a good measure of demand in a situation where the population is becoming progressively older and more disabled. As a first step, DVA might look at modelling usage rates per member, rather than aggregate usage.

6.6 Consideration should also be given to using the available data on the composition of the treatment population to attempt to model the factors affecting usage rates.

6.7 More importantly, in the longer term, steps should be taken to ensure that the HIC unit record data on service usage is available for analysis.

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