Volume 13 • Number 5 • 2010
VALUE IN HEALTH

Populating an Economic Model with Health State Utility Values: Moving toward Better Practice

Roberta Ara, MSc, John E. Brazier, PhD

University of Shefield, Shefield, UK

ABSTRACT

Background: The methods used to estimate health-state utility values (HSUV) for multiple health conditions can produce very different values. Economic results generated using baselines of perfect health are not comparable with those generated using baselines adjusted to reflect the HSUVs associated with the health condition. Despite this, there is no guidance on the preferred techniques and little research describing the effect on cost per quality adjusted life-year (QALY) results when using the different methods.
Methods: Using a cardiovascular disease (CVD) model and cost per QALY thresholds, we assess the consequence of using different baseline health-state utility profiles (perfect health, no history of CVD, general population) in conjunction with models (minimum, additive, multiplicative) frequently used to approximate scores for health states with multiple health conditions. HSUVs are calculated using the EQ-5D UK preference-based algorithm.
Results: Assuming a baseline of perfect health ignores the natural decline in quality of life associated with age, overestimating the benefits of treatment. The results generated using baselines from the general population are comparable to those obtained using baselines from individuals with no history of CVD. The minimum model biases results in favor of younger-aged cohorts. The additive and multiplicative models give similar results.
Conclusion: Although further research in additional health conditions is required to support our findings, our results highlight the need for analysts to conform to an agreed reference case. We demonstrate that in CVD, if data are not available from individuals without the health condition, HSUVs from the general population provide a reasonable approximation.
Keywords: decision models, health economics methods, health surveys, health-state utility, methodology.

Introduction

A number of agencies, including the National Institute for Health and Clinical Excellence (NICE), require economic evidence to be presented in the form of cost-effectiveness analyses whereby health benefits are quantified by quality adjusted life-years (QALYs) [1]. QALYs are calculated by summing the time spent in a health state weighted by the health-state utility value (HSUV) associated with the health state, thus incorporating both length of survival and HSUVs into a single metric. Classification systems can produce a wide range of values for the same health state and the economic results generated using different systems are not always comparable [1]. Consequently, for submissions in the UK, the Institute advocate a preference for EQ-5D data with HSUVs obtained using UK population weights when available [1].

However, this is not sufficient to ensure consistency across appraisals because there is no guidance on appropriate baseline HSUVs that should be used to quantify the underlying health condition for patients entering the model [1]. If a baseline utility of perfect health (i.e., EQ-5D equals 1) is used to represent the absence of a health condition, the incremental QALYs gained by an intervention are inflated [2] and the results obtained using a baseline of perfect health are not comparable with those obtained when the baseline is adjusted for not having a particular health condition [3]. There is currently no consensus on baseline HSUVs used in economic evaluations.

In addition, there is currently no directive on the method that should be used to combine HSUVs for multiple health conditions. Analysts are increasingly exploring the benefits of interventions in individuals with several comorbid conditions. For example, HMG-CoA reductase inhibitors (statins) reduce both cardiovascular (CV) risk and rheumatoid arthritis (RA) disease activity; and an economic model exploring the benefits of statins in this population would include health states for patients with a history of both RA and cardiovascular disease (CVD) [4]. Because of strict exclusion criteria preventing patients with comorbidities entering clinical trials, it is unlikely that HSUVs will be available from patients with both health conditions.

When HSUVs for the multiple health states are not available, approximate scores are estimated by combining data collected from patients with the individual health conditions. Three methods are frequently used: 1) additive; 2) multiplicative; and 3) minimum models. The additive and multiplicative models assume a constant absolute or proportional effect, respectively, while the minimum model applies a disutility that can vary depending on the baseline utility modeled. Research exploring the appropriateness of the techniques used to combine utility values is inconclusive. The additive and multiplicative models have been shown to produce similar results for individuals with both diabetes and thyroiditis [5]; the multiplicative model produced accurate utilities for several comorbid conditions [6]; and the minimum model was advocated as the preferred methodology in two other studies [7,8].

Although literature describing minimum requirements for probabilistic analyses is growing [9], research exploring the basic principles involved in using HSUVs in economic models, and the implications for results generated from the models when using different techniques is scarce. The limited research undertaken in this area has explored the appropriateness of different baseline utilities and approximate HSUVs for multiple health conditions in isolation; and there is currently no consensus on the preferred methodologies when the two adjustments are undertaken together.

We describe the results of a pilot study in which we explore the effect of using different baseline utility values and different

Address correspondence to: Roberta Ara, Research Fellow, Health Economics and Decision Science, ScHARR, University of Sheffield, 30 Regent Court, Sheffield S1 4DA UK. E-mail: r.m.ara@sheffield.ac.uk
10.1111/j.1524-4733.2010.00700.x

techniques to estimate approximate HSUVs for multiple health conditions in combination. We use an existing economic model and data from the Health Survey for England to investigate the potential effect on policy decision-making using cost per QALY thresholds. The primary objective of the study is to instigate additional research in this area to provide a foundation for better practice in economic evaluations used to inform health care decision-makers in the UK and elsewhere.

Methods

The following section provides a brief description of the economic model and a synopsis of the data used.

Cardiovascular Model

An existing peer-reviewed Markov model [10] was modified slightly so that the health states (Fig. 1) matched the definitions of three CV conditions available from the Health Survey for England which are angina (A), heart attack (HA) and stroke (Str) [10,11]. The model compares two alternative treatments and an annual cycle is used for transitions between health states. Individuals enter the model in the event-free (EF) health state and can move to a primary health state: angina (A), nonfatal heart attack (HA), or nonfatal stroke (Str), or remain in the EF health state. Individuals in the primary and post-event health states can move to a subsequent health state: subsequent angina (SA), subsequent nonfatal HA (SHA), subsequent nonfatal stroke (SStr); or remain in the primary or post-event health state. In each cycle all individuals are at risk of death through other causes (DoC), or fatal CVD (fCVD). Health-state costs are taken from a recent HTA evaluation of lipid treatments in the UK [10].

Health Survey for England

The Health Survey for England (HSE) is conducted annually using random samples of the population living in private households in England. The 2003 and 2006 surveys included questions about history of CVD and a random sample of participants (aged 16 to 98 years) were asked to complete the EQ-5D questionnaire (N = 26,679) [11,12]. Preference-based HSUVs were estimated using the weights obtained using time trade off valuations from the UK general public [13].

We assumed that the data from individuals who reported a history of just one CV condition are representative of the HSUVs of individuals who have a first ever primary CV event; and that data from individuals who reported a history of more than one CV condition are representative of the HSUVs of individuals who have a subsequent event (Table 1). For example, the mean HSUV during the first 12 months after experiencing a primary (secondary) heart attack is 0.721 (0.431) and the corresponding mean HSUV for time periods after this is 0.742 (0.685).

The relationship between HSUVs, age, sex, and history of CVD was explored using ordinary least square regres-

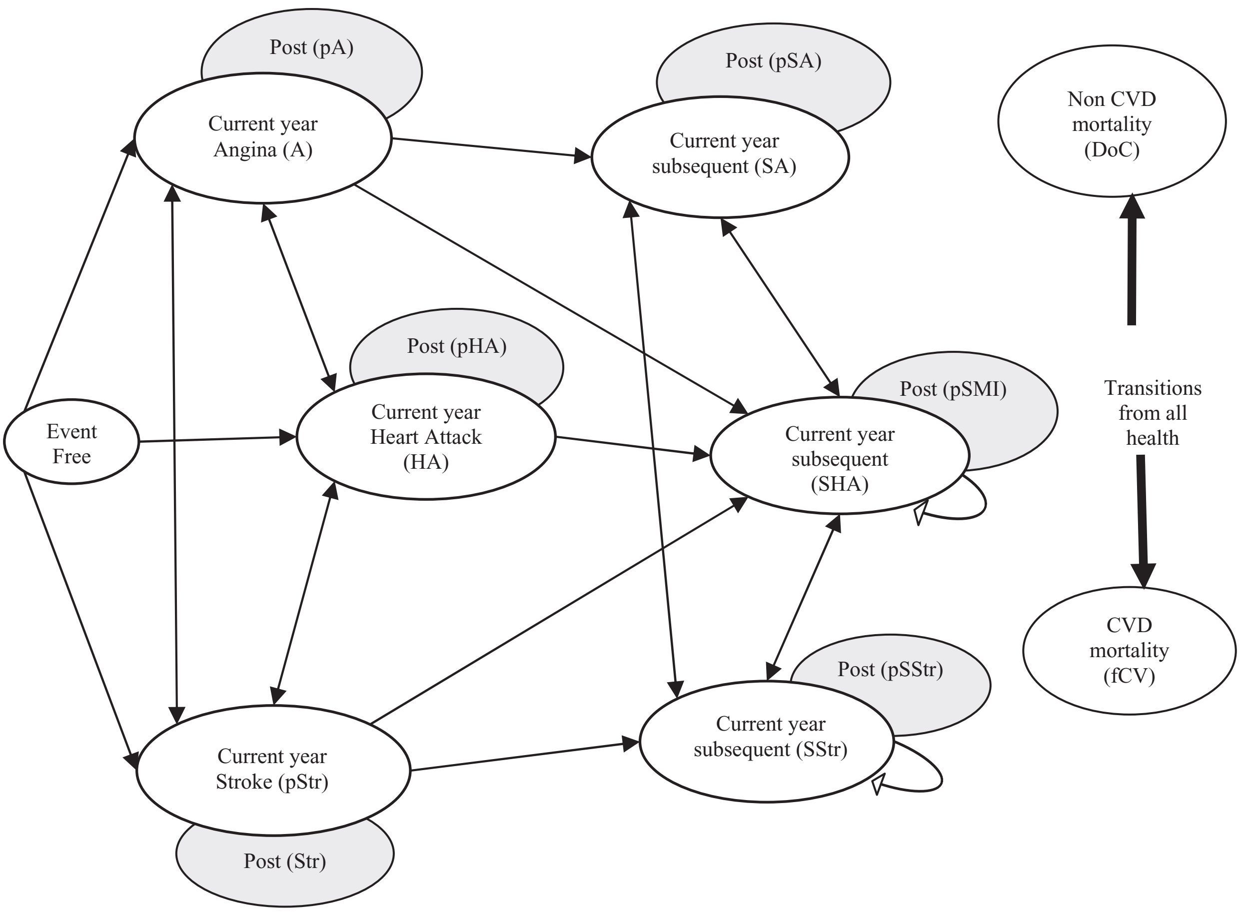

Figure 1 Health states in cardiovascular model.