Appendix D: Productivity losses and gains

HIV and HCV are diseases that affect the productivity of an individual by reducing both the quantity and quality of years of life. The term productivity costs has been defined as "the costs associated with lost or impaired ability to work or engage in leisure activities due to morbidity and lost economic productivity due to death" by the US Panel on Cost-Effectiveness in Health and Medicine [244].

No studies have attempted to estimate productivity costs associated with HIV infection in Australia. A small number of studies have been conducted overseas, mostly in the pre-ARV era. An analysis of the indirect costs of HIV in the UK in the pre-ARV era that used the human capital approach, found that annual productivity losses ranged from A$2,400 to A$16,600 (1997 prices) depending on clinical state [245]; a prevalence-based estimate from the United States argued that productivity losses resulting from morbidity and premature mortality would rise from US$3.9 billion in 1985 to US$55.6 billion in 1991 [246, 247]; a recent cross-sectional analysis of patients enrolled in the Swiss HIV cohort estimated a mean annual productivity loss per person of A$19,000 based on the human capital approach [243].

The inclusion of productivity losses and gains in economic evaluations that also include QALYs may be double-counting because the utility used in QALYs takes account of disability and losses in quality of life that may reduce employment [248]. However, in the economic evaluation of interventions, it can be valuable in secondary analyses to quantify the additional potential productivity benefits that may accrue by further expenditure, although it may favour interventions that improve the health of sections of the population with higher levels of employment, over those whom, are not participating in the workforce [249].

Rationale for method

The authors used the method developed by Deakin Health Economics because it provided a tractable model with relatively simple data needs that had been developed on behalf of decision-makers at the Victorian government Treasury and used in a series of analyses of prevention in the NHMRC-funded research program, Assessing Cost-Effectiveness of prevention. The method provides for a choice of two approaches to costing productivity losses: in brief, the Human Capital approach assumes that the productivity losses associated with a worker who stops work due to illness or dies, are the average annual wage for their age and gender from the time that they stop work until the age of 65; the Friction Cost approach

assumes that workers can be replaced and new workers trained to perform at the same level as the injured or deceased worker within a period of time (usually 3-12 months) [248, 250].

The Friction Cost approach is recommended or described as theoretically preferable by a number of reimbursement agencies [248, 251]. The Friction cost approach assumes that workers will return to work after a health intervention. This assumption may not hold if recovered workers value non-work life more highly after recovery from a serious illness [251] or have adequate levels of income without the need to work full-time [243].

Method

In this project, the Friction Cost approach was used, with a secondary analysis using the Human Capital approach for illustration. All cost is discounted to present value at a baseline discount rate of 3%, consistent with the US Panel on Cost-Effectiveness in Health and Medicine [248] varied to 0% and 5%, the latter figure consistent with the recommendations of the Prescription Benefits Advisory Committee [252-254]. It was assumed that three months would be required to hire and re-train due to a sick or deceased worker; variations of six months and 12 months were carried out to test this assumption.

The Deakin Health Economics model compares the employment status, participation rate, short-term absenteeism and mortality of people with a disease or intervention with people without the disease or intervention. Data on the workforce participation of people who inject drugs is limited. Studies from the early 1990s reported participation rates of around 30% for injection drug users with and without HCV attending clinics and participating in a coordinated care program [233]. On the other hand, in the HIV Futures V study (n=982) carried out in 2005/6 [255], 47 to 50% of the 271 current or previous injection drug users living with HIV were currently employed compared to 62% of those who did not inject drugs with HIV. Given the better economic conditions that were prevalent until 2008, we decided to assume that a population of injection drug users without HCV or HIV would have a workforce participation rate that was 10% less than the general workforce participation rate for age and gender provided in the National Health Survey of 2004/ 5 [255]. The demography of the comparison and disease populations in the productivity model was assumed to match the age and gender mix of the estimates of injection drug users in Australia with 33% women.

Short-term absenteeism rates in the comparison population were presumed to be similar to the general population rates from the National Health Survey when 3% of the population being absent from work daily in Australia [256]. Coverage by colleagues and employers for

absent workers during sick leave was also assumed to match the general population with 28% of employees not covered by sick leave [257]. Training costs for replacement of sick or deceased workers were derived from the Victorian Department of Treasury and Finance Report where outsourced human resources services were costed at 30% for lower paid staff and 75-100% for higher paid staff [258].

The age-sex structure of the population acquiring HIV and HCV in the productivity model mirrored assumptions made for the uninfected IDU population. Inputs for the participation rate, employment status, unemployment rate and short-term absenteeism in people with HIV by age group was provided by the Australian Research Centre in Sex, Health and Society from the HIV Futures V study [233]. In the Futures V study the overall employment rate was 51%, with some students, retired people and 10.9% unemployment. 6% reported that they were sometimes unable to attend work due to HIV so the absenteeism rate was assumed to double the rate of the comparison population [259]. Age-specific but not gender-specific employment and participation data was used in HIV population in the productivity model.

Extra mortality due to HIV and HCV leading to productivity losses for each incident infection at a specific age was estimated in a series of separate expected value analyses constructed in a simple Markov model in TreeAge with annual cycles and two states alive and dead. Age-specific mortality for HIV-infected and uninfected populations in the ARV-era (2000-2005) without HCV were drawn from a Danish population study [260, 261]. Additional deaths from HIV by 65 years were computed according to the time of infection and included in the model to allow the estimation of mortality-related productivity losses.

Inputs for friction costs involve estimating the workforce participation rate of HCV-infected individuals for the rest of their working life, compared to a cohort of population controls who are not HCV infected, measuring their respective disability, mortality, workplace absenteeism, and employment/work force participation. Survival time and age-specific mortality rates of an HCV-infected population was compared with that of the general population. The proportion of full time and part-time employment was based on a study evaluating the experiences of testing for blood borne viruses and acceptability of different methods of HCV testing among IDUs recruited through primary healthcare and drug treatment services: 61% of the IDUs with chronic hepatitis C reported unemployment [51].

Taxation and welfare effects of productivity losses were not estimated due the lack of data on marital status and eligibility for a disability support pension in the IDU population. Taxation

and welfare may be considered as transfer payments and therefore excluded from economic evaluations from a societal perspective.

The baseline output from the productivity model was the productivity loss per incident infection of HIV and HCV expressed in dollars discounted at 3%, using the Friction Cost approach of replacement in three months with gender specific wage rates.. The productivity model was run using the @Risk software package for 4000 simulations to enable the calculation of mean and 95% uncertainty limits. The reference year for costs was 2008.

Results

The baseline mean productivity loss was $21,757 per HIV infection, discounted at 3% with a 95% uncertainty range between $12,322 and $33,939 if the FC period was three months. Using the HC approach the production losses were $493,660 per HIV infection (95% limits 372,306 to 621,463) up to the age of 65 years. An increased time period for recruitment and training of new staff from three months to six months increased the productivity loss to $26,506. Gender free wages increased the productivity loss to $23,222. Using the FC approach, 71% of the cost of productivity loss was due to morbidity, especially in people aged 25-44 years old, reflecting the higher participation rates in the workforce. 29% was related to premature mortality particularly in males infected when aged 35-44. In contrast, using the HC approach, the 50% of productivity cost related to premature mortality. A higher discount rate of 5% reduced the mean loss by FC to $18,167 (95% limits $10,947 to $27,050) and with a zero discount rate the mean loss was $33,619 ($16,325 to $58,151).

Limitations

The method was limited for a number of reasons: First, we did not have direct data on the employment of IDUs around Australia and therefore made a number of assumptions. Secondly injection drug use may be associated with higher or lower workforce participation than in our model which would alter the productivity loss: if IDUs are already not working, then HIV or HCV may make little difference to their employment status. Third, we assumed that the mortality related to HIV would be the same in Australia and Denmark. Since the impact of premature mortality was limited on the result compared to morbidity, it is not likely to have made much difference. Finally a caveat: the results are only relevant to the productivity loss associated with an HIV infection in a population of injection drug users in Australia in the middle of this decade.