4 FINANCIAL EFFECTS OF NSPS

An economic model was developed that compares the costs of operating NSPs during the 1990s to the anticipated savings that will accrue from the number of cases of HIV and HCV avoided as a result of NSPs. This section describes the data sources and methodology used in the financial analysis.

4.1 DESCRIPTION OF THE ECONOMIC MODEL

4.1.1 OVERVIEW

The model used to analyse the financial effects of NSPs examines the direct costs of operating NSPs during the 1990s, and compares those costs to the future financial savings that are anticipated to flow from that investment. In this instance, these savings relate to the direct costs of treatment of cases of HIV and HCV that would otherwise have occurred until death, had it not been for the existence of NSPs. Because the investment in NSPs occurred over a ten year period, while the savings will continue to accrue into the future until all cases avoided have died, the cashflows associated with both are discounted back to a common reference point, namely the commencement of the investment period. The net value of these two cashflow streams after discounting, known as the Net Present Value, takes into account the fact that a dollar today is valued more highly than a dollar in, say, ten years, and thus converts them to a common dollar equivalent. The concept of discounting cashflows thus enables us to assess the current value of future costs and savings for any investment decision.

4.1.2 DIRECT AND INDIRECT COSTS AND BENEFITS

The issue of whether to include both direct and indirect costs and benefits was considered during the course of the design development. It was decided that in undertaking the analysis, only direct costs and benefits will be included.

- Direct costs include the costs of operating NSPs themselves, the infrastructure associated with their development and operation, and the costs of safe disposal of used syringes and needles. Conceptually, direct costs may also include the costs of volunteers and other unpaid workers in NSPs, and in-kind support provided by host agencies. However, the data reported by State and Territory health authorities were not able to identify or quantify this component, and it is therefore excluded from the analysis.
- Direct cost offsets or savings are those related to reduced costs due to the prevention or avoidance of HIV and HCV attributable to NSPs. These have been based on the lifetime costs of treatment of the diseases, and are discussed further below.

Indirect costs include productivity losses brought about by increased illness. Examples of indirect benefits include the value of increased productivity due to lives saved and extended employment. Typically, economic evaluations that have included indirect costs and benefits have demonstrated them to be many times the value of direct costs and benefits. In many cases, their inclusion has so overwhelmed the value of the direct benefits, that they have dominated the outcome. However, their measurement has often been the subject of considerable debate and criticism. This is particularly so when dealing with specific sub-populations, in this case injecting drug users.

At the same time, while the major focus of the study is on the public health perspective, it should be recognised that programs of this type may have implications for many other aspects of society that are not reflected in the economic analysis.

Given this history, together with the requirement that this study be based on a strong evidence base and be able to withstand close scrutiny, we have excluded indirect costs and benefits from the main economic analysis. However, it should be recognised that these costs and benefits exist, even if they are not quantified in the analysis.

4.2 EXPENDITURE ON NSPS

Data on the expenditure on operating NSPs in Australia during the 1990s was sought from all State and Territory health authorities by way of a standard survey instrument. A spreadsheet with explanatory comments and notes was provided to all authorities, with the request that they complete the fields as far as available data enabled.

Expenditure was identified under the following components:

- ☐ Overhead and infrastructure expenditure;
- ☐ Direct operating expenditure on public NSPs;
- ☐ Subsidies paid to community pharmacies; and
- ☐ Consumer expenditure.

All States and Territories provided the data sought, though to varying degrees of completion. In nearly all instances, data was provided for at least the last three to five years of the study period. Where data was not available, estimates were imputed for each component, based on trends within that component for the respective State/Territory. Table 4.2.1 illustrates the aggregate expenditure on NSPs across Australia for the period 1990/91 to 1999/2000, expressed in Year 2000 prices.

Table 4.2.1 Expenditure on NSPs, Australia, 1990-91 to 1999-2000 ($'000)[(1)]

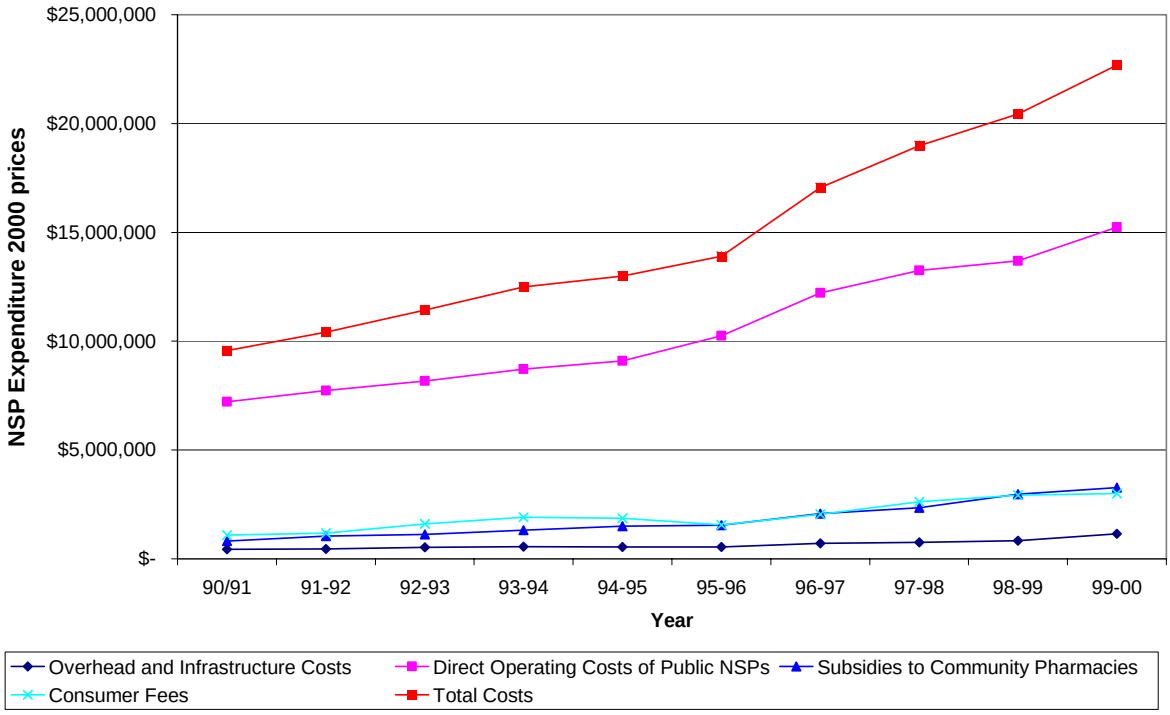
1990-1991	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	Total
Overhead and Infrastructure Costs										
$441	$455	$530	$560	$541	$539	$714	$757	$841	$1,153	$6,531
Direct Operating Expenditure on Public NSPs										
$7,215	$7,730	$8,172	$8,710	$9,089	$10,251	$12,213	$13,250	$13,690	$15,243	$105,562
Subsidies to Community Pharmacies										
$826	$1,045	$1,129	$1,318	$1,497	$1,551	$2,079	$2,347	$2,975	$3,278	$18,045
Consumer Costs										
$1,091	$1,183	$1,608	$1,905	$1,865	$1,555	$2,043	$2,625	$2,930	$3,001	$19,807
Total Government Direct Expenditure										
$8,042	$8,774	$9,301	$10,028	$10,586	$11,802	$14,292	$15,597	$16,664	$18,521	$123,607
Total Government Expenditure										
$8,483	$9,230	$9,831	$10,589	$11,127	$12,341	$15,006	$16,354	$17,505	$19,673	$130,138
Total Expenditure										
$9,574	$10,413	$11,438	$12,494	$12,992	$13,897	$17,048	$18,979	$20,435	$22,674	$149,944

[(1)] Year 2000 Prices

Over the decade, a total of $150 million (Year 2000 prices) was expended on NSPs across Australia, comprised of $130 million (87%) by government, and $20 million (13%) in consumer expenditure. Overhead and infrastructure costs ($7 million) accounted for 5% of government expenditure, with direct operating costs of public NSPs ($106 million) accounting for a further 81%, and subsidies paid to community pharmacies for NSP services ($18 million) the remaining 14%.

After adjusting for inflation over the period, total expenditure on NSPs increased by 2.3 times over the ten years. Figure 4.1 illustrates the growth in real expenditure of the various components over the ten-year period.

Figure 4.1 Expenditure on NSPs, 1990-91 to 1999-2000 (Year 2000 Prices)



It should be noted that the data presented above covers expenditure on NSPs operating within the programs managed by State and Territory health authorities. Many retail pharmacies also sell needles and syringes on a commercial basis, for which reliable data is not available on the number of needles sold or the level of expenditure by consumers. The relative activity of the retail market in this area varies considerably between States (eg in Queensland, an estimated 5 million needles are distributed through the retail market). Costs of needle and syringes bought through the retail market are borne by consumers rather than through government subsidy. Consequently the total investment by consumers in needle and syringes may be understated in the analysis. For the purposes of illustration, sensitivity analysis has been conducted to assess the impact of doubling the above expenditure figures, and is presented in Section 4.8.

4.3 IMPACTS OF NSPS ON HIV AND HCV

The impact of NSPs on HIV and HCV is presented in Section 3, and was prepared by the National Centre in HIV Epidemiology and Clinical Research, The University of New South Wales. Estimates of the number of HIV and HCV infections avoided through the introduction of NSPs by stage of disease are discussed in Sections 3.4.4 and 3.5.4, with detailed figures for HIV and HCV contained in Tables 3.4.5 and 3.5.5 respectively (See Appendix C).

Figures 4.2 and 4.3 illustrate the estimated number of HIV and HCV cases with and without NSPs and the number of cases avoided, until all cases avoided have died.

In both instances, the figures illustrate that the total number of cases avoided accumulates up to the end of 2000, the end of the NSP investment period, then progressively decline as they progress through the various disease stages and mortality takes effect. The difference in scales of the two figures should be noted, reflecting the higher prevalence of HCV among IDUs.

Figure 4.2 HIV cases with, without and avoided by NSPs

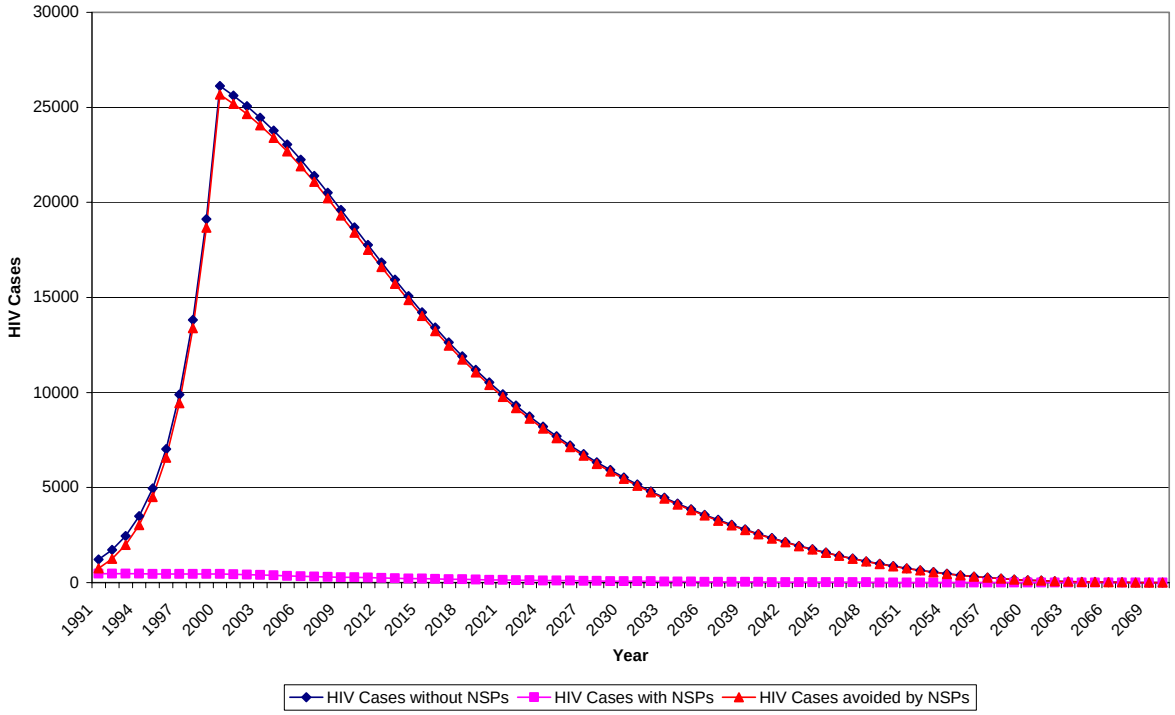
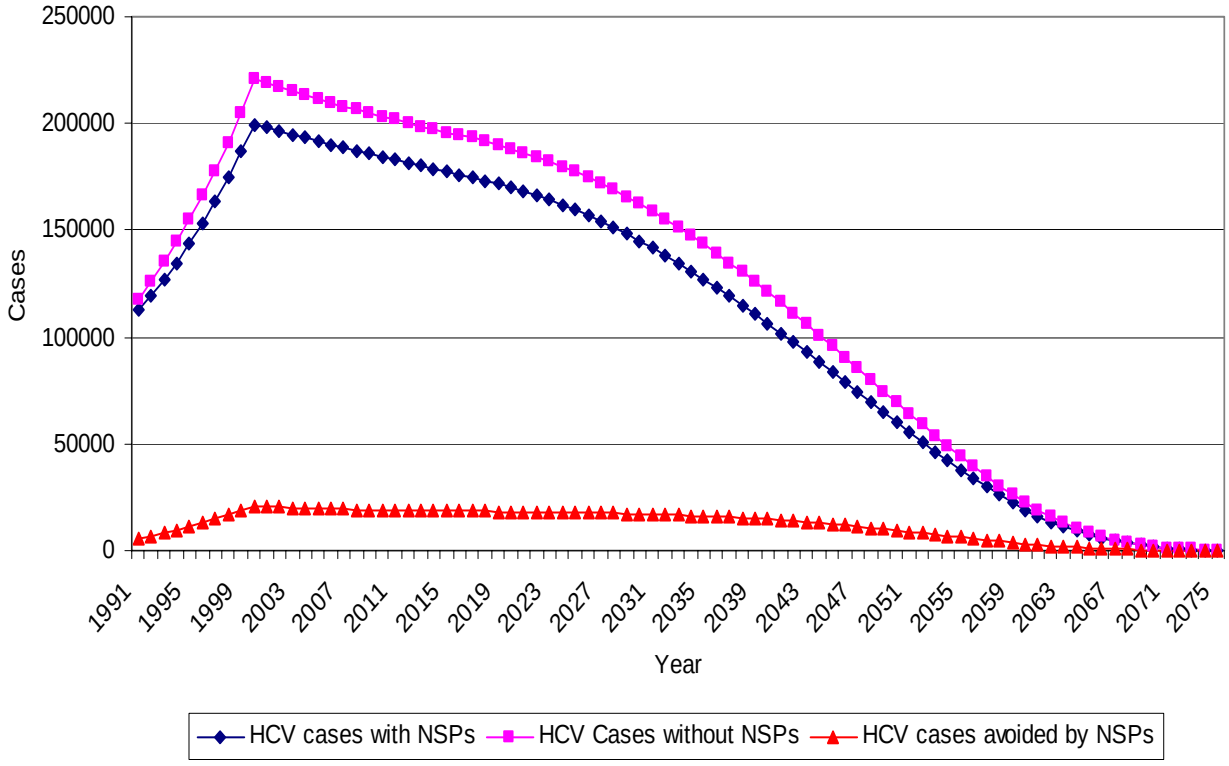


Figure 4.3 HCV cases with, without and avoided by NSPs



Figures 4.4 and 4.5 illustrate the stages of disease in HIV and HCV for the cases avoided by NSPs.

Figure 4.4 HIV cases avoided by stage of disease

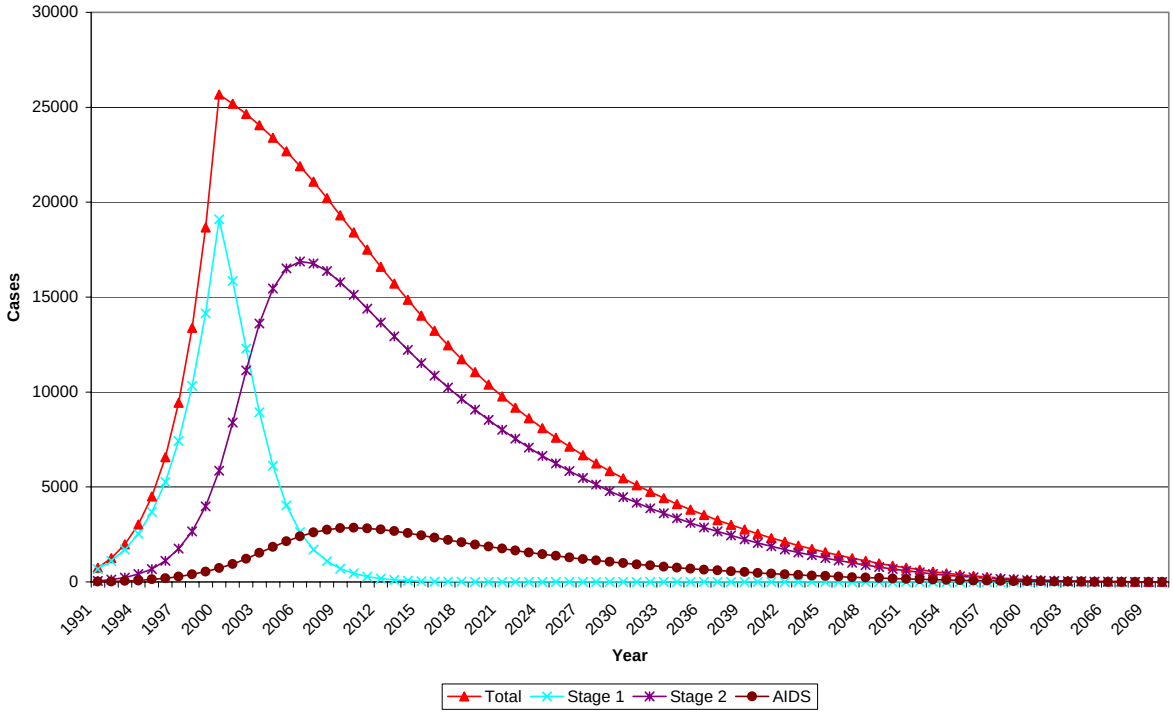
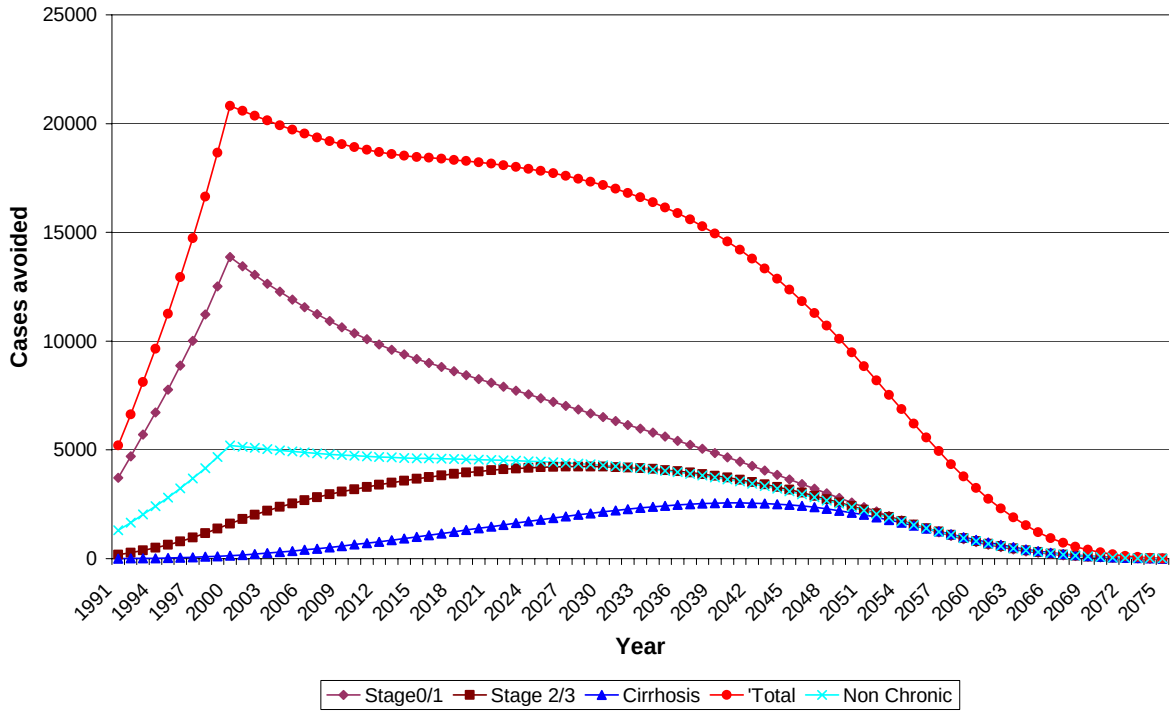


Figure 4.5 HCV cases avoided by stage of disease



The figures illustrate the rate of progression of the two diseases, and the proportional distribution of the various stages of each disease over time, with later stages of the disease gaining greater prominence over time.

These data were applied in the economic model, with treatment costs included only for those patients diagnosed with the disease, as discussed in Sections 3.4 and 3.5. To the extent that some consumers not diagnosed with the disease also incur costs of treatment, the exclusion of these consumers from the model represents a conservative approach (i.e. the costs of treatment avoided may be understated).

4.4 METHODOLOGY FOR HEALTH CARE COSTINGS FOR HIV

Initially, a review of national and international literature relating to quality of life assessment and health care for HIV/AIDS was undertaken. Additional information on health care utilisation for HIV/AIDS was sought from various databases and sources, including:

- ☐ The Australian HIV Observational Database - data on antiretroviral therapy uptake by risk group and stage of disease, and utilisation of specific HIV investigations (CD4 count and HIV viral load)
- ☐ The Highly Specialised Drugs Program - data on use and costs of antiretroviral therapy in Australia

The following assumptions were employed in determination of health care costs for HIV/AIDS:

- ☐ All people who acquire HIV infection are at risk of progression to advanced HIV disease.
- ☐ The health care costs of acute HIV are small, due to the often asymptomatic nature of newly acquired HIV infection, and therefore were not considered in the total costs.

4.4.1 COSTS OF ANTIRETROVIRAL THERAPY

Data on antiretroviral therapy use and costs in Australia was obtained from the Highly Specialised Drug Scheme (NCHECR 2001). The per person cost of antiretroviral therapy increased significantly from 1996 (AUD$4,385) to 1997 (AUD$9,163) following the introduction of highly active antiretroviral therapy (HAART) (Table 4.4.1). Based on this data and a previous HIV/AIDS health care costing assessment in Australia (Hurley et al. 1995) we have estimated antiretroviral therapy per person costs to be AUD$4,000 for the period 1990-1996 and AUD$10,500 from 1997 (Table 4.4.2).

Table 4.4.1 Antiretroviral therapy expenditure in Australia, 1996-2000[1]

	1996	1997	1998	1999	2000
Total patients	5,617	6,425	6,085	6,296	6,520
Total costs (AUD$)	$24,632,000	$58,876,000	$66,312,000	$67,689,000	$69,413,000
Cost per patient (AUD$)	$4,385	$9,163	$10,897	$10,751	$10,646

1. Based on data available from the Highly Specialised Drug Scheme and the Australian HIV Observational Database (NCHECR 2001)

4.4.2 COSTS OF OTHER HIV/AIDS MANAGEMENT

HIV/AIDS Treatment protocols and costs were partly based on the previous HIV/AIDS health care costing assessment in Australia (Hurley et al. 1995). In addition, information on CD4 count and HIV viral load utilisation was obtained from AHOD. Regarding hospitalisation costs (including treatment of complications), the following assumptions were made:

- ☐ Only people who have progressed to AIDS are hospitalised.

- ☐ Annual hospitalisation, diagnosis and complication treatment costs for people with AIDS prior to 1997 are based on Hurley et al (1995).
- ☐ Total hospitalisation, diagnosis and complication treatment costs for people with AIDS are similar in the periods 1990-1996 and from 1997.
- ☐ Survival for people with AIDS is approximately 18 months pre-1997 and 3 years from 1997, therefore annual costs for hospitalisation, diagnosis and complication treatment costs for people with AIDS will be reduced by 50% from 1997 (Table 4.4.2).

Table 4.4.2 Treatment protocols and their costs for HIV disease

Disease stage and health care service costs	Costs
1. Early HIV disease[1]	
Doctor visits (specialist x 1, primary care x 3)	$213
HIV viral load testing x 3	$528
CD4 count x 3	$60
Other laboratory services (full blood count x 3, biochemistry x 3, liver function tests x 3)	$169
Antiretroviral therapy	$4,000 (1990-1996) $10,500 (from 1997) for estimated 40% on treatment
2. Progressive HIV disease[1]	
Doctor visits (specialist x 2, primary care x 4)	$295
HIV viral load testing x 4	$704
CD4 count x 4	$80
Other laboratory services (full blood count x 4, biochemistry x 4, liver function tests x 4)	$225
Antiretroviral therapy	$4,000 (1990-1996) $10,500 (from 1997) for estimated 70% on treatment
3. AIDS[2]	
Doctor visits (specialist x 2, primary care x 4)[1]	$295
HIV viral load testing x 4[1]	$704
CD4 count x 4[1]	$80
Other laboratory services (full blood count x 4, biochemistry x 4, liver function tests x 4) [1]	$225
Antiretroviral therapy	$4,000 (1990-1996) $10,500 (from 1997) for estimated 90% on treatment
Diagnosis of HIV complications	$3,228 (1990-1996) $1,614 (from 1997)
Prophylaxis and management of opportunistic infections[2]	$15,132 (1990-1996) $7,566 (from 1997)
Hospital bed-days[2]	$50,328 (1990-1996) $25,164 (from 1997)

[1] Health care services are per year per case in disease stage, based on CMBS Schedule Fee (2000).
[2] Cost estimates for AIDS (except antiretroviral therapy from 1997) are based on previous Australian figures from Hurley et al (1995), without adjustment for inflation.

The above annual costs of treatment of HIV by stage of disease were than converted to Year 2000 prices, where required, by application of the relevant CPI ratio. The annual costs of treatment by stage of disease were then applied to the number of survivors in each stage. Detailed figures of the results are provided in Table 4.4.3 (See Appendix D), with discussion presented in Section 4.6.

4.5 METHODOLOGY FOR HEALTH CARE COSTINGS FOR HCV INFECTION

The following assumptions were employed in determination of health care costs for hepatitis C:

- ☐ 75% of people who acquire HCV infection develop chronic hepatitis C.
- ☐ The health care costs of acute hepatitis C are small, due to the largely asymptomatic nature of newly acquired HCV infection, and therefore were not considered in the total costs.
- ☐ All people with chronic hepatitis C are at risk of progression to advanced liver disease complications.
- ☐ People can either remain in disease states or progress forward but not regress.

4.5.1 TREATMENT PROTOCOLS AND COSTS FOR HCV

Table 4.5.1 outlines treatment protocols for HCV and their cost estimates. Additional health care service items for stages 1-3, but for total period rather than per year are:

- ☐ Liver ultrasound x 2
- ☐ Liver biopsy x 2
- ☐ Pathology services (HIV serology x 1, HBV serology x 1, Iron studies x 1, full blood count x 4, alpha-1-antytrypsin level x 1, caeruloplasmin level x 1, ANA/auto-antibodies x 1, HCV genotype x 1, HCV viral load x 1)

These costs have been estimated at $2,358 per case (Year 2000 prices)

Hospitalisation is assumed to only be required for:

- ☐ Liver biopsy (day only stay)
- ☐ Liver failure (incorporated into total cost estimate)
- ☐ Hepatocellular carcinoma (incorporated into total cost estimate)

Of the estimated 150,000 people living with chronic hepatitis C in Australia (Law 1999), less than 10% will have received combination therapy, the preferred treatment for hepatitis C, consisting of interferon and ribavirin. For this reason, and the assumption that the costs of combination therapy will have been balanced by some reduction in development of advanced liver disease complications, we have not costed combination therapy in the analysis.

Table 4.5.1 Treatment protocols and their costs for HCV disease

Disease stage and health care services	Costs
1. Mild chronic hepatitis C[1]	
Doctor visits (specialist x 1, primary care x 2)	$164
Pathology services (liver function tests x 2)	$39
2. Moderate chronic hepatitis C[1]	
Doctor visits (specialist x 1, primary care x 2)	$164
Pathology services (liver function tests x 2)	$39
3. Compensated cirrhosis[1]	
Doctor visits (specialist x 2, primary care x 2)	$198
Pathology services (liver function tests x 2, full blood count x 1, alpha-fetoprotein x 1, liver ultrasound x 1)	$182

Table 4.5.1 (Cont) Treatment protocols and their costs for HCV disease

Disease stage and health care services	Costs
4. Liver failure[2]	
Without transplant (80% of patients), cost per patient	$164,340
With transplant (20% of patients), cost of transplant	$75,000
Expected cost per episode	$146,472
5. Hepatocellular carcinoma[2]	
Without surgery (76% of patients), cost per patient	$117,895
With surgery (33% of patients), cost per patient	$28,290
Expected cost per episode	$88,325

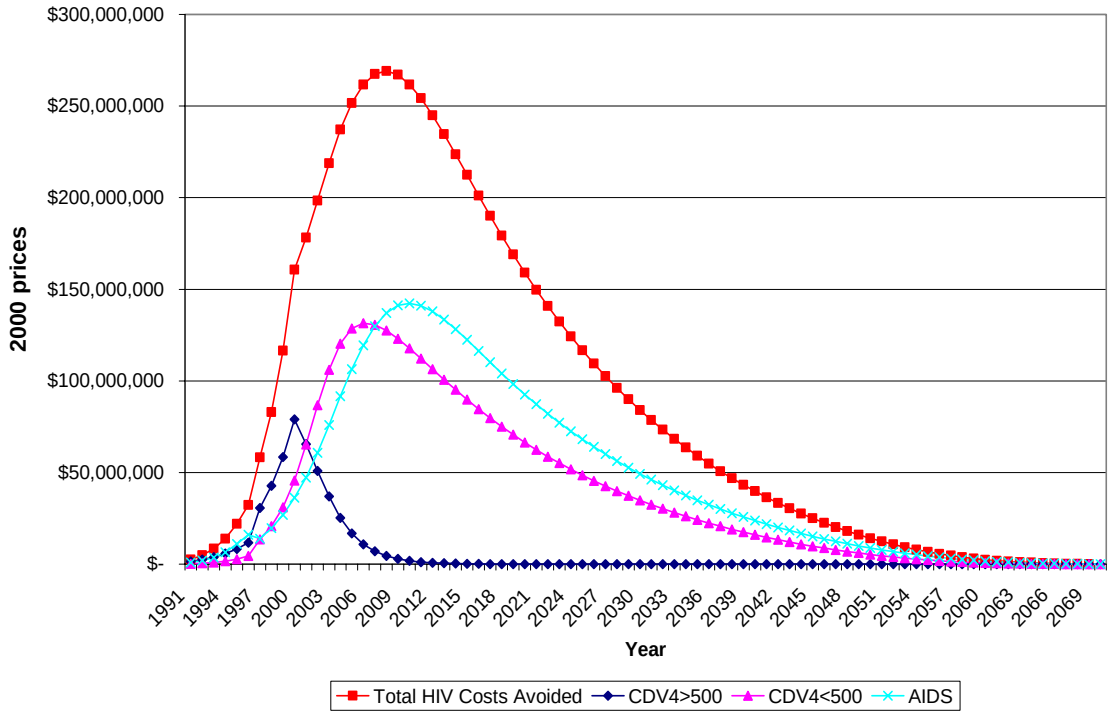
[1] Health care services are per year per case in disease stage, based on CMBS Schedule Fee (2000).
[2] Cost estimates are previous Australian figures from Shiell et al (1994), without adjustment for inflation.

4.6 HIV TREATMENT COSTS

The annual costs of treatment of HIV by stage of disease (Table 4.4.2) were converted to Year 2000 prices, where required, by application of the relevant CPI ratio. These were then applied to the number of survivors in each stage. Detailed figures of the results are provided in Table 4.4.3 (See Appendix D).

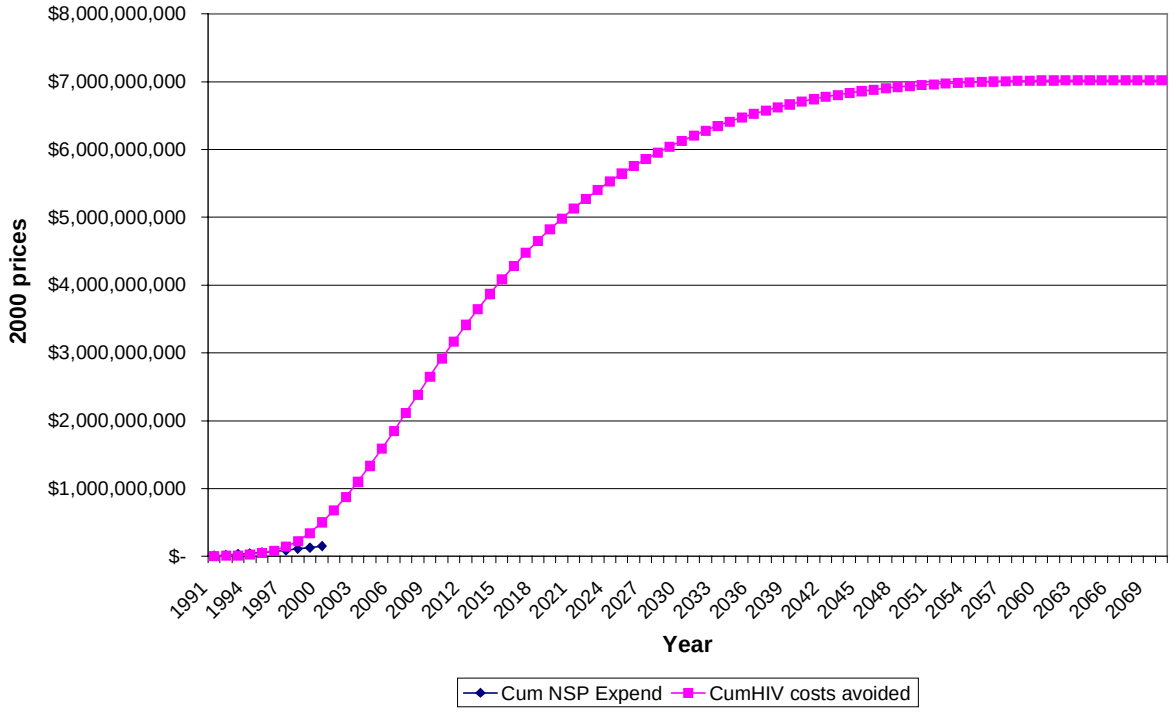
Figure 4.6 illustrates the annual costs of treatment for the diagnosed cases of HIV avoided as a result of the ten year investment in NSPs. Annual treatment costs rise progressively to the year 2008 as patients progress to later stages of the disease, at which time they peak at approximately $269 million. Thereafter, annual costs decline, brought about mainly by the declining number of patients in the second and third stages of HIV.

Figure 4.6 Annual costs of treatment of diagnosed cases of HIV avoided by NSPs (Not discounted)



Cumulative HIV treatment costs avoided over the lifetime of consumers are illustrated in Figure 4.7. Costs accumulate throughout the lifetime of survivors, but at a slower rate after about 2008.

Figure 4.7 Cumulative costs of treatment of diagnosed cases of HIV avoided by NSPs (Not discounted)



4.6.1 HCV TREATMENT COSTS

The annual costs of treatment of HCV by stage of disease (Table 4.5.1) were converted to Year 2000 prices, where required, by application of the relevant CPI ratio. These were then applied to the number of diagnosed survivors in each stage of the disease. Detailed figures of the results are provided in Table 4.4.3 (See Appendix D).

Figure 4.8 illustrates the annual costs of treatment for the diagnosed cases of HCV avoided as a result of the ten year investment in NSPs. Annual treatment costs rise progressively to the year 2040, at which time they peak at approximately $18.8 million and decline thereafter. The major factor influencing this cost profile is the number of patients with liver failure who, while relatively small in number, have extremely high costs of treatment.

Cumulative costs of treatment of HCV are presented in Figure 4.9. Costs accumulate throughout the period as patients progress through stages of HCV, reaching a plateau in the late 2050s. The shapes of the curves for both annual and cumulative costs of HIV and HCV treatment are indicative of the different rates of progression through each disease, with progression in HCV occurring at a much slower rate than for HIV, and hence treatment for later stages of the disease peaking much later for HCV than for HIV. This deferral has implications for the determination of the Net Present Values of this expenditure, as discussed below.

Overall, total treatment costs avoided over the life of the cases of HIV and HCV avoided by NSPs are approximately $7,808 million (before discounting). The costs of HIV treatment avoided are approximately ten times those for HCV, which reflects a combination of the number of cases avoided in the first instance (25,000 for HIV compared to 21,000 for HCV), a higher diagnosis rate for HIV than HCV, and higher average annual treatment costs for HIV than for HCV.

Figure 4.8 Annual costs of treatment of diagnosed cases of HCV avoided by NSPs (Not discounted)

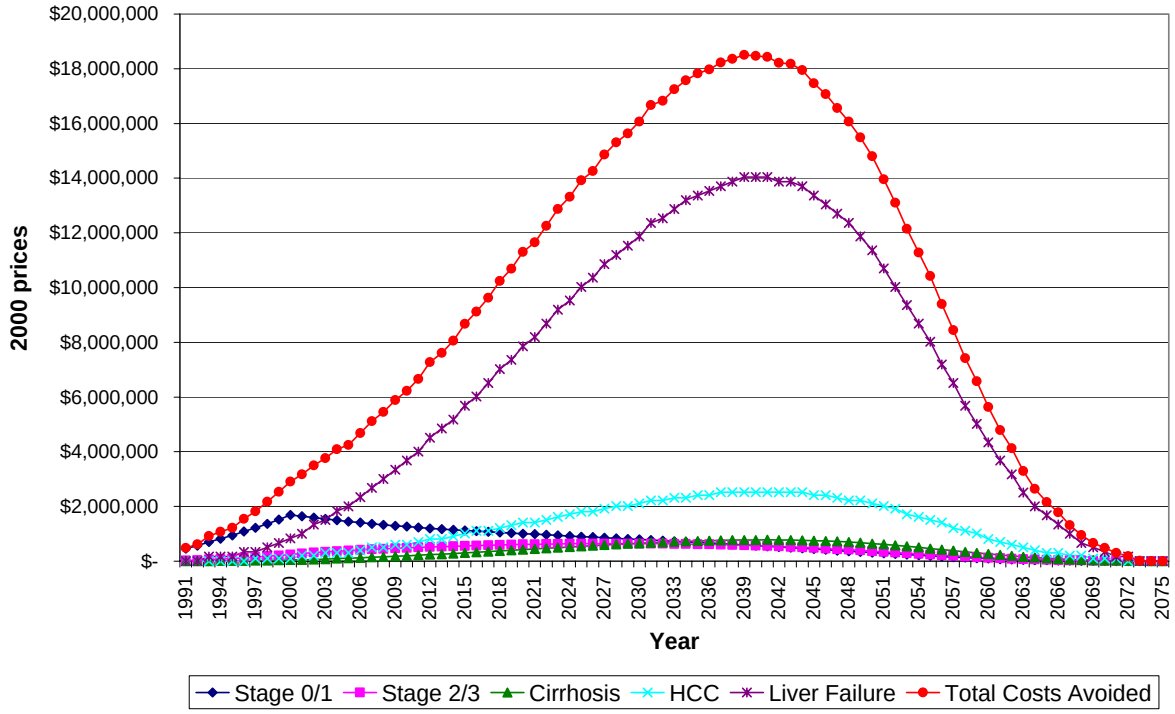
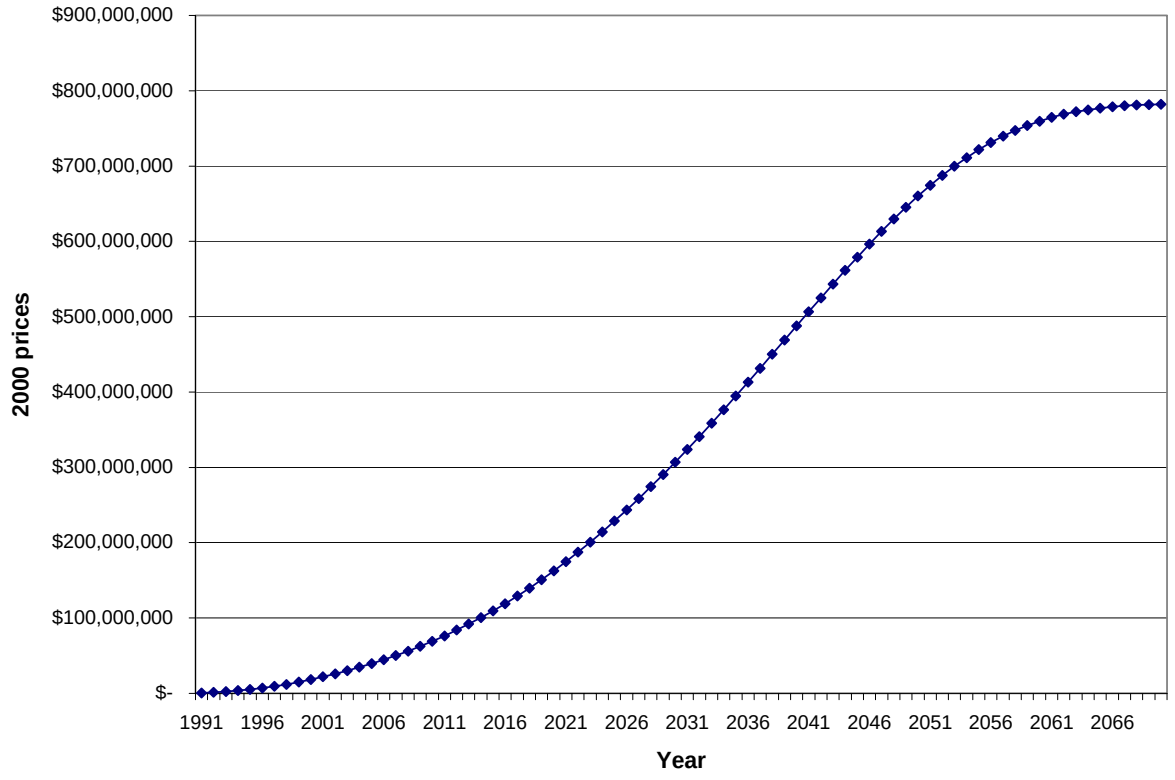


Figure 4.9 Cumulative costs of treatment of diagnosed cases of HCV avoided by NSPs (Not discounted)



4.7 RETURN ON INVESTMENT

The calculation of the return on investment from NSPs takes into account the total investment by government and consumers in NSPs during the 1990s, together with anticipated savings resulting from treatment costs avoided for persons who would otherwise have contracted HIV and HCV over their lifetime, were it not for the availability of NSPs during the decade under study.

The calculation of return on investment discounts future cashflows associated with the investment in the NSP program and treatment costs avoided by an agreed discount rate. The discount rate most commonly used in government programs of this nature is 5% per annum. For the purposes of illustration, we have also applied discount rates of 3% and 0%.

When considering the return on investment, one of the questions to be considered is "Whose investment?" In this instance, expenditure on NSPs has been made by government and consumers. In our analysis, we have presented findings that illustrate both the return to government from its investment, as well as the return on total investment. We have also considered the return on investment over the lifetime costs of treatment of cases avoided, as well as the return achieved to the end of the investment period itself (Year 2000) ignoring any savings that accrue thereafter.

The impact of NSPs on both HIV and HCV has been considered in the analysis. Given the history of NSPs, their original purpose, and the stronger evidence base demonstrating their impact on the incidence of HIV among injecting drug users (see Section 3), our primary focus has been on HIV. Our initial analysis therefore considers the return on investment in NSPs from HIV avoidance alone. In the second part of the analysis, we consider what additional savings may have been derived from the avoidance of HCV among injecting drug users.

4.7.1 HIV IMPACTS

The results of the analysis on return on investment in NSPs to government and in total, having regard to the impacts on HIV alone, are presented in Table 4.7.1. Detailed tables are provided in Table 4.4.3 (See Appendix D).

Table 4.7.1 Net Present Value of investment in NSPs for HIV.

Discount Rate	Net Present Value, 1991 ($million, Year 2000 Prices)	
	Govt Expenditure	All Expenditure
Lifetime Costs of Treatment		
5%	$2,277	$2,262
3%	$3,415	$3,398
0%	$6,896	$6,876
To Year 2000		
5%	$242	$227
3%	$287	$270
0%	$373	$353

The table illustrates that the net savings to government from its investment in NSPs over the lifetime of cases of HIV avoided (after deducting the value of the initial government investment) before discounting are $6,896 million. Discounting these savings at 5% results in a Net Present Value (NPV) of their investment of $2,277 million ($3,415 million at 3% discount rate). When considering the total investment in NSPs (by including consumer

expenditure), the equivalent returns are $6,876 million (undiscounted), $2,262 million (discount rate of 5%) and $3,398 million (discount rate of 3%).

To put these outcomes in perspective, they represent the savings that accrue from a combination of the following:

- ☐ A total investment of approximately $150 million (Year 2000 prices) in NSPs during the 1990s, that resulted in
- ☐ approximately 25,000 cases of HIV avoided, who
- ☐ live for an average of about 24 years after infection, and who
- ☐ incur average treatment costs of nearly $14,000 each year of their life after diagnosis.

Under these circumstances, the analysis indicates that there have been significant savings accruing to government from the investment in NSPs to date, and that these savings will continue to accrue into the future.

This is further illustrated by considering the return achieved to the end of the investment period (i.e. to Year 2000) without taking into account any additional savings that accrue in the future. This is also demonstrated in Table 4.7.1 where the NPV of the savings to the Year 2000 are shown, both to government and as a whole. By the year 2000, government had achieved net savings of $373 million (after deducting the value of their investment), the NPV of which at a discount rate of 5% is $242 million ($287 million at a discount rate of 3%). The equivalent returns on the total investment in NSPs over the same period were $353 million (undiscounted), $227 million (discount rate of 5%) and $270 million (discount rate of 3%)

4.7.2 HIV AND HCV IMPACTS COMBINED

In the second stage of the analysis, we consider the effects of NSPs on HIV and HCV combined. The return on investment in NSPs to government and in total, having regard to the impacts on HIV and HCV combined, are presented in Table 4.7.2. Detailed tables are provided in Table 4.4.3 (See Appendix D).

Table 4.7.2 Net Present Value of investment in NSPs for HIV and HCV combined.

Discount Rate	Net Present Value, 1991 ($million, Year 2000 Prices)	
	Govt Expenditure	All Expenditure
Lifetime Costs of Treatment		
5%	$2,402	$2,386
3%	$3,653	$3,637
0%	$7,678	$7,658
To Year 2000		
5%	$255	$240
3%	$302	$285
0%	$391	$371

The table illustrates that the net savings to government from its investment in NSPs over the lifetime of cases of HIV and HCV avoided (after deducting the value of the initial government investment) before discounting are $7,678 million. Discounting these savings at 5% results in a Net Present Value (NPV) of their investment of $2,402 million ($3,653 million at 3% discount rate). When considering the total investment in NSPs (by including consumer expenditure), the equivalent returns are $7,658 million (undiscounted), $2,386 million (discount rate of 5%) and $3,637 million (discount rate of 3%).

The analysis indicates that the incorporation of HCV into the NPV calculations has further increased the savings accruing to government and in total. This is to be expected, as no additional investment has been required, and some 21,000 cases of HCV are estimated to have been avoided. The impact on savings, however, is significantly lower than for HIV, due to the lower annual costs of treatment for the earlier stages of HCV, and the fact that the higher costs associated with the relatively small proportion of patients who progress to liver failure are deferred until much later and are considerably reduced by discounting.

As noted in Section 4.5.1, we have not taken into account the costs of combination therapy for the treatment of HCV, due primarily to the small proportion of people with HCV receiving this treatment to date. Should this situation change and combination therapy become more widely prescribed, annual treatment costs are also expected to increase. Under these circumstances, the estimates of savings presented above are likely to underestimate the savings that would accrue under this treatment regime. This, of course, would also depend on the effect of combination therapy in slowing the rate of disease progression.

4.8 SENSITIVITY ANALYSIS

The analysis presented above has been based on the best estimates available for each of the key variables used in the economic model. In order to test the robustness of the results, sensitivity analysis has been conducted on a number of the variables affecting the outcomes. These are:

- ☐ Halving the rate of effect of NSPs on HIV. This analysis seeks to address the issue of the extent to which NSPs contribute to the reduction in HIV as opposed to other concomitant activities (see Section 3.1.7).
- ☐ Quartering the effect of NSPs on HIV. This analysis further extends the examination of reduced NSP effects on HIV.
- ☐ Doubling the level of investment in NSPs over the ten years. This analysis examines the result of increasing the expenditure on NSPs without any increase in effect on HIV. By so doing, it takes into account the potential contribution of the commercial pharmacy market.
- ☐ Halving the annual treatment costs for HIV. This analysis considers the results of possible future reductions in the costs of HIV treatment.

The outcomes for each of these variations in isolation are illustrated in Table 4.8.1, applied only to the impact on HIV, and based on a discount rate of 5% in all scenarios.

Table 4.8.1 Net Present Value of investment in NSPs for HIV – Sensitivity Analysis.

	Net Present Value, 1991 ($million, Year 2000 Prices)	
	Govt Expenditure	**All Expenditure**
Lifetime Costs of Treatment		
Original Estimate	$2,277	$2,262
Half NSP Effect on HIV	$333	$318
Quarter NSP Effect on HIV	$52	$37
Double NSP Investment	$2,180	$2,151
Half HIV Annual Treatment Costs	$1,090	$1,075

The analysis indicates that the outcomes previously presented are most sensitive to the impact of NSPs on HIV incidence. This is to be expected because of the nature of the estimation technique employed, which uses the logit scale as its base. Consequently, halving the rate of effect of NSPs on HIV incidence has a proportionally

greater effect on the number of cases avoided over time. Nevertheless, even at the most conservative estimate of effect (one-quarter of the original effect estimate) the return on investment on both government expenditure and total expenditure on NSPs is positive. This also holds true for variations to the other input variables in the model. Of some interest is the fact that even when the annual costs of treatment for HIV are halved, NSPs continue to meet the required investment criteria. The sensitivity analysis indicates that the results presented are robust, and that the return on investment from NSPs is positive in all other tested scenarios.

4.9 DISCUSSION

The evaluation of the financial effect of NSPs on HIV and HCV has been based on:

- ☐ The reported operating and overhead costs of NSPs across Australia during the 1990s;
- ☐ Estimates of the number of cases of HIV and HCV avoided as a result of NSPs;
- ☐ Past and current treatment regimes and associated costs of treating HIV and HCV;
- ☐ Projections of future treatment costs based on the above; and
- ☐ The application of a Net Present Value (NPV) model to determine the return on investment to both government and in total for NSPs.

The analysis indicates that the return on investment will exceed manyfold the original investment in NSPs, and that the original investment had been fully recouped and surpassed by the end of the investment period, before any future savings are taken into account. The investment in NSPs is justified by the effect on HIV alone, with the effect on HCV providing an additional financial benefit, albeit a smaller one than HIV. Sensitivity analysis on the main variables used in the analysis indicates that the results are robust under a range of alternative assumptions and scenarios.

A number of observations are offered about the results presented.

- ☐ The factor that has the greatest impact in the financial analysis is the effect of NSPs in reducing the incidence of HIV (and to a lesser extent HCV). The evidence base for the estimation of effect has increased significantly since the earlier study by Hurley and Kaldor, with a greater number of sites now reporting data on HIV seroprevalence, which has been used in the analysis of effect presented in Section 3. As noted in Section 3.1.7, however, NSPs typically operate in an environment where a range of public health and other initiatives are in place. It is not possible to isolate the effects of NSPs from other elements in these initiatives. Indeed, it may be that NSPs are simply a "marker" for a range of activities whose combined effect is that demonstrated to date. Notwithstanding this point, the sensitivity analysis conducted indicates that even under scenarios where the effect of NSPs on HIV incidence is reduced by 75% of the original estimate, the return on investment from NSPs remains positive.
- ☐ The analysis of return on investment has considered only the direct costs and savings associated with NSPs. In particular, only direct health care savings relating to treatment costs of HIV and HCV have been incorporated into the analysis. There is clearly a greater range of other potential financial savings to be derived from a reduction in HIV and HCV, savings that would accrue to governments, patients and their carers as well as wider society. For example, savings to government and the community in terms of employment and unemployment, education and parenting costs are likely to be considerable. The exclusion of these savings from the analysis means that the case presented may understate, potentially significantly, the total financial benefits of NSP programs.
- ☐ Estimates of future treatment costs have been based on current treatment regimes and the costs associated with those regimes. As has been shown with the introduction of antiretroviral therapy for the treatment of HIV, methods and costs of treatment can change very quickly, which may have a significant effect on patients, as well the analysis of return on investment. The sensitivity analysis conducted on the results to date indicates that, even if future treatment costs halve, NSPs would continue to be a sound

investment strategy. However, any radical changes to treatment methods and their effect on disease progression and life expectancy may affect the outcomes presented.

- The analysis presented has considered the retrospective investment in NSPs, as well as the direct health care savings accrued to date and in the future associated with that investment, and assumes that the investment in NSPs ceases in the year 2000. Given the current population of injecting drug users and the level of use of NSP services, together with the demonstrated effect of NSPs on HIV and HCV, it is clear that an ongoing investment in NSPs will continue to avert the incidence of HIV and HCV, and that savings will continue to accrue. Consequently, the model demonstrates not only that the return on investment to date in NSPs has been positive, but also that ongoing investment in NSPs is warranted.