

## Executive summary

### This project aimed to:

1. Estimate the population benefits of needle and syringe programs (NSPs) on HIV and hepatitis C virus (HCV) related outcomes among injecting drug users (IDUs) in Australia and in each State and Territory over the period from 2000 to 2009.
2. Explore changes in the provision of NSPs, populations at risk, and sharing behaviour on these outcomes.
3. Calculate the net present value and future values and cost-effectiveness of NSPs in terms of HIV and HCV infections averted from a health sector (government as third party payer) perspective.

### Population model methods

A mathematical epidemic model was developed to simulate HIV and HCV transmission among IDUs in Australia. The model was informed by detailed biological data, Australian IDUs behavioural data (e.g., the annual NSP survey/finger prick survey), and the number of injecting equipment units distributed by NSPs each year. The model described IDUs in the community and not those in prisons. The extensive available data enabled the model to describe well the complex injecting behaviour and mixing patterns of Australian IDUs and viral transmissions within this population. The model was used to determine the population-level effectiveness of NSPs in preventing transmissions of HIV and HCV through the distribution of sterile injecting equipment. It accurately reflected the current HIV and HCV epidemiology in Australia. Separate analyses were carried out for IDUs in Australia and by each Australian state and territory as well as Australian Aboriginal and Torres Strait Islander people who inject drugs.

The decade from 2000-2009 was investigated to estimate the number of HIV and HCV infections with and without NSPs in the past, thus determining the effectiveness of NSPs. The model was then used to forecast epidemic trajectories over the next 70 years (2010-2079) under assumptions that funding and services of NSPs or behaviour of IDUs remain unchanged or according to changes in conditions. This time horizon was chosen in order to consider whole of lifetime impacts. Shorter timeframes are also analysed. These results became inputs into an economic analysis.

### Economic analysis methods

An economic analysis used the epidemic model results and detailed data on costs. Costs associated with NSPs were provided by State and Territory health departments. Healthcare costs for HIV and HCV were estimated from activity-based analysis and national databases. All costs are presented in 2008 Australian dollars. The outcome of interest from the economic analysis was:

- Disability-Adjusted-Life-Years (DALYs).

A range of time horizons were chosen for the analyses:

- 2000-2009
- 2010-2019
- 2010-2029
- Life-time of current IDU cohort.

Discounting was applied at 3% and 5% where appropriate (discounting assesses the value of money at different time periods) [1].

### Summary of investment

- The number of needles and syringes distributed in Australia increased during the past decade (from ~27 million to ~31 million).
- Expenditure on NSPs increased by 36% (adjusted for inflation) over this time period, mostly associated with personnel and not principally for equipment (Table a); a significant portion of the increased investment has been the Illicit Diversion Supporting Measures for NSPs to increase referrals to drug treatment and other services.
- Over the last decade there has been
  - Increases in funding for primary sites.
  - Increases in the number of secondary sites.
  - Increases (by 15%) in the numbers of units of equipment provided.
  - Stable spending on sterile injection equipment.
  - At the time of writing there were 85 primary sites, 737 secondary sites, 20 enhanced secondary sites, and 118 vending machines.

### Effectiveness of NSPs

It was estimated that over the last decade (2000-2009) NSPs have directly averted:

- 32,050 new HIV infections;
- 96,667 new HCV infections.

Table b summarises the epidemiological benefits of NSPs over the last decade. When secondary transmissions (sexual or mother-to-child transmission from infected IDUs) are considered, the epidemiological benefits are even greater. The cumulative benefits of NSPs are further pronounced if long-term projections are considered, as the preventative effects of NSPs flow through to influence the incidence of long-term clinical complications.

### Economic analysis of NSPs during 2000-2009

During 2000-2009, gross funding for NSP services was \$243m. This investment yielded:

- Healthcare costs saved of \$1.28 billion (\$1.12bn-\$1.45bn, IQR).
- Approximately 140,000 DALYs gained.
- Net financial cost-saving of \$1.03 billion (\$876m-\$1.98bn, IQR).

The net present value of NSPs (in 2000) is \$896m (disc 3%)(Table c) and \$817m (disc 5%).

It was estimated that:

- For every one dollar invested in NSPs, more than four dollars were returned (additional to the investment) in healthcare cost-savings in the short-term (ten years) if only direct costs are included; greater returns are expected over longer time horizons.
- NSPs were found to be cost-saving over 2000-2009 in seven of eight jurisdictions and cost-effective in the other jurisdiction. Over the longer term, NSPs are highly cost saving in all jurisdictions.
- The majority of the cost savings were found to be associated with HCV-related outcomes. However, when only HIV-related outcomes were considered in the analysis, it cost \$4,500 per DALY gained associated with HIV infection.
- If patient/client costs and productivity gains and losses are included in the analysis, then the net present value of NSPs is \$5.85bn; that is, for every one dollar invested in NSPs (2000-2009), \$27 is returned in cost savings. This return increases considerably over a longer time horizon.
- NSPs are very cost-effective compared to other common public health interventions, such as vaccinations (median cost per QALY of \$58,000), allied health, lifestyle, and in-patient interventions (median cost of \$9,000 per DALY gained), and interventions

addressing diabetes and impaired glucose tolerance or alcohol and drug dependence (median cost of \$3,700 per DALY gained) [2].

### Results about future NSPs

If NSPs were to decrease in size or number, then relatively large increases in both HIV and HCV could be expected with associated losses of health and life and reduced returns on investment (Table d). Significant public health benefits can be attained with further expansion of sterile injecting equipment distribution.

Investment in NSPs was cost-saving for current NSP funding when analysed for all time periods. Cost savings were:

- \$782m (2010-2019)
- \$3.23bn (2010-2029)
- \$17.75bn (2010-2059)
- \$28.71bn (2010-2079).

The net present value of current NSP investment at 2010 (discounted 3%):

- \$641m (2010-2019)
- \$2.27bn (2010-2029)
- \$8.41bn (2010-2079).

Increased funding and provision of NSPs would be associated with greater cost-savings. The maximum return would be achieved at 125% to 200% of current levels (Table e); this is when the total net savings (NPV) is maximal. Expansion of NSPs in all jurisdictions would be cost-saving. There is potential for expansion, considering that only approximately 50% of all injections are currently with a sterile syringe.

### Conclusions

Investment in NSPs (2000-2009) has resulted in:

- An estimated 32,050 HIV infections and 96,667 HCV infections averted;
- Substantial healthcare cost savings to government related to HCV and HIV;
- Substantial gains in Disability Adjusted Life years.

For every dollar currently spent on the activities of NSP, more than four dollars will be returned (in addition to the investment; i.e., five times the investment) and approximately 0.2 days of disability-adjusted life gained. Over a longer time horizon there is even greater return.

Results from model-based projections into the future (2010 onwards) suggest that:

- Maintenance of current levels of NSP funding will continue to provide
  - substantial and increasing healthcare cost savings;
  - gains in life years.
- Increases in the funding and provision of NSPs will:
  - avert additional HCV and HIV infections;
  - lead to further and increased cost-savings of funding up to 150-200% of current level if met with demand;
  - reduce marginal return on investment as funding increased.
  - the maximum return would be achieved at 150% to 200% of current levels.

It is important to note that this report is based on the effectiveness of NSPs in averting HIV and HCV infections among IDUs only and not on the many other benefits of NSPs, such as avoided mental health episodes and injecting related injury, psychosocial benefits, other support, referral, education and prevention etc. Costs of NSPs in this analysis included some other services (but not primary healthcare or drug and alcohol programs or the human resource cost of providing sterile injecting equipment) and thus results are conservative estimates of the true return on investment.

**Key tables**

**Table a: Investments made by financial year in 2008 Australian dollars (unadjusted financial expenditures and adjusted for consumer price index). Note that NSP support includes human resource costs, rent and overheads; support for secondary sites consists of human resource costs.**

	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8
<b>CONSUMABLES (\$'000)</b>								
Sterile injecting equipment	5,658	5,140	5,633	6,677	6,928	6,571	7,404	6,857
Disposal equipment	911	884	952	941	1,184	1,122	1,274	1,474
Safe sex packs	15	52	70	69	246	245	289	293
<b>Sub-total</b>	<b>6,583</b>	<b>6,076</b>	<b>6,655</b>	<b>7,686</b>	<b>8,358</b>	<b>7,938</b>	<b>8,968</b>	<b>8,624</b>
<b>NSP SUPPORT (\$'000)</b>								
Primary NSP Operations	8,851	10,510	10,417	11,261	12,505	12,274	14,450	15,929
Support for Secondary NSPs	380	653	745	788	951	1,264	963	1,222
Transport	89	82	92	105	117	184	198	192
Vending Machines	10	0	0	0	0	19	246	441
<b>Sub-total</b>	<b>9,331</b>	<b>11,245</b>	<b>11,254</b>	<b>12,154</b>	<b>13,573</b>	<b>13,742</b>	<b>15,856</b>	<b>17,783</b>
<b>TOTAL (\$'000)</b>								
<b>(unadjusted for CPI)</b>	15,914	17,321	17,909	19,841	21,931	21,680	24,824	26,407
<b>TOTAL (\$'000)</b>								
<b>(adjusted for CPI)</b>	<b>20,119</b>	<b>21,236</b>	<b>21,312</b>	<b>23,064</b>	<b>24,850</b>	<b>23,897</b>	<b>26,500</b>	<b>27,380</b>
<b>Total Client Costs (\$'000)</b>	<b>7,608</b>	<b>7,296</b>	<b>6,548</b>	<b>6,769</b>	<b>6,825</b>	<b>6,230</b>	<b>6,176</b>	<b>6,160</b>

**Table b: Estimated HIV- and HCV-related outcomes, with and without NSPs (medians)**

Outcome (2000-2009)	With NSPs	Without NSPs	Cases averted
<b>HIV</b>			
Prevalence of HIV among IDUs (2009)	0.1%	14.0%	
Cumulative incidence of HIV infections	305	32,355	32,050
Cumulative number of HIV-related deaths	383	2,574	2,191
<b>HCV</b>			
Prevalence of HCV among IDUs (2009)	65.1%	87.1%	
Cumulative incidence of HCV infections	103,124	199,791	96,667
Number of cirrhosis cases (2009)	4,337	5,030	693
Cumulative incidence of HCC	1,854	1,862	8
Cumulative incidence of liver failure	2,704	2,720	16
Cumulative number of liver transplants	4,277	4,278	1
Cumulative number of liver-related deaths	4,084	4,088	4

**Table c: Net cost of program and gains in DALYs (undiscounted) as well as net present value (discounted (3%) and undiscounted) from the perspective of year 2000**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	SUM
<b>Costs saved \$m (IQR)</b>	66 (57-75)	192 (171-212)	137 (119-157)	98 (84-107)	96 (86-105)	106 (94-116)	119 (107-135)	134 (119-154)	153 (134-177)	176 (148-206)	
<b>DALY gain (median)</b>	4087	10825	12863	12799	13089	13705	15148	16922	19301	22386	
<b>NPV current program \$m (IQR) (undisc.)</b>	46 (37-55)	171 (149-191)	116 (98-136)	75 (61-84)	71 (61-80)	82 (70-93)	93 (80-108)	107 (92-127)	126 (107-150)	145 (118-174)	1.03bn (873m-1.98bn)
<b>NPV current program \$m (IQR) (3% disc.)</b>	46 (37-55)	166 (145-185)	109 (92-128)	69 (56-77)	63 (54-79)	70 (60-80)	78 (67-90)	87 (74-103)	99 (84-118)	110 (90-132)	896m (758m-1.04bn)

**Table d: Loss of life and reduced return associated with decreased funding period 2010-2019 (all discounted at 3%)**

NSP funding	Reduction in NSP spending	Loss in DALY vs. current	Reduced return
50% of current levels	\$112m	36,370	\$197m
75% of current levels	\$56m	16,473	\$98m
90% of current levels	\$22m	7,607	\$36m

**Table e: Gain in DALYs and net present value with level of funding in NSPs after ten years (2010-2019) compared to no program**

Level of funding for NSPs	NSP investment	Gain in DALY	Net saving (NPV)	Return on investment
<b>Period 2010-2019</b>				
100% of current levels	\$225m	97,229	\$631m	current investment + 380%
110% of current levels	\$248m	98,562	\$633m	current investment + 360%
125% of current levels	\$282m	104,005	\$647m	current investment + 330%
150% of current levels	\$338m	111,254	\$656m	current investment + 290%
175% of current levels	\$395m	116,874	\$650m	current investment + 270%
200% of current levels	\$451m	121,303	\$635m	current investment + 240%
300% of current levels	\$676m	132,595	\$514m	current investment + 180%