

New Zealand Needle Exchange Programme

Cost-Benefit Analysis Report

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Introduction

This report aims to provide an overview of the benefits and costs of the services provided by the New Zealand Needle Exchange Programme (NZNEP) in the context of the New Zealand economy. It will put a monetary value to the benefits created by and the costs of running the service as well as suggest the possible avenues of externalities and further research. The report will provide the cost to benefit ratio of the programme for the use and knowledge of the organisation.

There have been two previous reports completed in 2002 and 2008 from different authors (Aitken, 2002; Aitken & Winter, 2008). These provided the NZNEP with valuable knowledge for the preceding 20 years, but the data is outdated and the NZNEP has evolved.

New Zealand Needle Exchange Programme

The NZNEP is a needle exchange service provided in outlets across New Zealand. It was originally established in 1988 to reduce the transmission of the HIV virus which causes AIDS. The service offers clean needles to individuals who require them, with no questions asked, to ensure that the identity of users of the programme remain confidential. This is to encourage maximum use of the programme by people who inject drugs (PWID) to ensure the programme has the greatest chance of reducing transmission of bloodborne diseases. Currently, the NZNEP consists of 20 static needle exchange outlets, two mobile services, one online shop and 197 pharmacy and alternative outlets partners (e.g. NZ Prostitutes Collective, Sexual Health Clinics). The programme distributed over 3.8 million needles in 2020 alone (Noller et al., 2021).

There are a variety of people who use this service, for injecting legal and illegal substances. Providing clean needles reduces the reuse and sharing of needles and syringes among the injecting community. This reduces the spread of bloodborne viruses such as Hepatitis B, Hepatitis C and HIV, and occurrences of other non-viral injecting harm.

The NZNEP also offers medical advice, support avenues, dangerous material disposal, overdose reduction services, and teaches safe injecting techniques. The NZNEP's limited nurse and doctor consultations also help reduce the spread of bloodborne viruses by treating the people who come in to access these services. This service helps to reach PWID in the community who may not be accessing hospital and GP care, for various reasons. Additionally, the frontline service is delivered by peer staff who have established trusting relationships with clients.

Method

The analysis will evaluate and predict the benefits and costs provided by the services of the NZNEP within 2021 and over a 5-year period. These predictions will be given in New Zealand dollars as of 2021, using inflation of 2% and a discount rate of 5% (The Treasury, 2020) of the benefits.

The figures around the cost of treating bloodborne viruses and injection injures are from a variety of medical, economics, and scientific journals. These values consider the difference in population size, medical standards, and the purchasing power parity index, and have been adjusted accordingly. The final value of the services provided by the NZNEP will be calculated by subtracting the costs associated with the service from the benefits associated with the service in real dollars.

A range of industry specialists, academics, and NZNEP staff were consulted, to provide advice on the evaluations, predictions and analytical interpretations used in this report. Though the externalities associated with the NZNEP are widespread and highly important to the community, for purposes of accuracy they have not been valued or predicted in this analysis. The externalities will still be discussed throughout the report.

Values and Predictions

Our predictions of the costs of the programme are in current New Zealand dollars, and the 5-year prediction value is the total value over the period of 2022 to 2026 inclusive, discounted to 2021 New Zealand dollars. These values, based on the programme's budget at 2021, are shown in Table 1.

Table 1: Predicted Costs

Cost	Value for the year 2021	Value for 5 year period prediction (2022 - 2026)
Direct costs	\$1,223,135.00	\$5,611,020.78
Overheads	\$4,656,347.00	\$21,360,569.19
Total	\$5,879,482.00	\$26,971,589.98

We have also predicted the benefits of the programme, and these are also in current New Zealand dollars, and the 5 year prediction value is the total value over the period of 2022 to 2026 inclusive, discounted to 2021 New Zealand dollars. These are shown in Table 2.

Table 2: Predicted Benefits

Benefits	Value for the year 2021	Value for 5 year period prediction (2022 - 2026)
Hepatitis B avoided in the community	\$10,612,515.35	\$47,430,565.19
Hepatitis C avoided in the community	\$17,764,281.92	\$83,902,312.73
HIV avoided in community	\$70,046.73	\$310,482.95
Fatal overdoses prevented from services provided	\$8,024,844.72	\$36,813,246.72
Reduction in Non-Viral Injection Related Injuries	\$3,440,850.00	\$15,784,587.04
Total	\$39,912,538.72	\$184,241,194.62

Externalities have not been evaluated or predicted due to accuracy issues. The values we have provided have not been scaled to our economy or the magnitude of the externality and are provided for future reference. These values are in New Zealand dollars as of 2021 are shown in Table 3.

Table 3: Externality Values

Externalities	Values
Support offered to those without a strong support network	\$5,772 per person supported
Drug rehabilitation for those seeking rehabilitation services	PWID 5 x more likely to seek rehabilitation if seeing NEP
Minor medical advice for unrelated injecting injures or concerns	\$1,152 per medical issue avoided

Cost-Benefit Analysis

For the year 2021, we estimate the NZNEP creates approximately \$40 million in benefits, with approximately \$6 million costs. These are shown in Table 4 and graphed below. We estimated that for every \$1 in costs created by the NZNEP (both actual and social), the NZNEP creates \$6.79 in benefits (including prevented future costs). Further analysis showed that the NZNEP creates \$6.83 in benefits for every \$1 of costs over the coming five years (2022 - 2026). These returns are graphed below in \$NZ 2021 and show that the return (benefits / costs) is increasing over the next five years.

Table 4: Estimated Net Benefit

Cost-Benefit Analysis	Value for 2021	Value for 5 year period prediction
Totals Benefits discounted	\$39,912,538.72	\$184,241,194.62
Totals Costs discounted	\$5,879,482.00	\$26,971,589.98
Value (benefits less cost)	\$34,033,056.72	\$157,269,604.65
Return (benefits / cost)	\$6.79	\$6.83

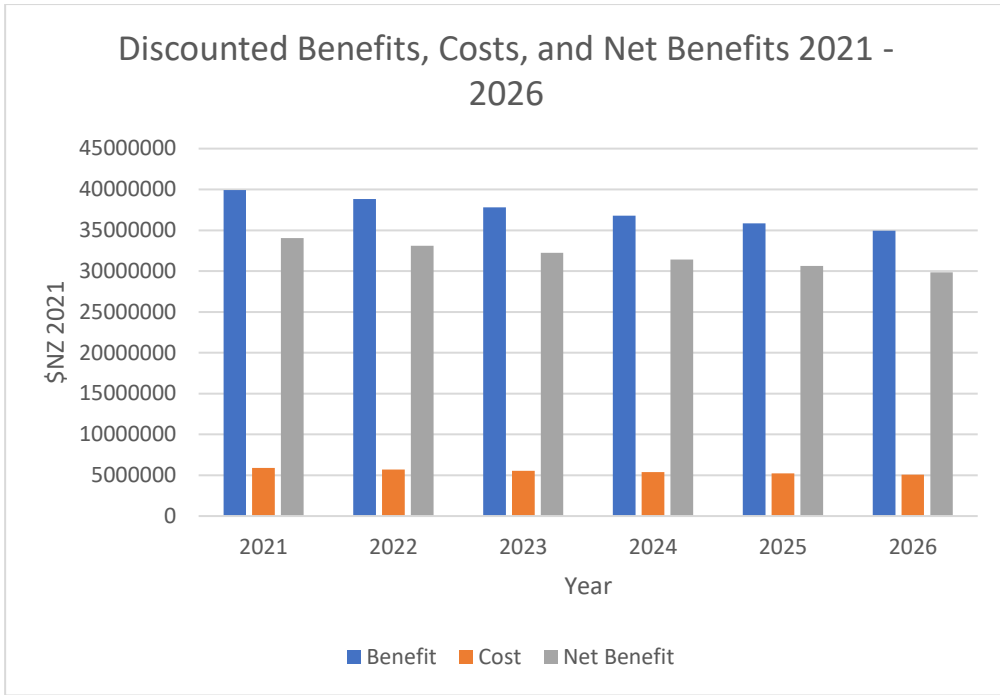


Figure 1: Discounted benefits, costs and net benefits for the NZNEP, 2021-26

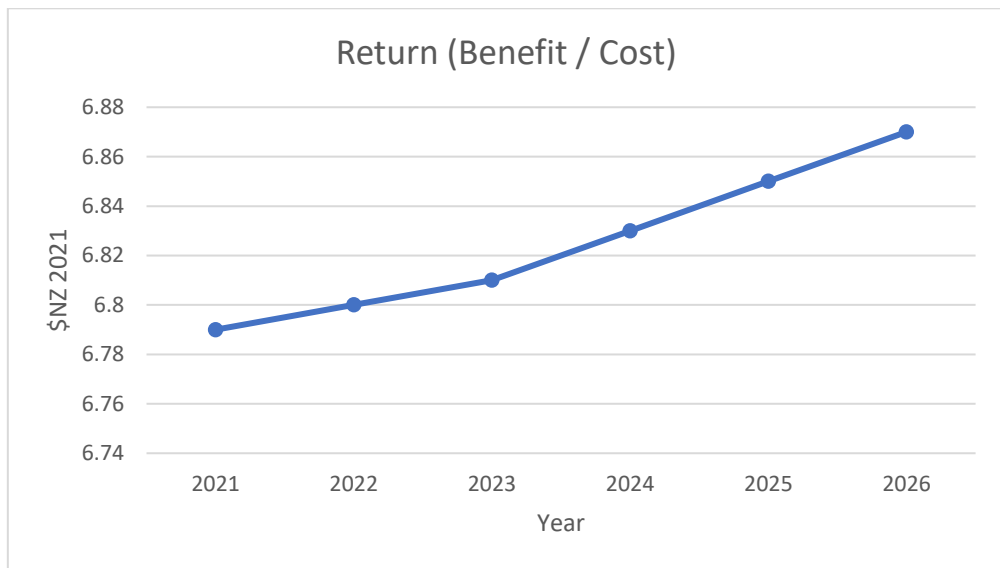


Figure 2: Return (benefit/cost) for the NZNEP, 2021-26

Easily the largest benefit of the NZNEP comes from the prevention of future harms. Our regression models predict that by 2026 almost 4,000 more New Zealanders will have hepatitis C, a virus which is most prevalent among injecting communities. Services like the NZNEP have been estimated to reduce risk of incidence of hepatitis C in international injecting communities by varying amounts up to as high as 76% reduction in Europe (Platt et al., 2017). This suggests the NZNEP could be preventing up to as many as 12600 people from contracting Hepatitis C by 2026. For the sake of this analysis, we have been more conservative with a 40% reduction rate due to the variability of rates from different communities. This would mean the NZNEP will prevent 2600 New Zealanders from being exposed to Hepatitis C by 2026.

Discussion

The key benefits of the NZNEP come from reducing the harm to PWID and reducing the burden on the New Zealand health system. By providing clean, unused needles and syringes (along with other equipment) the NZNEP reduces the sharing and reuse of that equipment which are two factors that greatly increase the risk of contracting bloodborne viruses and non-viral injecting injuries.

Hepatitis B, Hepatitis C, and HIV are the most common bloodborne viruses and can all progress to more serious, chronic illnesses and can eventually cause death. These illnesses put strain on the public health system and cause significant harm to individuals and their families by reducing quality of life and life expectancy. Not only does the NZNEP reduce the transmission of these viruses, but it also encourages PWID to get tested and treated, including providing testing. Diagnosing and treating these viruses sooner gives PWID a better prognosis and reduces the risk of them infecting another person while they are unaware of their HBV, HCV and/or HIV positive status.

The future benefit of reducing transmission of bloodborne viruses is difficult to foresee. Any reduction in transmission today could reduce transmission tomorrow, which continues indefinitely. Modelling of this chain of transmission would be worthwhile research and would increase the accuracy of the benefit's value. In this analysis, only the benefit of that one person not contracting a virus is considered.

Additionally, it is also difficult to predict what treatments and preventions could be developed for these viruses in the future and what effect any of these could have on transmission and prevalence of the viruses. An example of this is the HIV prevention, PrEP, that was publicly funded in March 2018 and therefore made more accessible by reducing the annual cost from \$12,045 pa to \$20 pa (Pharmac, 2018). We found no data on how this change has or will affect the transmission of HIV in New Zealand, but it is likely to reduce incidence. However, this does not greatly affect our analysis as HIV prevalence in the New Zealand injecting community likely remains very low, i.e. it was last estimated at 0.2% in 2013 (Noller & Henderson, 2014), despite a subsequent one-off peak in 2018 (Saxton et al., 2020).

People who inject drugs are at risk of getting skin and soft tissue infections (SSTIs) which need medical intervention. SSTIs can be life threatening and may require surgery and/or hospitalization if allowed to progress. The NZNEP supplying sterile injecting equipment and educating PWID on the importance of clean equipment reduces the risk of these non-viral injection related injuries, the lifetime experience of which have been reported by over 70% of NZ PWID, despite the programme (Noller & Henderson, 2014).

The NZNEP educates PWID on recognising overdoses and treating them. They are currently piloting Naloxone provision which counters an opioid overdose. Giving PWID this education and access to Naloxone reduces the number of people who die during an overdose as their peers can recognise the signs of an overdose and administer Naloxone to the person overdosing (New Zealand Drug Foundation, 2014). This earlier recognition and treatment of overdoses greatly reduces the chance of fatal consequences. Hence, the NZNEP helps to reduce the number of fatal overdoses among PWID.

The NZNEP also educates PWIDs on how injecting drugs can cause individuals to partake in risky sex, particularly 'chemsex', i.e. drug taking combined with sexual activity. Risky sex

may result in physical damage, leading to a sharing of blood and hence the transmission of bloodborne viruses. Knowing more about this risk has the potential to enable PWID to create a safer environment for themselves and may reduce harm from sexual practices. While it is a benefit of the NZNEPs work, it is difficult to quantify how much of the NZNEPs effect on transmission comes from reduced sexual transmission.

While the NZNEP undeniably reduces harm within and around the injecting community, quantifying this is difficult due to the lack of recent, relevant data. There are other benefits of the NZNEP which are even more difficult to quantify such as offering support. The NZNEP prioritises employing people who have previously or currently inject drugs (peers, or people with lived experience of injecting) so that they can offer a non-judgmental service and make PWIDs feel accepted and welcome in their outlets. The NZNEP's peer-based service is recognised as providing mental health benefits to PWID (Hay et al., 2017).

Interestingly, evidence suggests that PWID are 5 times more likely to seek treatment and rehabilitation when accessing needle and syringe services (Platt et al., 2017). It could be worth researching whether less people inject drugs in the community or if PWID inject less often or for less time which could be another benefit of the program.

Despite being called an exchange, the NZNEP does not deny anyone new sterile injecting equipment, regardless of whether they have got used equipment to return. This could lead to more equipment going out than is coming back, which could indicate more needles are out in the community. It would also be worthwhile investigating how many needles are exchanged at the NZNEP and whether there are any costs associated with more needles being out in the community.

Collecting and accessing data on the costs and benefits of the NZNEP is difficult. Ultimately, PWID and their health and privacy are the programme's priority, which makes it difficult to gather data. As most PWID are partaking in (currently) illicit activities, many are not willing to discuss injecting drugs or the costs that come with this.

When people are diagnosed with hepatitis B or hepatitis C, if it is chronic rather than acute, it is not notifiable. Hence, there is no accurate record of how many people in New Zealand have these viruses, let alone how many PWID have them. Additionally, PWID who access emergency services may not talk about how they got their injuries and do not have to. They will receive treatment and be sent home with no record going anywhere about their injury in relation to injecting drugs. The DHBs across New Zealand have different processes and gathering any data from them to collate would be very difficult.

Our total benefits for 2021 are calculated at approximately \$39.9 million compared to the approximately \$6 million in costs. This is roughly \$6.79 in benefits for every \$1 of costs. This is higher than the estimate provided by Aitken in 2002 (i.e. \$3.35, unadjusted) which could be due to more research being available now, more PWIDs in the community, a higher prevalence of hepatitis B and hepatitis C in New Zealand, and/or higher medical costs associated with treatments. This research implies that the NZNEP is even more important now than it was 20 years ago.

We are, therefore, confident in saying the NZNEP is worthwhile and provides a long-lasting benefit for the community.

Future Analysis

In the future, there are several things that could be done to improve on the analysis above. The scope of the analysis was made very narrow due to difficulty finding relevant information. Additional research to target these data gaps would be very beneficial. The cost-benefit analysis spreadsheet can be updated as more accurate data are collected.

Platt and colleagues (2017) suggest PWID could be five times more likely to access rehabilitation services if they access a needle and syringe service. Research on how needle and syringe programs affect rehabilitation uptake, frequency of injecting, and the number of people who inject drugs regularly would give greater insight into how far reaching the benefits of the NZNEP are.

Future surveys of NZNEP clients could explore whether they are getting the support they want or need from the programme. Such a survey could also ask for service quality feedback as well as information on other services they have accessed or been referred to. This support is an important element of the NZNEP and should be factored into future analysis.

A research scheme with some hospitals and general practices into SSTIs, how often they occur, and whether the person with the SSTI is reusing needles would also be beneficial.

One potential consequence we identified was an increase in the supply of needles in the community. The NZNEP has data on the weight of material being returned but it is difficult to determine the exact amount of equipment being returned. It would be good to quantify this as there could be a social cost associated with increased public supply.

A more comprehensive model of the incidence and prevalence of each of the bloodborne viruses and how the NZNEP affects these rates in New Zealand could make the benefits section more accurate. We have only considered the initial person who was prevented from getting a virus, not the flow on effect of this person not being able to transmit the virus to other people (e.g. Fu et al., 2016). If additional transmissions were also considered, the benefit is likely to be much higher.

Subsequent medical advancements should be taken into consideration when predicting the prevalence of bloodborne viruses in the future as a preventative drug becoming readily available could significantly reduce the transmission of viruses (such as the new HIV prevention PrEP, and the new direct acting antiviral HCV drugs - DAAs). These may significantly reduce transmission, reducing the benefit of the NZNEP if such medications were to become universally taken up.

Summary

From the research and data analytics, it is clear the services provided by the NZNEP are immensely valuable. From the cost-benefit analysis, the benefits provided by the NZNEP over the year 2021 come to a significant \$39,912,538.72. This means for every \$1 the NZNEP spends, they create \$6.79 of benefits. This shows the NZNEP is an efficient and cost-effective programme to alleviate potential costs on the medical system and our community. Beyond the direct benefits, the NZNEP services provide externalities such as support systems, other minor medical advice, and rehabilitation guidance, creating additional benefits to the wider community.

From this analysis, it is evident the NZNEP is worthwhile and the benefits per dollar spent indicates the gain from investing in the NZNEP, which provides a long-lasting benefit for the community.

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Appendix 1: Other Relevant Research

Internationally, prevalence rates for HIV among injecting users are around 13%. In New Zealand, due largely to the early introduction of needle exchange and the work of the programme, prevalence rates are very low at 0.2%. People injecting drugs are the most affected by hepatitis C with a national antibody prevalence of 59%, and regional variance as high as 84%. According to the 2013 Seroprevalence study, 69% of people injecting drugs report using a new needle every time (Noller & Henderson, 2014).

Appendix 2: Data Tables for Viruses

Hepatitis B

Table 5: Hepatitis B estimates in New Zealand

Figure	2020 estimate	2021 estimate	R squared
DALY	2317.396	23	0.99356
Death	86.6	86.3	0.99342
Incidence	8361	8261	0.98048
Prevalence	41527	41652	0.82526
YLD	58.7	58.6	0.99554
YLL	2259	2234	0.99338

Note: Estimates from regression of data since 2000

Only acute cases of hepatitis B are notifiable in NZ. Only 5-10% of acute cases cannot be fought off by the immune system and progress to chronic hepatitis B. This chronic condition is where the main costs of hepatitis B come in.

Regression of data from the Global Burden of Disease predicts the following:

Table 6: Regression of data of hepatitis B

	2020	2021	2022	2023	2024	2025	2026
Incidence	8360.517	8260.615	8172.058	8095.493	8031.508	7980.643	7943.392
Deaths	86.61667	86.32809	85.72209	84.78979	83.52309	81.91458	79.95744

Note: Prevalence was not included due to a low R squared value

We estimate that 41,652 people have hepatitis B (R squared = 0.825) in New Zealand with a yearly incidence of 8621 (R squared = 0.980). Evidence suggests that needle exchange programs in other countries reduce the incidence of hepatitis B by 20% which is what we have used to estimate the value of this benefit from the NZNEP (Platt et al., 2017). This could be different in New Zealand depending on how many of the people with hepatitis B are injecting drugs. The average cost of incidence of hepatitis B in New Zealand in 2021 is \$5138.85 per person, including those whose immune systems fight off the virus. The total value of this benefit of the NZNEP, the reduction in transmission of hepatitis B, for 2021 is \$10,612,515.35.

Hepatitis C

Table 7: Hepatitis C estimates in New Zealand

Figure	2020 estimate	2021 estimate	R squared
DALY	4557	4601	0.99662
Death	213	216	0.99611
Incidence	2142	2163	0.99382
Prevalence	35869	36406	0.99218
YLD	80.2	81.8	0.99924
YLL	4477	4519	0.99644

Note: Estimates from regression of data since 2000

Only acute cases of Hepatitis C are notifiable in NZ.

Table 8: Regression of data of hepatitis C

	2020	2021	2022	2023	2024	2025	2026
Incidence	2141.952	2162.859	2184.088	2205.681	2227.678	2250.115	2273.027
Prevalence	35869.26	36406.26	36978.49	37587.44	38234.43	38920.69	39647.35
Deaths	212.9221	215.9109	218.6272	221.0605	223.2011	225.0403	226.5698

We estimate that 36,406 people have hepatitis C (R squared = 0.992) in New Zealand with a yearly incidence of 2163 (R squared = 0.993). Evidence suggests that needle exchange programs in other countries reduce the incidence of hepatitis C by anywhere up to 76% (Platt et al, 2017). We used 40% to estimate the value of this benefit from the NZNEP due to the variability of results internationally as we were unable to find a significantly comparable community. Information from the NZNEP states that more than half of all PWID have hepatitis C antibodies (i.e. have been exposed to the virus; Noller & Bourke, 2020; Noller & Henderson, 2014). The average cost of incidence of hepatitis C in New Zealand in 2021 is \$12,320 per person (Davis et al., 2011), including those whose immune systems fight off the virus. The total value of this benefit of the NZNEP, the reduction in transmission of hepatitis C, for 2021 is \$17,764,281.92.

HIV

Table 9: HIV estimates in New Zealand

Figure	2020 estimate	2021 estimate	R squared
DALY	525	481	0.48084
Death	6.76	5.48	0.51490
Incidence	155	155	0.98909
Prevalence	2709	2854	0.99992
YLD	222	235	0.99790
YLL	304	246	0.57975

Note: Estimates from regression of data since 2000

Data from Pharmac New Zealand shows that 2828 people were living with HIV in New Zealand in June 2020 which is between our estimates for 2020 and 2021.

From March 1st, 2018, HIV prevention pill publicly funded by the New Zealand government. This reduced the price from \$33 per day to \$5 per three months, i.e. \$12,045 pa to \$20 pa. Depending on the uptake of this drug, prevalence and incidence in New Zealand may be rapidly declining as the government's goal is to make New Zealand HIV free. Therefore, the predictions above and below may be inaccurate.

Table 10: Regression of data of HIV

	2020	2021	2022	2023	2024	2025	2026
Incidence	155.0516	155.4939	155.0009	153.5423	151.0903	147.6195	143.1067
Prevalence	2708.695	2854.142	3004.325	3159.191	3318.695	3482.794	3651.449

Note: Deaths was not included as R squared is too low

We estimate that 2854 people have HIV/AIDS (R squared = 1.00) in New Zealand with a yearly incidence of 155 (R squared = 0.989). We used 5% to estimate the value of this benefit from the NZNEP as HIV is not as prevalent in the New Zealand injecting community as it is overseas. The average cost of incidence of HIV in New Zealand in 2021 is \$8,559.10 per person (Boubouchairopoulou et al., 2014), including those whose immune systems fight off the virus or are on prevention pills. The total value of this benefit of the NZNEP, the reduction in transmission of HIV, for 2021 is \$70,046.73.

Appendix 3: Costs from the Treasury CBAX Tool

Table 11: Costs of Services

Description	Cost (2021 NZ\$)
25% of average annual income - total	\$12,502 per year
100% of average annual income - total	\$50,007 per year
Inpatient hospital visit	\$5,200 per visit
Outpatient hospital visit	\$362 per visit
Intensive care unit	\$5,687 per day
Emergency room	\$383 per visit
Specialist visit (initial)	\$362 per visit
Specialist (subsequent)	\$259 per visit
Specialist (per hour)	\$155 per hour
Practice nurse visit	\$41 per visit
Home nurse visit	\$103 per visit
Hospital nurse	\$57 per hour
Community services nurse	\$57 per hour
GP visit (20 minutes) - publicly funded	\$83 per visit
GP visit (20 minutes) - privately funded	\$83 per visit
Hospital pharmacist	\$57 per hour
Marginal value of health care savings - avoided cardiovascular disease	\$7,579 per year
Ambulance call out	\$800 per incident
Cost per hour of police time	\$101 per hour
Quality-adjusted life year (QALY) gained	\$32,258 per year
Value of a statistical life	\$4,560,000
Being unemployed	\$68,728 per year
Mental health for every 1 point change (improvement) (0-100 scale)	\$4,582 per year
Physical health for every 1 point change (improvement) (0-100 scale)	\$1,152 per year
Having access to general help for every 1 point change (0-4 scale)	\$5,772 per year
Feeling lonely for every 1 point change (increase) (0-4 scale)	\$17,534 per year
Gaining a friend (for every friend gained)	\$589 per year
Adult - regular volunteering (weekly)	\$581 per year

Appendix 4: Graphs of Regressions

Using data from the Global Burden of Disease database from the Global Health Data Exchange, regressions were done to predict the prevalence, incidence, deaths, disability adjust life years (DALY), years lived with disability (YLD), and years of life lost (YLL) for Hepatitis B, Hepatitis C, and HIV. These are the graphs of the regression models that we used to predict 2020 – 2026 values. Most models fit the data well, but some did not. The ones that did not fit were not necessary for the analysis and were made for interest. The models are grouped by virus.

