

2017 Estimates and Projections of the Hepatitis C Virus Epidemic in NSW: Summary Report

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2017 Estimates and Projections of the Hepatitis C Virus Epidemic in NSW:

Summary Report

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1. Introduction and Key Findings

This report summarises key findings from mathematical modelling undertaken in 2016-17 to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in NSW over 2016-2030. The research was undertaken by the Kirby Institute, in collaboration with the Center of Disease Analysis (CDA), with funding from NSW Health, as part of the BBV & STI Research, Intervention and Strategic Evaluation Program (BRISE), and the Australian Government.

We used an existing model developed by the CDA, which is currently being used by many countries around the world including Australia (<http://centerforda.com/>). In this model, we used the most recent and robust local data sources including estimates for the uptake of direct-acting antiviral (DAA) drugs for the treatment of HCV since their listing on the Pharmaceutical Benefits Scheme (PBS) in March 2016. Previous studies have validated the model's demographic, epidemiological, and clinical outputs for the Australia population and the model provides annual estimates for the HIV, Viral Hepatitis and Sexually Transmitted Infections in Australia; Annual Surveillance Report.

We applied this model separately to each jurisdiction in Australia and each local health district (LHD) within NSW. We assumed investment in primary prevention is maintained with current harm reduction strategies and HCV testing strategies continuing to ensure treatment can be accessed by people at high-risk of HCV infection. Due to a lack of population movement data, we also assumed there was no net migration of people living with chronic HCV between jurisdictions and between LHDs.

The coverage of HCV treatment is a key input in the model. At the end of 2015, an estimated 227,310 people in Australia were living with HCV with 80,700 living in NSW. In 2016, an estimated 32,400 people with HCV initiated DAA treatment with 35% of those people initiating treatment in NSW (based on 10% PBS sample provided by Prospecion, accessed end June 2017). From March to December 2016, the number of people dispensed DAA in Australia decreased from 4,500 in March to 1,750 in December (Prospecion 10% PBS sample). This suggests that the initial treatment wave after the first few months might have plateaued. Therefore, we project three treatment roll-out scenarios for Australia:

Pessimistic scenario: treatment number drops markedly; 32,400 (2016), 18,500 (2017), 13,900 (2018), then 13,900 each year (2019-2030)

Intermediate scenario: treatment number drops moderately; 32,400 (2016), 27,800 (2017), 23,100 (2018), then 18,500 each year (2019-2030)

Optimistic scenario: treatment number of 32,400 continues each year 2016-2030

For comparison purposes, we also ran a pre-DAA PBS listing scenario where the number treated remains at the 2015 level ($n=7,300$) and new HCV infections are held constant until 2020. Treatment rates initially varied by disease stage (higher for advanced fibrosis), but were assumed uniform across HCV transmission risk level sub-populations. We ran separate models for NSW, and for each LHD using the pessimistic, intermediate, and optimistic treatment scenarios with a DAA distribution as reported under the PBS (post PBS listing for March-December 2016; Table 1.1).

Table 1.1 Estimated percentage of all DAA treatments in NSW initiated in each LHD

	DAA treatment initiated (% of all people treated in NSW)
South Eastern Sydney	11.8%
Sydney	11.9%
South Western Sydney	10.9%
Hunter New England	12.3%
Northern NSW	10.0%
Western Sydney	7.2%
Northern Sydney	6.2%
Mid North Coast	5.7%
Illawarra Shoalhaven	6.2%
Central Coast	4.6%
Southern NSW	3.1%
Western NSW	3.8%
Nepean Blue Mountains	3.0%
Murrumbidgee	2.8%
Far West	0.4%

Notes: Percentage estimated using PBS Highly Specialised Drugs Programme data for the Treatment of HCV during 1 March to 31 December 2016 provided by NSW Ministry of Health. The estimated number treated in each LHD from 2016 onwards was calculated using these percentages and overall number treated in NSW. The overall number treated in NSW during 2016 was estimated to be 11,400 using the 10% PBS sample data to the end of June 2017 provided by Prospection.

For each region and scenario, the model estimates the prevalence and incidence of chronic HCV, the number of cases of cirrhosis, the number of cases of hepatocellular carcinoma (HCC), the number of liver-related deaths, and the number of people who achieve a sustained virologic response (SVR) after treatment (Figure 2.1). We also estimated the year NSW and each LHD will achieve the three World Health Organization (WHO) elimination targets (80% reduction in new chronic infections, 80% of eligible treated, and 65% reduction in HCV-related deaths by 2030 compared to 2015) (Table 2.4) and what level of DAA roll-out would be required for each LHD to meet these targets by 2028 (Table 2.5).

In this summary report, we present the results for the NSW population overall and for each LHD separately in individual standalone summary reports of 2 pages. We provide results as a best estimate with a 95% confidence interval. We emphasize the potential impact of population movement needs to be considered when interpreting these results. Further details of this work can be obtained by contacting Dr. Richard Gray (Rgray@kirby.unsw.edu.au).

Key Findings

- In 2016, we estimate there were 227,310 people living with chronic HCV in Australia and 80,700 people living with chronic HCV in NSW.
- Pharmaceutical Benefits Scheme data (to March 2017) suggests at least 32,400 individuals were treated during 2016 in Australia with an estimated 35% of those who initiated treatment living in NSW.
- Over March-December 2016 we estimated 11,400 people in NSW initiated HCV direct-acting antiviral (DAA) treatment giving a treatment coverage of 14% of all people living with chronic HCV.
- Of the people living with chronic HCV in each LHD, we determined what proportion has been dispensed treatment in that LHD (treatment dispensing coverage). Across LHDs treatment dispensing coverage in 2016 varied between 9% in Western Sydney and 25% in Mid North Coast (Table 2.4).
- We estimate, that by 2030 under the intermediate treatment scenario, the roll-out of new DAA treatment in NSW will result in a substantial decline (overall and across all LHDs) in:
 - People living with chronic HCV (75-100% reduction)
 - HCV incidence (77-100% reduction)
 - Associated liver mortality (33-100% reduction)
- Under the intermediate treatment scenario, NSW could meet all the WHO elimination targets by 2026 (defined as 80% reduction in HCV incidence, 80% eligible treated, and 65% reduction in deaths). To achieve this NSW will need to initiate 500-1000 people living with HCV on DAA treatment each month until the targets are met.
- NSW would meet elimination targets in the year 2031 under the pessimistic treatment scenario and in the year 2023 under the optimistic treatment scenario.
- Low treatment dispensing coverage in Western Sydney and South Eastern Sydney (9%) in 2016 could result in a substantial number of people living with chronic HCV in 2030—more than the equivalent scenarios for NSW and Australia overall. This reflects a potential mismatch between the initial distribution of DAA treatment across NSW and chronic HCV prevalence. The assumption of no population movement should be considered when interpreting these results.
- Our results suggest the current treatment uptake across LHDs is suboptimal which could lead to delays in achieving the WHO targets particularly for the LHDs with low treatment coverage.
- All but four LHDs will meet the WHO targets by 2028 under the intermediate scenario. South Eastern Sydney, South Western Sydney, Western Sydney and Nepean Blue Mountains could meet the WHO targets by 2028 if DAA treatment roll-out increased by 55%, 20%, 48%, and 38% respectively.
- The roll-out of DAAs needs to be increased or at least maintained at current treatment dispensing coverage level to ensure WHO targets are met in the shortest time in each LHD and NSW overall.

2. NSW

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in NSW over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in NSW (Table 2.1) based on the estimated number treated in 2016 from Pharmaceutical Benefits Scheme (PBS) data.

Table 2.1 Scenarios for the annual number of people in NSW receiving DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	2,570	11,400	6,510	4,890	4,890
Intermediate roll-out	2,570	11,400	9,770	8,140	6,510
Optimistic roll-out	2,570	11,400	11,400	11,400	11,400

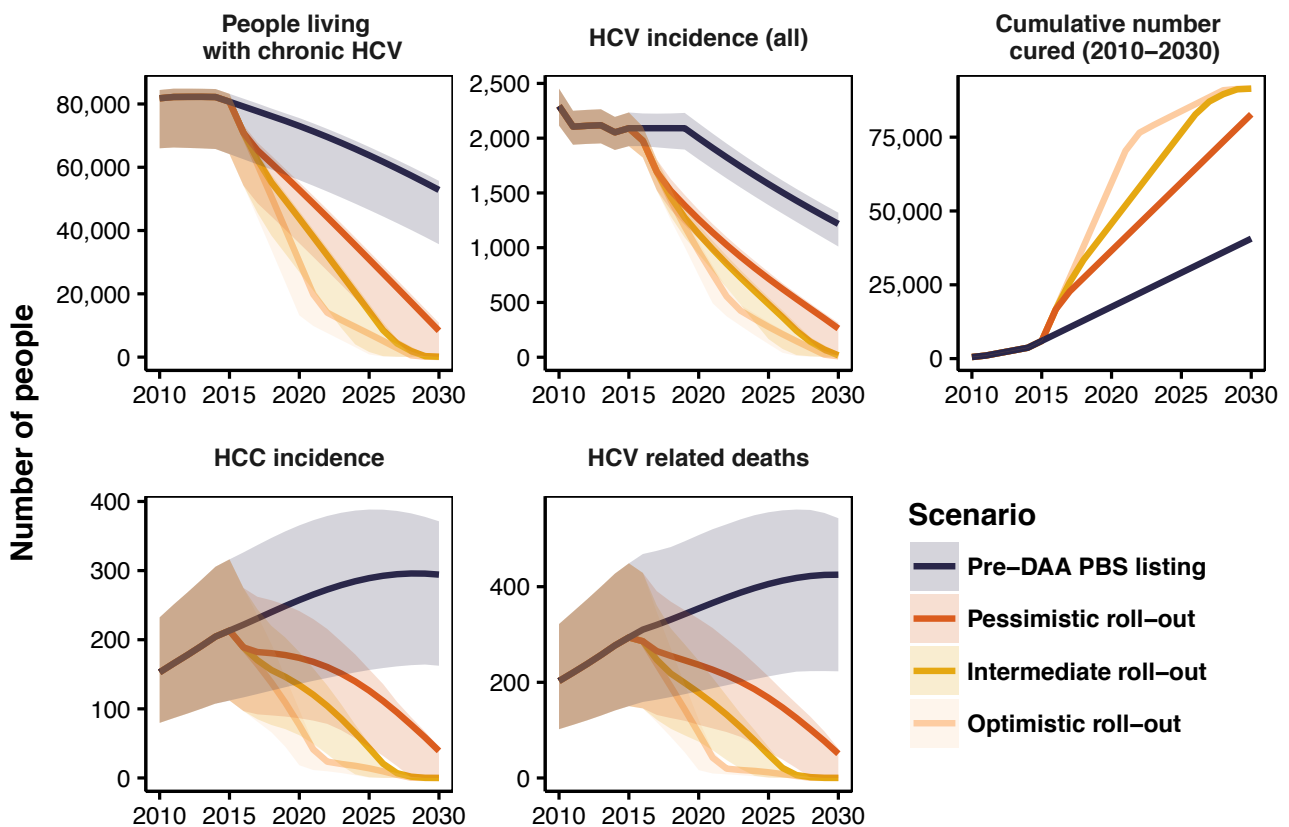
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA PBS listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections for key indicators of HCV in NSW over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within NSW due to DAA treatment roll-out (Figure 2.1).

Figure 2.1 Annual change in key HCV and hepatocellular carcinoma indicators in NSW (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 14% of people living with chronic HCV have initiated DAA treatment in NSW.

Table 2.2 and figure 2.2 show the projected change in HCV epidemiology in NSW due to DAA treatment roll-out.

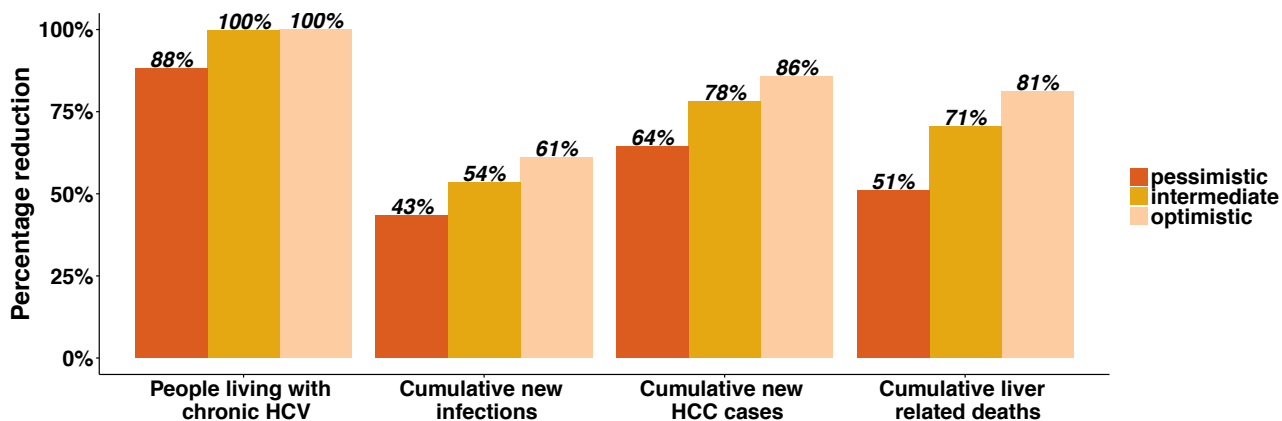
Table 2.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	80,700 (64,150 – 83,200)	8,330 (70 – 10,820)	120 (30 - 220)	60 (20 - 100)
New infections (all)	2,090 (1,930 – 2,230)	260 (10 – 310)	20 (2 – 40)	9 (2 – 10)
Chronic HCV prevalence	1.1% (0.8% - 1.1%)	0.1% (0.0% - 0.1%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0 - F3 ¹	73,710 (52,070 – 84,300)	7,030 (70 – 9,580)	120 (20 – 210)	60 (20 – 100)
Cirrhosis (F4)	6,020 (3,320 – 8,870)	1,110 (0 – 1,390)	0 (0 – 2)	0 (0 – 1)
Decompensated cirrhosis	540 (240 – 930)	80 (0 – 120)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	210 (110 – 320)	40 (0 – 40)	0 (0 – 0)	0 (0 – 0)
Annual liver related deaths	290 (150 – 450)	50 (0 - 60)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	25,870 (23,010 – 27,690)	14,660 (13,380 – 17,700)	12,020 (11,090 – 15,310)	10,100 (9,810 – 13,280)
New HCC cases	4,060 (2,180 – 5,550)	2,030 (950 – 2,980)	1,240 (610 – 2,010)	810 (450 – 1,430)
Liver-related deaths	5,700 (2,960 – 7,900)	2,790 (1,250 – 4,210)	1,680 (810 – 2,800)	1,070 (600 – 1,960)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 2.2 Predicted relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects NSW will meet the WHO elimination targets by 2026 in the intermediate scenario and by 2023 in the optimistic scenarios (Table 2.3).

Table 2.3 Estimated year NSW meets targets compared to pre-DAA scenario

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2029	2026	2023
80% of people living with chronic HCV treated	2029	2025	2022
65% reduction in HCV-related deaths	2028	2024	2020

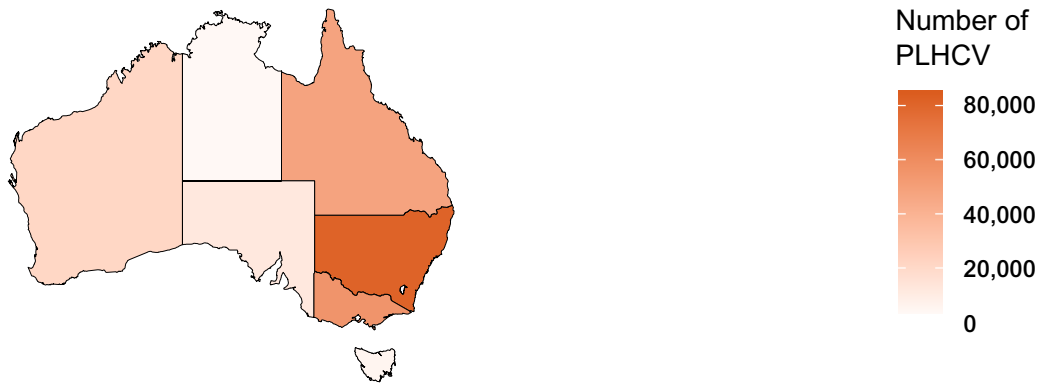
Note: Treatment roll-out scenarios are presented in Table 2.1

Projected HCV Epidemiology in NSW and each LHD

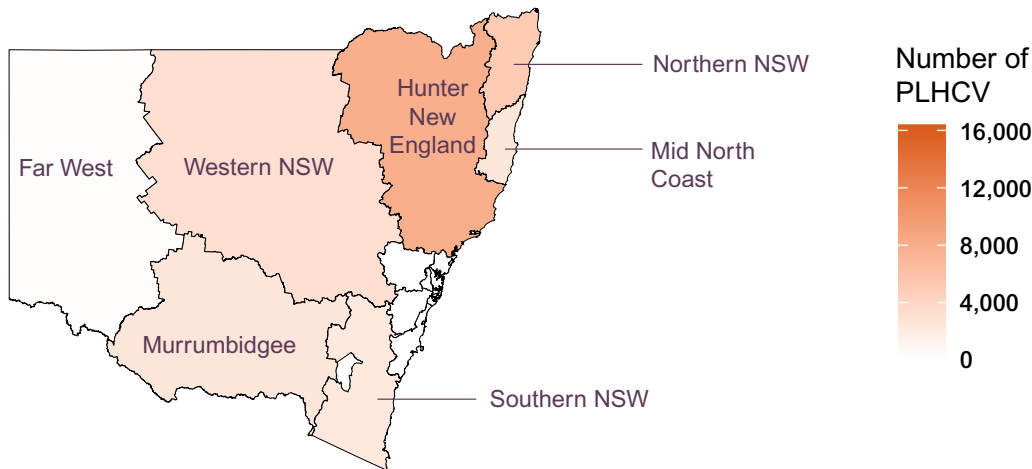
We ran separate models for each Local Health District (LHD) using the pessimistic, intermediate and optimistic treatment scenarios with the number of treatments distributed according to the 2016 DAA distribution reported to the PBS (Table 1.1). The resulting epidemiology for each LHD reflects the variations in initial treatment dispensing coverage (Table 2.4). For comparison, we also ran a separate national model for each jurisdiction and Australia overall.

Figure 2.3 The distribution of chronic HCV (based on location at diagnosis) across Australia and within NSW LHDs in 2015

States and territories



Rural and Regional LHDs



Zoom of metro LHDs

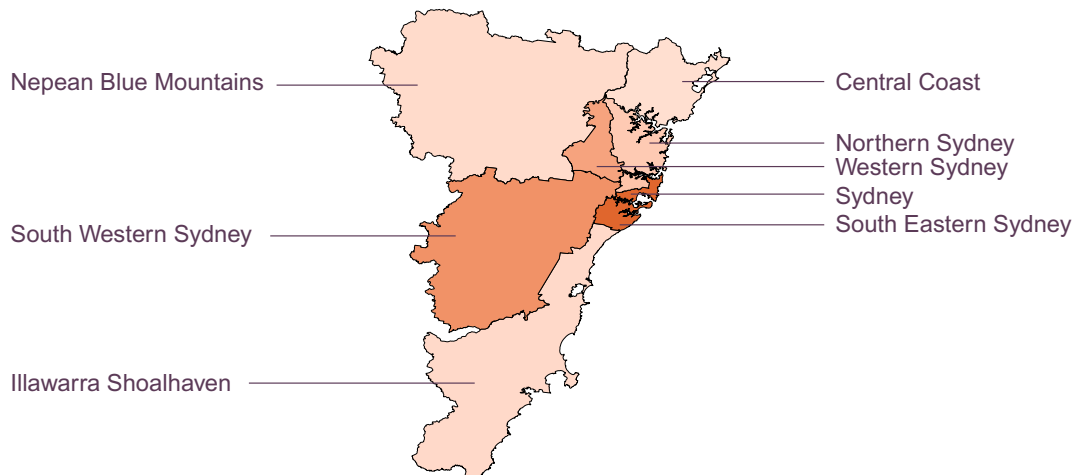


Table 2.4 provides a summary of key HCV indicators and projections for each LHD in NSW and for Australia overall (estimates for the intermediate scenario). All results and ranges for each LHD are provided in separate sections.

Summary of estimates and projections across NSW

From the estimates for the intermediate scenario:

- At end of 2015, 36% of all people living with chronic HCV in Australia are in NSW.
- NSW treatment DAA coverage in 2016 is similar with the Australian coverage overall (14.1% VS 14.3%) meaning that both NSW and Australia reach the WHO targets by 2026.
- All LHDs will see a substantial decline in people living with chronic HCV, incidence and associated liver morbidity.
- Treatment coverage varies between 9% in Western Sydney and 25% in the Mid North Coast compared to an overall coverage of 14% in NSW.
- Low treatment dispensing coverage in Western Sydney and South Eastern Sydney (9%) could result in a substantial number of people living with chronic HCV in 2030—more than the equivalent scenarios for NSW and Australia overall. The assumption of no population movement should be considered when interpreting these results.
- If the current treatment roll-out is maintained, treatment coverage across LHDs would reflect a misallocation of treatment resulting in delays in achieving the WHO targets particularly for the LHDs with the low treatment coverage (9%).
- The roll-out of DAAs needs to be increased or at least maintained at current treatment dispensing coverage level to ensure WHO targets are met in the shortest time in each LHD and NSW overall.

Table 2.4 Summary results for NSW Local Health Districts (Intermediate scenario only; rounded to nearest 10)

Region	2015 Estimates			Initial DAA coverage (2016)	2030 Projections			From end of 2015 to 2030			WHO Targets			
	People living with chronic HCV	New infections	New HCC cases		Annual liver-related deaths	People living with chronic HCV	New infections	New HCC cases	Annual liver-related deaths	Cumulative new infections (all)	Cumulative new HCC cases	Cumulative liver-related deaths	Incidence (80% reduction)	Treatment (80% of eligible on treatment)
South Eastern Sydney	15,040	380	40	50	3,720	80	20	30	2,960	490	670	2030	2032	2032
Sydney	5,850	160	10	20	10	2	0	0	790	30	50	2025	2021	2019
South Western Sydney	10,770	280	30	40	470	30	1	2	2,000	230	310	2029	2028	2026
Hunter New England	8,000	210	20	30	10	2	0	0	1,120	80	110	2025	2023	2021
Northern NSW	5,110	140	10	20	9	1	0	0	670	30	50	2024	2021	2019
Western Sydney	9,070	230	20	30	2,300	50	10	20	1,860	270	380	2031	2032	2032
Northern Sydney	5,210	140	10	20	20	4	0	0	880	80	110	2027	2026	2024
Mid North Coast	2,660	70	7	10	10	3	0	0	370	20	20	2025	2022	2018
Illawarra Shoalhaven	4,000	100	10	10	20	5	0	0	600	40	50	2026	2023	2021
Central Coast	3,430	90	9	10	40	5	0	0	560	40	60	2026	2024	2022
Southern NSW	2,190	60	6	8	7	1	0	0	340	20	40	2026	2024	2022
Western NSW	3,100	80	8	10	9	1	0	0	500	50	60	2027	2025	2023
Nepean Blue Mountains	3,580	90	10	10	720	20	3	4	720	100	140	2030	2031	2030
Murrumbidgee	2,450	60	7	9	20	3	0	0	430	40	60	2028	2026	2024
Far West	240	6	1	1	3	0	0	0	30	2	5	2025	2022	2022
NSW	80,700	2,090	210	290	120	20	0	0	12,020	1,240	1,680	2026	2025	2024
Australia	227,310	5,900	610	830	154	18	0	0	32,380	3,750	5,200	2026	2025	2024

Note: numbers for each LHD do not add up to the NSW estimates because separate models were run for each LHD with the LHD treatment coverage for 2016.

Table 2.5 LHD Targets - Progress and treatment requirements to meet WHO targets by 2028 for each NSW Local Health District. The assumption of no population movement should be considered when interpreting these results.

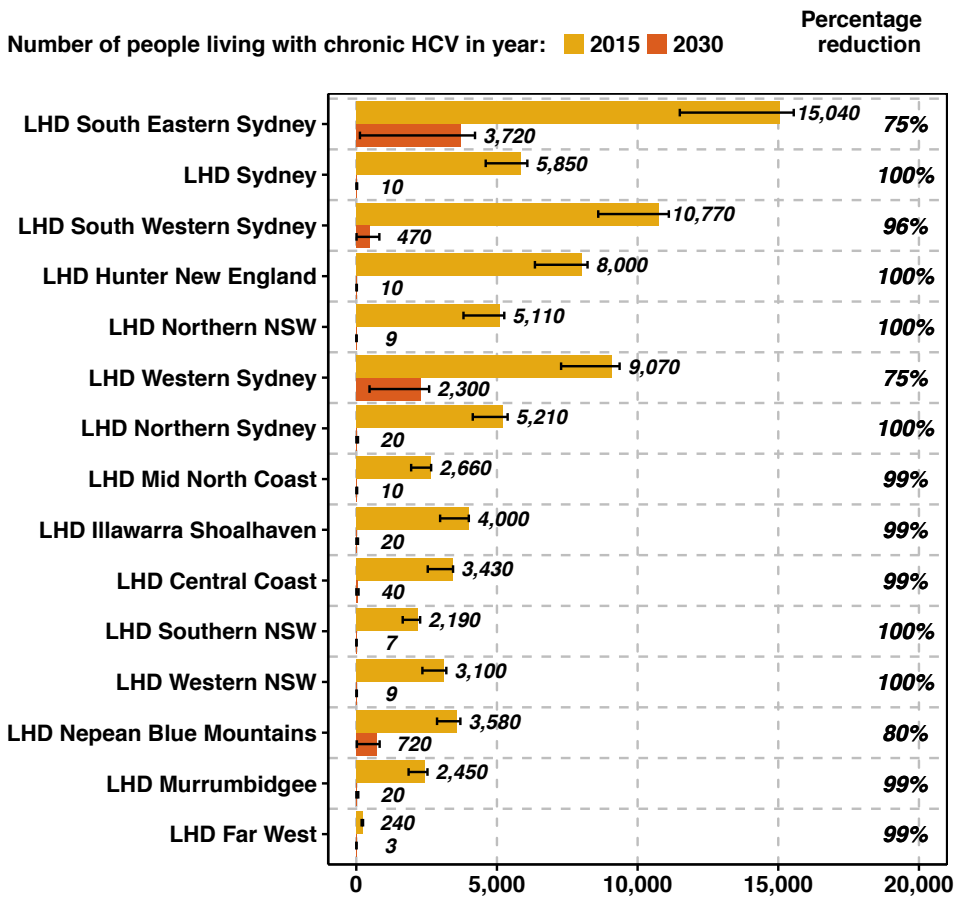
LHD	Number of people to treat to meet targets by 2028 ²				
	On track	2017/18	2018/19	From-2019/20	Change from intermediate roll-out ¹
South Eastern Sydney	No	1,640	1,340	1,190	Increase by 55%
Sydney	Yes	1,070	880	780	Maintain
South Western Sydney	No	1,170	960	850	Increase by 19%
Hunter New England	Yes	1,110	910	800	Maintain
Northern NSW	Yes	900	740	650	Maintain
Western Sydney	No	960	780	700	Increase by 48%
Northern Sydney	Yes	560	460	410	Maintain
Mid North Coast	Yes	520	420	370	Maintain
Illawarra Shoalhaven	Yes	550	450	400	Maintain
Central Coast	Yes	410	340	300	Maintain
Southern NSW	Yes	280	230	200	Maintain
Western NSW	Yes	340	280	250	Maintain
Nepean Blue Mountains	No	380	310	270	Increase by 41%
Murrumbidgee	Yes	250	200	180	Maintain
Far West	Yes	40	30	30	Maintain
NSW	Yes	9,000	7,360	6,510	Maintain
Australia	Yes	25,575	20,925	18,510	Maintain

Notes:

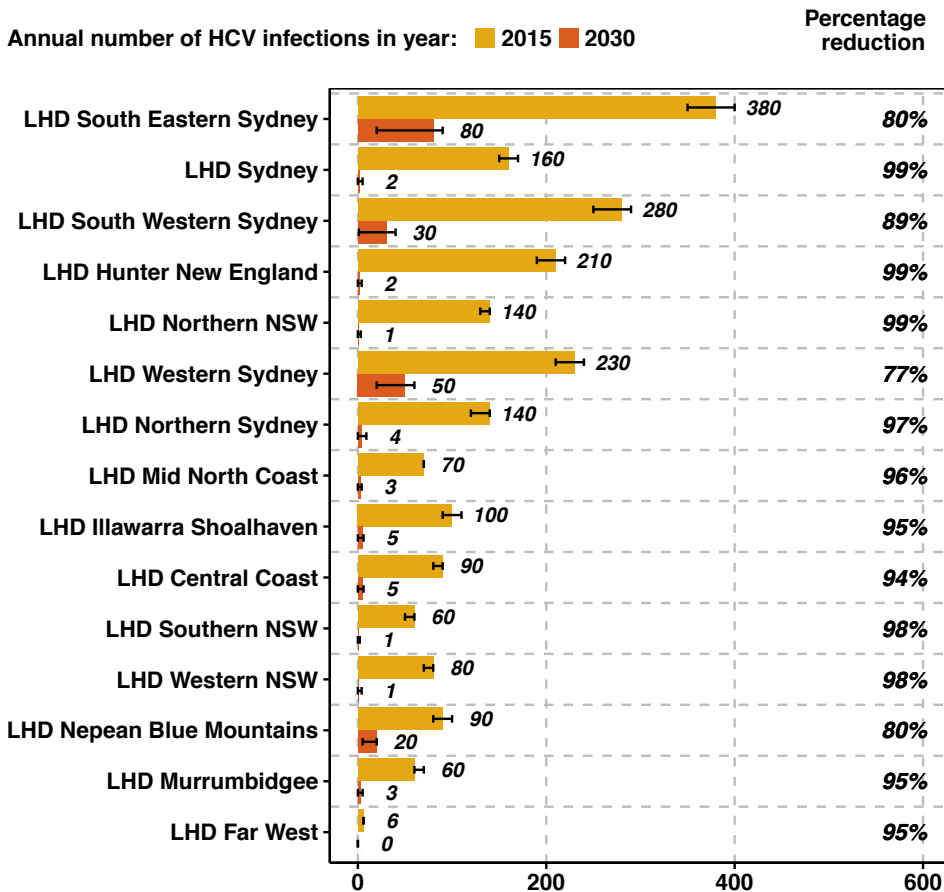
- 1 The change from current roll-out shows the % increase of the number of people receiving DAA from 2017 onwards (from the intermediate scenario) to meet WHO HCV elimination targets by 2028.
- 2 Current intermediate treatment scenario for each LHD available in the associated LHD section. The calendar year number of people to treat was converted to financial year by calculating mean of the population in consecutive calendar years.

Figure 2.4 Summary results for NSW Local Health Districts (Intermediate scenario only)

A



B



NSW

3. South Eastern Sydney LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the South Eastern Sydney LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in South Eastern Sydney (Table 3.1) based on the estimated number of individuals dispensed HCV DAA treatment (Table 1.1).

Table 3.1 Scenarios for the annual number of people in South Eastern Sydney initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	300	1,350	770	580	580
Intermediate roll-out	300	1,350	1,150	960	770
Optimistic roll-out	300	1,350	1,350	1,350	1,350

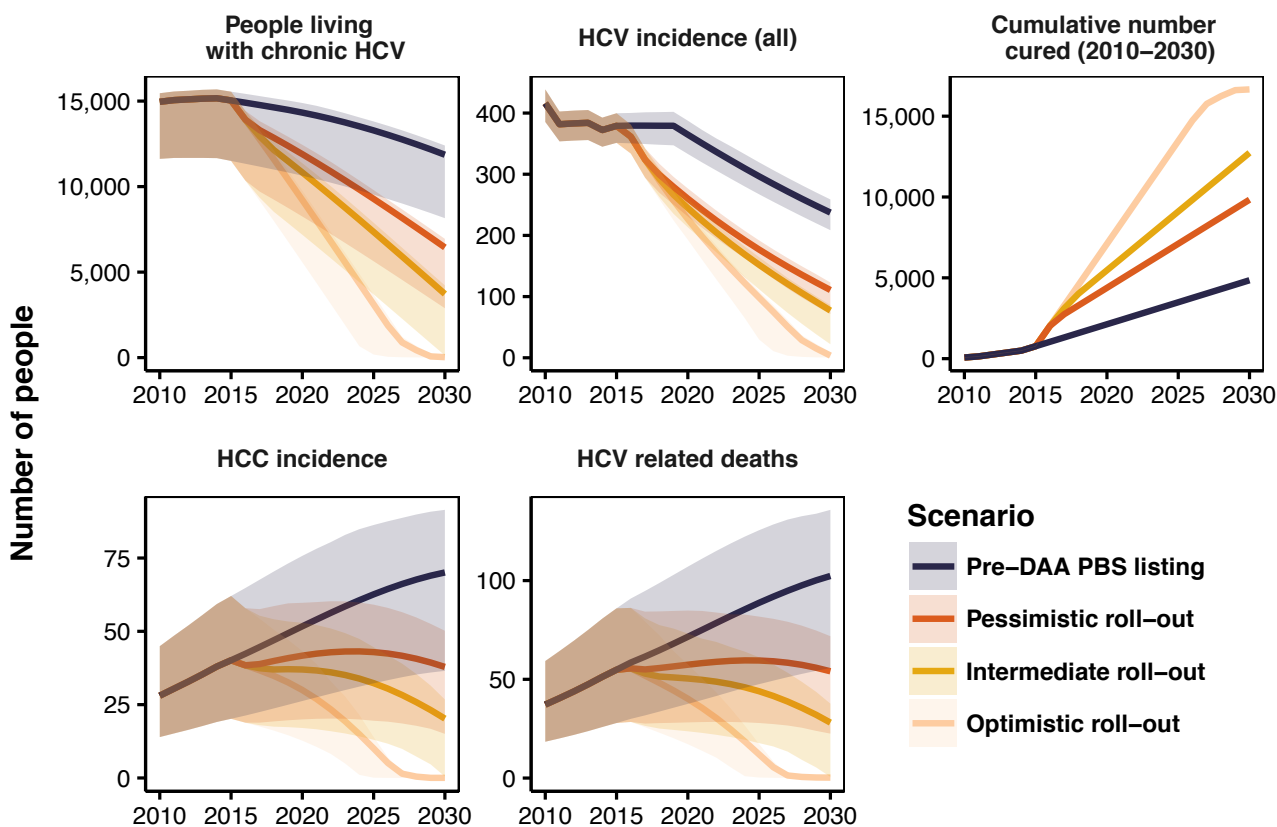
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in South Eastern Sydney over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within South Eastern Sydney due to DAA treatment roll-out (Figure 3.1).

Figure 3.1 Annual change in key HCV and Hepatocellular carcinoma indicators in South Eastern Sydney (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 9% of people living with chronic HCV have initiated DAA treatment in South Eastern Sydney. Table 3.2 and Figure 3.2 show the projected change in HCV epidemiology in South Eastern Sydney due to DAA treatment roll-out.

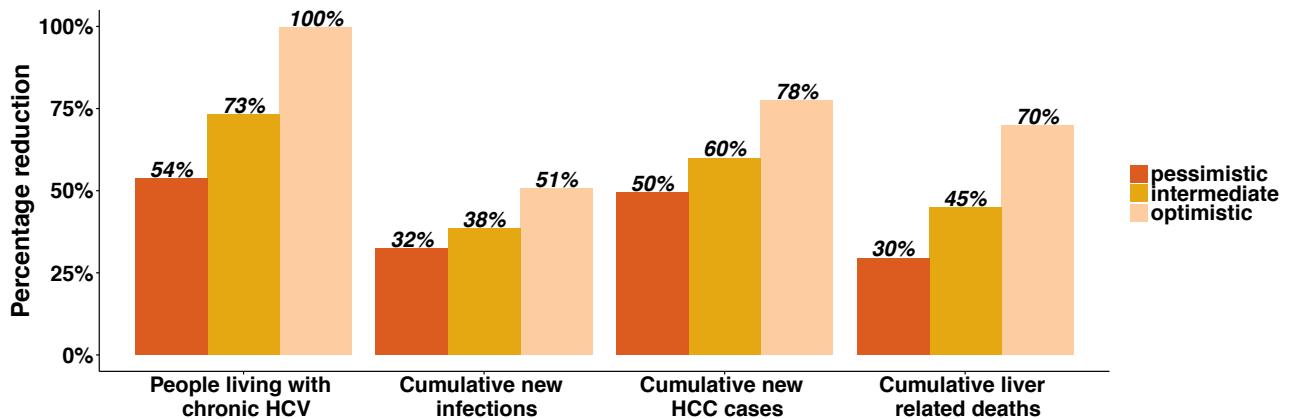
Table 3.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	15,040 (11,500 – 15,550)	6,440 (2,890 – 6,940)	3,720 (130 – 4,220)	30 (10 – 50)
New infections (all)	380 (350 – 400)	110 (70 – 120)	80 (20 – 90)	4 (0 – 9)
Chronic HCV prevalence	1.7% (1.3% - 1.7%)	0.6% (0.3% - 0.7%)	0.4% (0.0% - 0.4%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	13,720 (9,610 – 15,950)	5,200 (2,180 – 6,410)	3,050 (110 – 3,830)	20 (0 – 50)
Cirrhosis (F4)	1,130 (590 – 1,650)	1,070 (470 – 1,330)	570 (10 – 730)	1 (0 – 1)
Decompensated cirrhosis	100 (40 – 170)	100 (30 – 150)	50 (1 – 70)	0 (0 – 0)
New HCC cases ²	40 (20 – 60)	40 (20 – 50)	20 (0 – 30)	0 (0 – 0)
Annual liver-related deaths	50 (30 – 90)	50 (20 – 70)	30 (1 – 40)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	4,800 (4,350 – 5,130)	3,250 (3,050 – 3,760)	2,960 (2,710 – 3,470)	2,370 (2,150 – 2,940)
New HCC cases	860 (440 – 1,210)	620 (290 – 880)	490 (220 – 730)	270 (120 – 460)
Liver-related deaths	1,220 (650 – 1,750)	860 (410 – 1,240)	670 (300 – 1,010)	370 (170 – 630)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 3.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects South Eastern Sydney will meet the WHO elimination targets by 2032 in the intermediate scenario and by 2026 in the optimistic scenario (Table 3.3). Due to an initial treatment coverage of 9%, South Eastern Sydney will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%). To meet these targets by 2028 South Eastern Sydney would have to increase treatment roll-out by 55% from the intermediate scenario to 1,790 in 2017, 1,490 in 2018 and 1,190 from 2019.

Table 3.3 Estimated year South Eastern Sydney meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2033	2030	2026
80% of people living with chronic HCV treated	2037	2032	2026
65% reduction in HCV-related deaths	2039	2032	2024

Note: Treatment roll-out scenarios are presented in Table 3.1

4. Sydney LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Sydney LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Sydney (Table 4.1) based on the estimated number of individuals dispensed HCV DAA treatment (Table 1.1).

Table 4.1 Scenarios for the annual number of people in Sydney initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	310	1,360	780	580	580
Intermediate roll-out	310	1,360	1,170	970	780
Optimistic roll-out	310	1,360	1,360	1,360	1,360

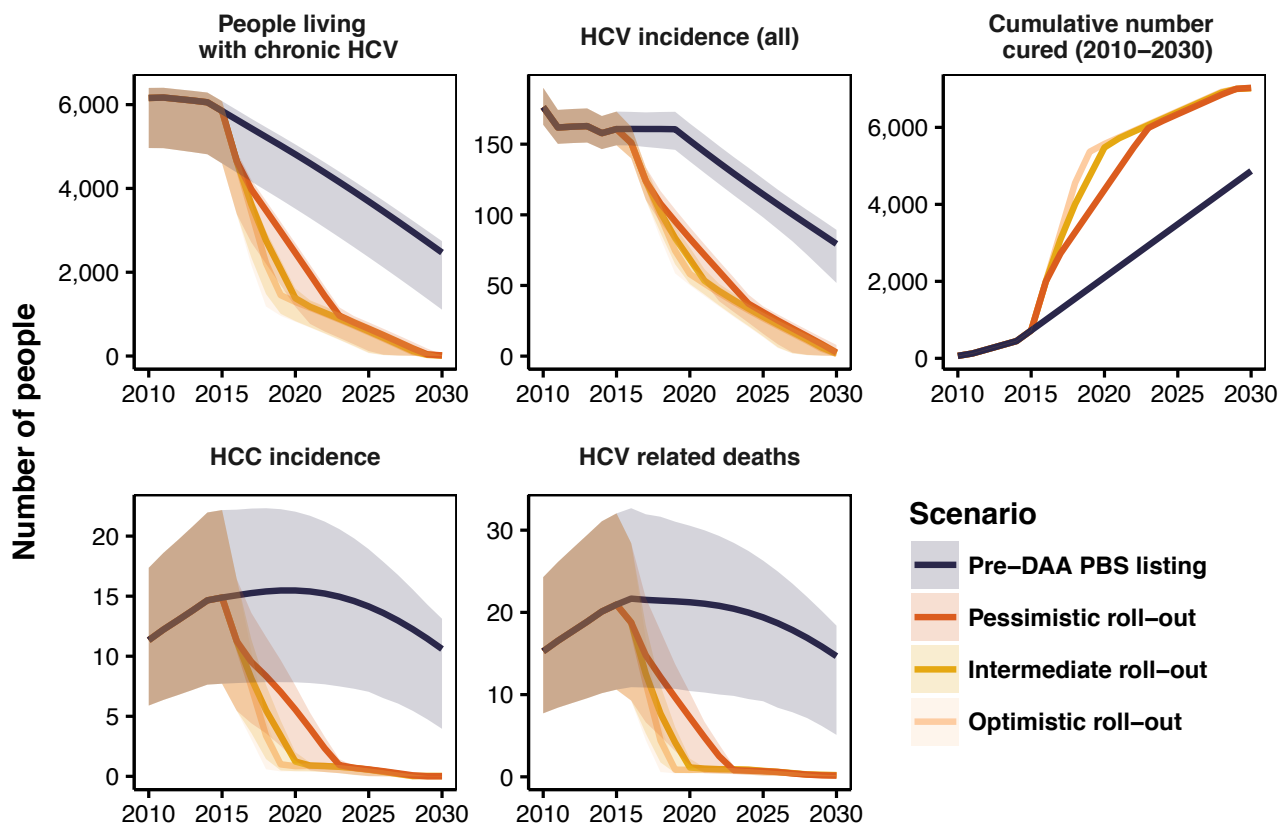
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Sydney over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Sydney due to DAA treatment roll-out (Figure 4.1).

Figure 4.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Sydney (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 23% of people living with chronic HCV have initiated DAA treatment in Sydney. Table 4.2 and Figure 4.2 show the projected change in HCV epidemiology in Sydney due to DAA treatment roll-out.

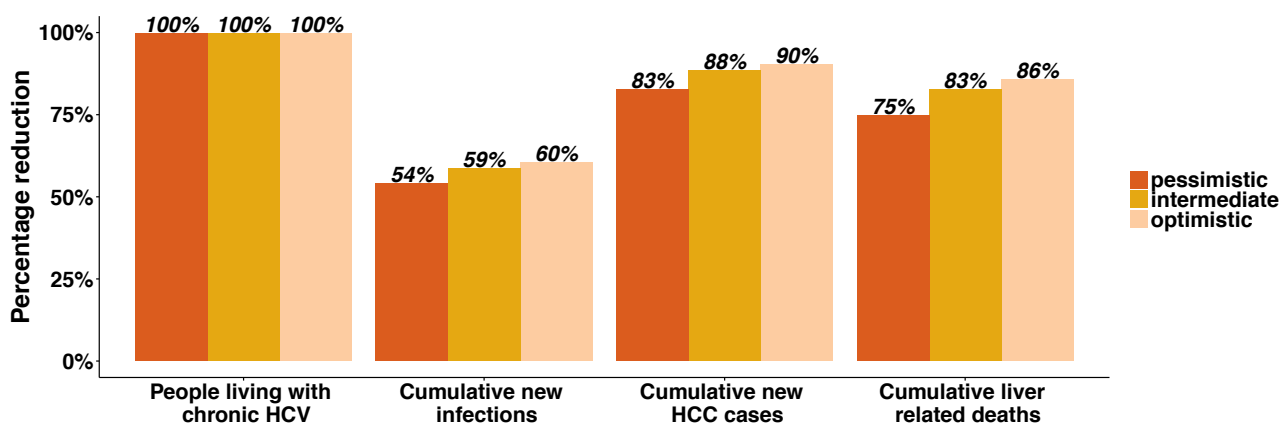
Table 4.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	5,850 (4,600 – 6,080)	20 (4 – 40)	10 (4 – 30)	10 (4 – 20)
New infections (all)	160 (150 – 170)	3 (0 – 8)	2 (0 – 5)	2 (0 – 5)
Chronic HCV prevalence	0.9% (0.7% - 1.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	5,360 (3,770 – 6,160)	10 (2 – 40)	10 (2 – 30)	9 (2 – 20)
Cirrhosis (F4)	420 (230 – 620)	0 (0 – 1)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	40 (20 – 70)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	10 (8 – 20)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	20 (10 – 30)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,910 (1,650 – 2,080)	880 (820 – 1,150)	790 (760 – 1,050)	750 (740 – 1,010)
New HCC cases	210 (100 – 290)	50 (30 – 90)	30 (20 – 70)	30 (20 – 60)
Liver-related deaths	290 (140 – 410)	70 (40 – 140)	50 (30 – 110)	40 (30 – 90)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 4.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Sydney will meet the WHO elimination targets by 2025 in the intermediate scenario and by 2024 in the optimistic scenario (Table 4.3). Due to an initial treatment coverage of 23%, Sydney will reach the WHO targets before the overall NSW projections (which have an initial treatment coverage of 14%).

Table 4.3 Estimated year Sydney meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2025	2025	2024
80% of people living with chronic HCV treated	2023	2021	2021
65% reduction in HCV-related deaths	2020	2019	2018

Note: Treatment roll-out scenarios are presented in Table 4.1

5. South Western Sydney LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the South Western Sydney LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in South Western Sydney (Table 5.1) based on the estimated number of individuals dispensed HCV DAA treatment (Table 1.1).

Table 5.1 Scenarios for the number of people in South Western Sydney initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	280	1,240	710	530	530
Intermediate roll-out	280	1,240	1,060	890	710
Optimistic roll-out	280	1,240	1,240	1,240	1,240

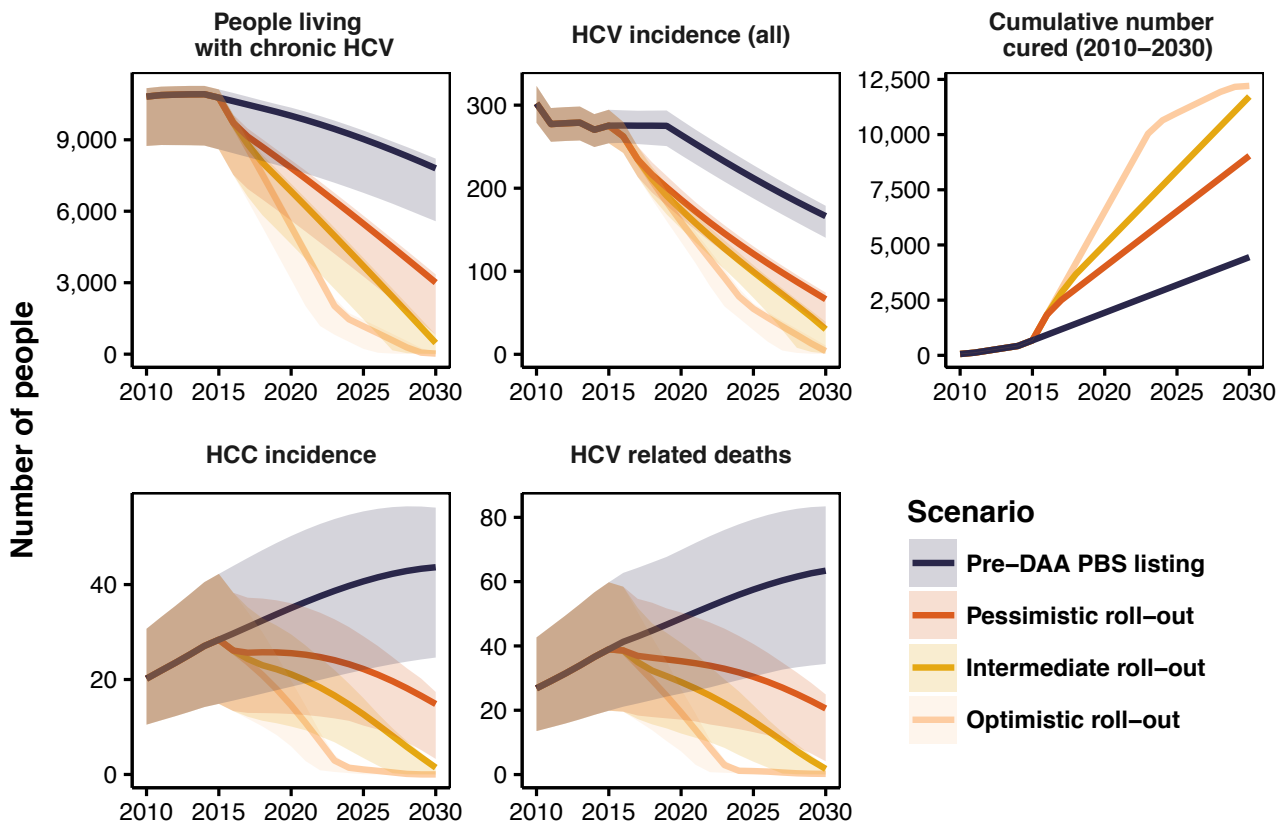
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in South Western Sydney over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within South Western Sydney due to DAA treatment roll-out (Figure 5.1).

Figure 5.1 Annual change in key HCV and Hepatocellular carcinoma indicators in South Western Sydney (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 12% of people living with chronic HCV have initiated DAA treatment in South Western Sydney. Table 5.2 and Figure 5.2 show the projected change in HCV epidemiology in South Western Sydney due to DAA treatment roll-out.

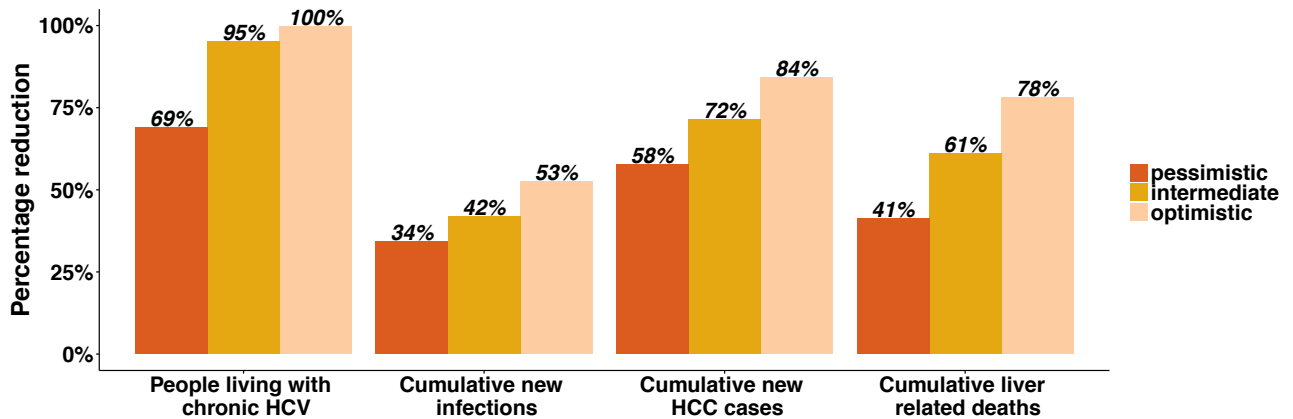
Table 5.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	10,770 (8,600 – 11,110)	3,010 (820 – 3,350)	470 (9 – 820)	20 (6 – 50)
New infections (all)	280 (250 – 290)	70 (30 – 70)	30 (1 – 40)	4 (0 – 10)
Chronic HCV prevalence	1.2% (0.9% - 1.2%)	0.3% (0.1% - 0.3%)	0.0% (0.0% – 0.1%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	9,840 (6,980 – 11,270)	2,510 (660 – 3,140)	420 (7 – 750)	20 (4 – 50)
Cirrhosis (F4)	800 (440 – 1,180)	420 (90 – 510)	40 (0 – 70)	0 (0 – 1)
Decompensated cirrhosis	70 (30 – 120)	40 (5 -50)	2 (0 – 4)	0 (0 – 0)
New HCC cases ²	30 (10 – 40)	10 (3 – 20)	1 (0 – 2)	0 (0 – 0)
Annual liver-related deaths	40 (20 – 60)	20 (4 - 2)	2 (0 – 3)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	3,450 (3,080 – 3,690)	2,270 (2,120 – 2,650)	2,000 (1,820 – 2,420)	1,630 (1,540 – 2,070)
New HCC cases	570 (310 – 790)	340 (170 – 480)	230 (110 – 350)	130 (70 – 220)
Liver-related deaths	800 (420 – 1,120)	470 (220 – 690)	310 (140 – 500)	180 (90 – 310)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 5.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects South Western Sydney will meet the WHO elimination targets by 2029 in the intermediate scenario and by 2025 in the optimistic scenario (Table 5.3). Due to an initial treatment coverage of 12%, South Western Sydney will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%). To meet these targets by 2028 South Western Sydney would have to increase treatment roll-out by 20% from the intermediate scenario to 1,280 in 2017, 1,060 in 2018 and 850 from 2019.

Table 5.3 Estimated year South Western Sydney meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2031	2029	2025
80% of people living with chronic HCV treated	2033	2028	2023
65% reduction in HCV-related deaths	2033	2026	2022

Note: Treatment roll-out scenarios are presented in Table 5.1

6. Hunter New England LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Hunter New England LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Hunter New England (Table 6.1) based on the estimated number treated in 2016 (Table 1.1).

Table 6.1 Scenarios for the annual number of people in Hunter New England initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	320	1,400	800	600	600
Intermediate roll-out	320	1,400	1,200	1,000	800
Optimistic roll-out	320	1,400	1,400	1,400	1,400

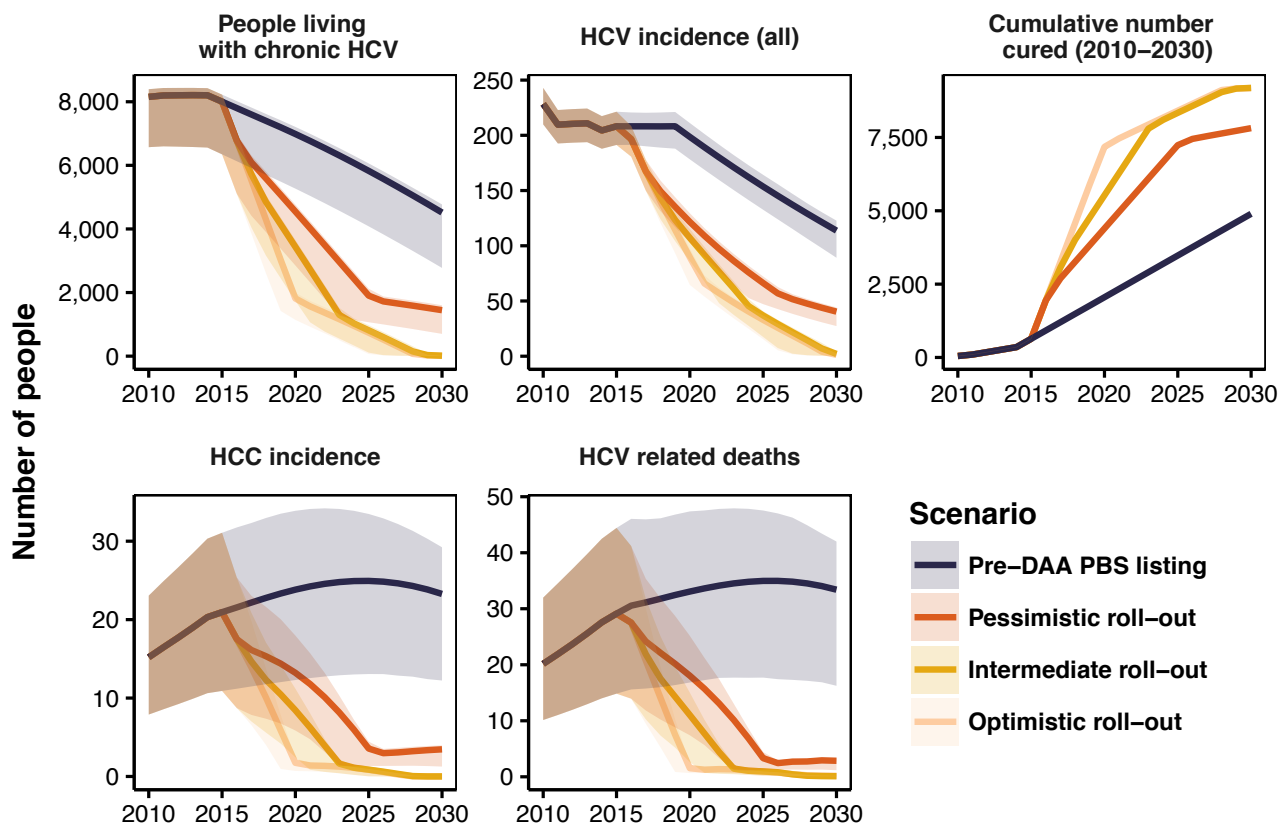
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Hunter New England over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Hunter New England due to DAA treatment roll-out (Figure 6.1).

Figure 6.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Hunter New England (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 18% of people living with chronic HCV have initiated DAA treatment in Hunter New England. Table 6.2 and Figure 6.2 show the projected change in HCV epidemiology in Hunter New England due to DAA treatment roll-out.

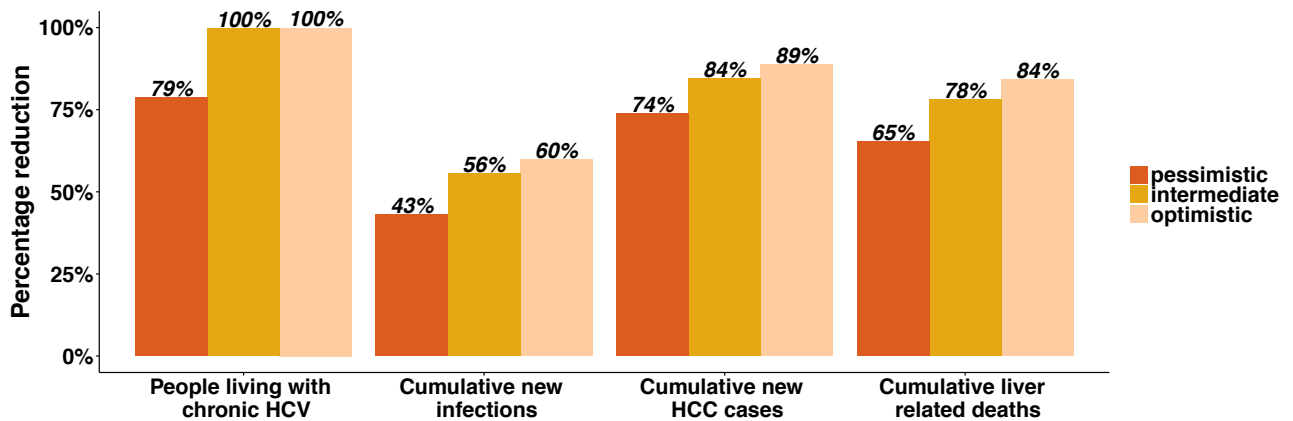
Table 6.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	8,000 (6,350 – 8,220)	1,450 (700 – 1,600)	10 (5 – 20)	10 (4 – 20)
New infections (all)	210 (190 – 220)	40 (30 – 40)	2 (0 – 4)	1 (0 – 3)
Chronic HCV prevalence	0.9% (0.7% - 0.9%)	0.1% (0.1 – 0.1%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	7,310 (5,160 – 8,340)	1,340 (610 – 1,610)	10 (3 – 20)	8 (3 – 20)
Cirrhosis (F4)	590 (320 – 870)	100 (40 – 120)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	50 (20 – 90)	3 (1 – 4)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	20 (10 – 30)	3 (1 – 4)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	30 (10 – 40)	3 (1 – 3)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	2,530 (2,220 – 2,700)	1,450 (1,350 – 1,720)	1,120 (1,040 – 1,440)	1,010 (980 – 1,320)
New HCC cases	360 (190 – 490)	130 (60 – 200)	80 (40 – 140)	60 (30 – 110)
Liver-related deaths	500 (250 – 690)	170 (80 – 280)	110 (60 – 200)	80 (50 – 160)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 6.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Hunter New England will meet the WHO elimination targets by 2025 in the intermediate scenario and by 2024 in the optimistic scenario (Table 6.3). Due to an initial treatment coverage of 18%, Hunter New England will reach the WHO targets before the overall NSW projections (which have an initial treatment coverage of 14%).

Table 6.3 Estimated year Hunter New England meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2030	2025	2024
80% of people living with chronic HCV treated	2029	2023	2021
65% reduction in HCV-related deaths	2023	2021	2019

Note: Treatment roll-out scenarios are presented in Table 6.1

7. Northern NSW LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Northern NSW LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Northern NSW (Table 7.1) based on the estimated number treated in 2016 (Table 1.1).

Table 7.1 Scenarios for the annual number of people in Northern NSW initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	260	1,140	650	490	490
Intermediate roll-out	260	1,140	980	810	650
Optimistic roll-out	260	1,140	1,140	1,140	1,140

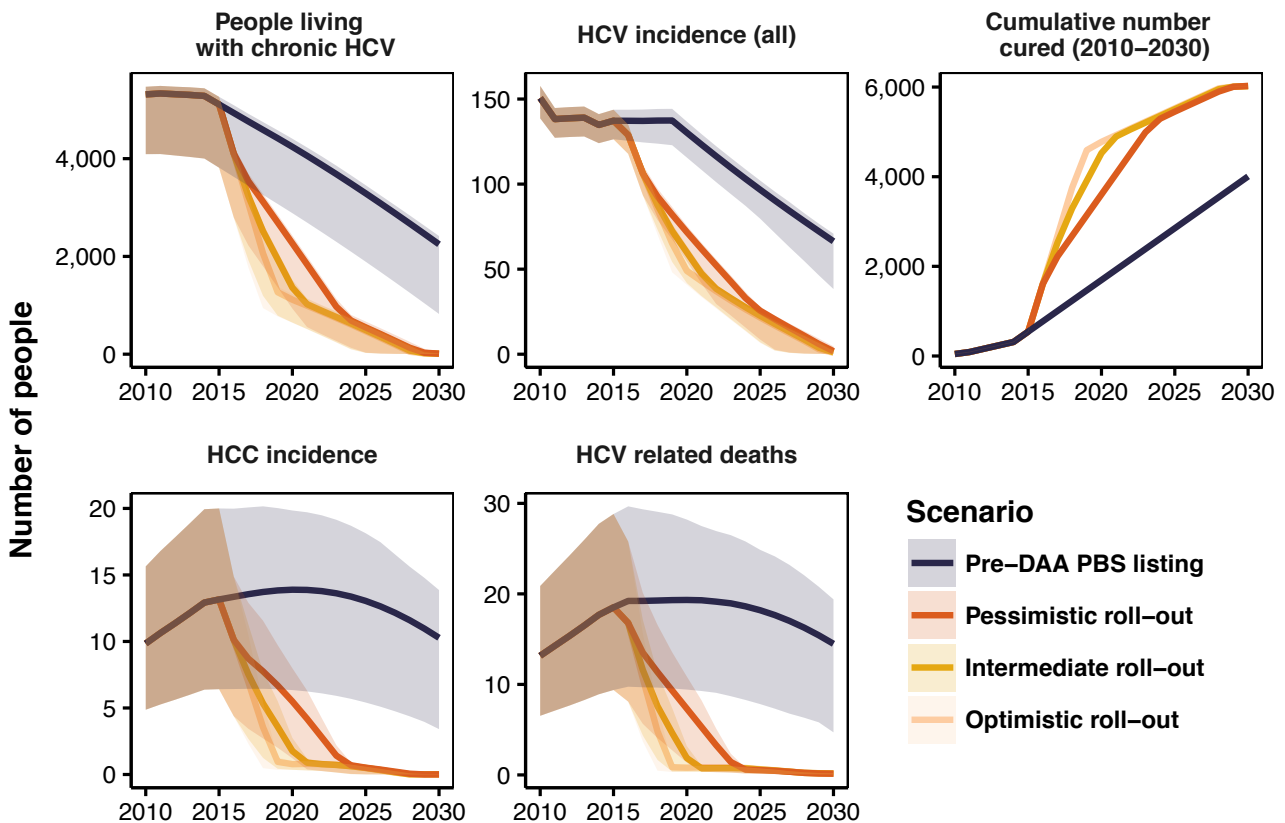
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Northern NSW over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Northern NSW due to DAA treatment roll-out (Figure 7.1).

Figure 7.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Northern NSW (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 22% of people living with chronic HCV have initiated DAA treatment in Northern NSW. Table 7.2 and Figure 7.2 show the projected change in HCV epidemiology in Northern NSW due to DAA treatment roll-out.

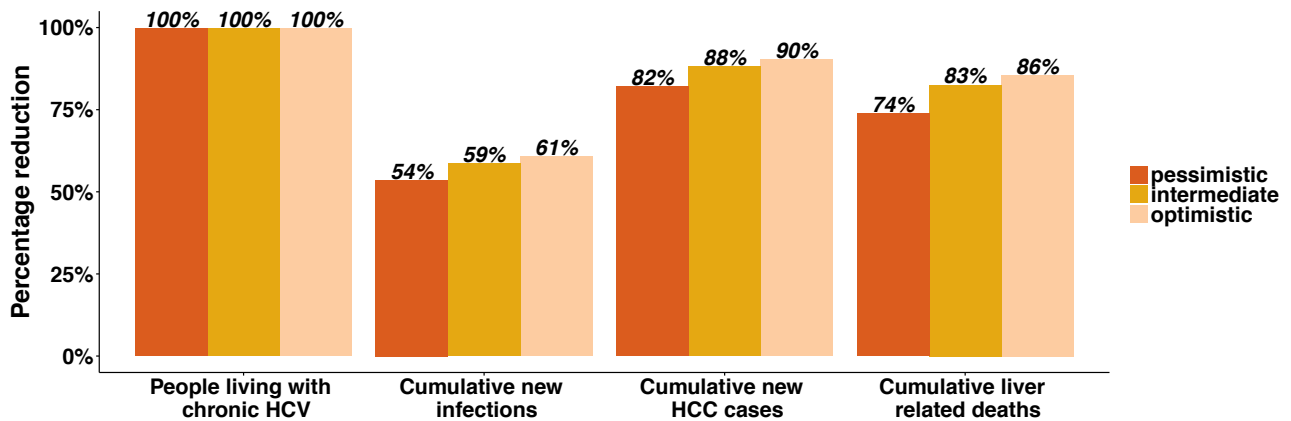
Table 7.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	5,110 (3,810 – 5,260)	10 (4 – 20)	9 (4 – 10)	8 (4 – 10)
New infections (all)	140 (130- 140)	2 (0 – 5)	1 (0 – 3)	1 (0 – 2)
Chronic HCV prevalence	1.7% (1.3% - 1.8%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	4,680 (3,200 – 5,400)	10 (2 – 20)	7 (2 – 10)	6 (2 – 10)
Cirrhosis (F4)	370 (190 – 540)	0 (0 – 1)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	30 (10 – 60)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	10 (6 – 20)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	20 (9 – 30)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,620 (1,360 – 1,710)	750 (660 – 950)	670 (610 – 860)	640 (600 – 820)
New HCC cases	190 (80- 270)	50 (20 – 90)	30 (20 – 70)	30 (20 – 60)
Liver-related deaths	270 (120 – 390)	70 (30 – 130)	50 (30 – 100)	40 (20 – 90)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 7.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Northern NSW will meet the WHO elimination targets by 2024 in the intermediate scenario and by 2024 in the optimistic scenario (Table 7.3). Due to an initial treatment coverage of 22%, Northern NSW will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 7.3 Estimated year Northern NSW meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2025	2024	2024
80% of people living with chronic HCV treated	2023	2021	2021
65% reduction in HCV-related deaths	2021	2019	2018

Note: Treatment roll-out scenarios are presented in Table 7.1

8. Western Sydney LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Western Sydney LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Western Sydney (Table 8.1) based on the estimated number treated in 2016 (Table 1.1).

Table 8.1 Scenarios for the annual number of people in Western Sydney initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	190	820	470	350	350
Intermediate roll-out	190	820	710	590	470
Optimistic roll-out	190	820	820	820	820

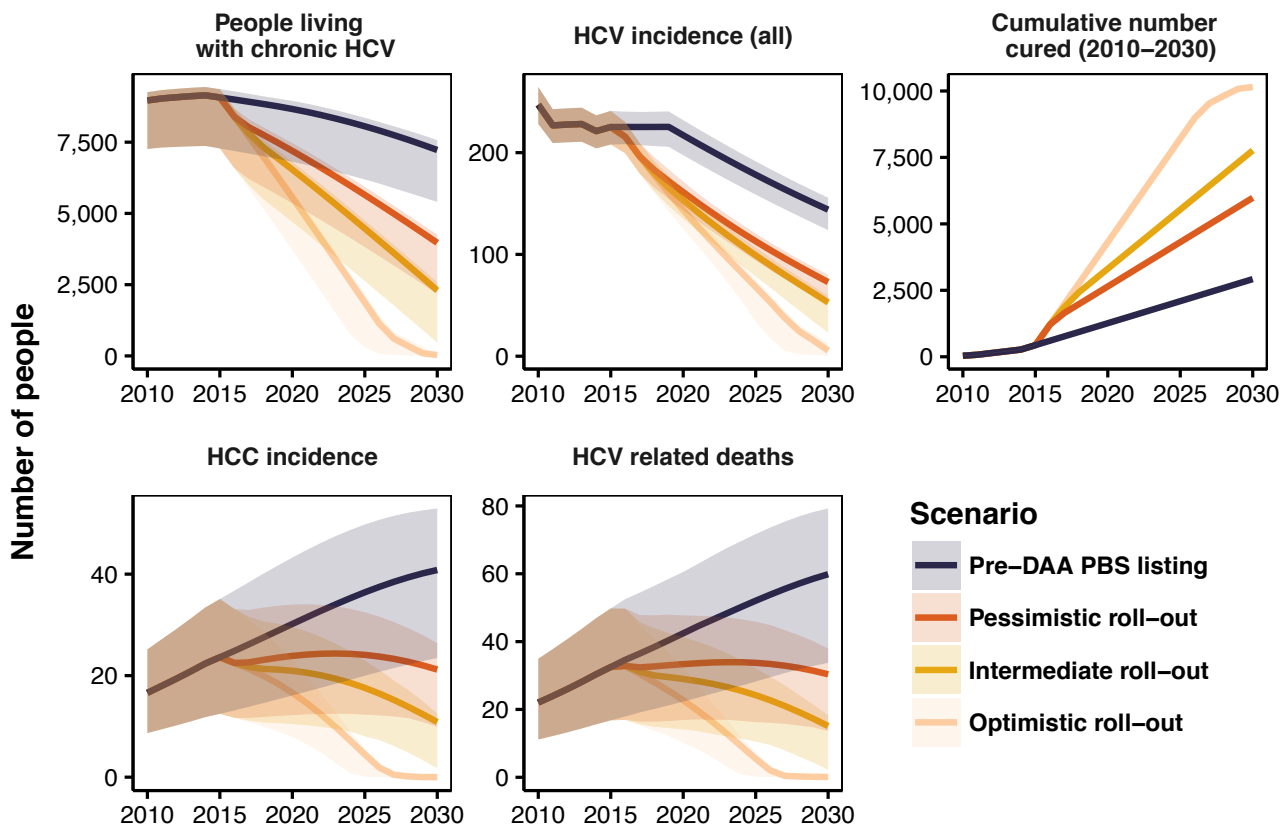
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Western Sydney over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Western Sydney due to DAA treatment roll-out (Figure 8.1).

Figure 8.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Western Sydney (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 9% of people living with chronic HCV have initiated DAA treatment in Western Sydney. Table 8.2 and Figure 8.2 show the projected change in HCV epidemiology in Western Sydney due to DAA treatment roll-out.

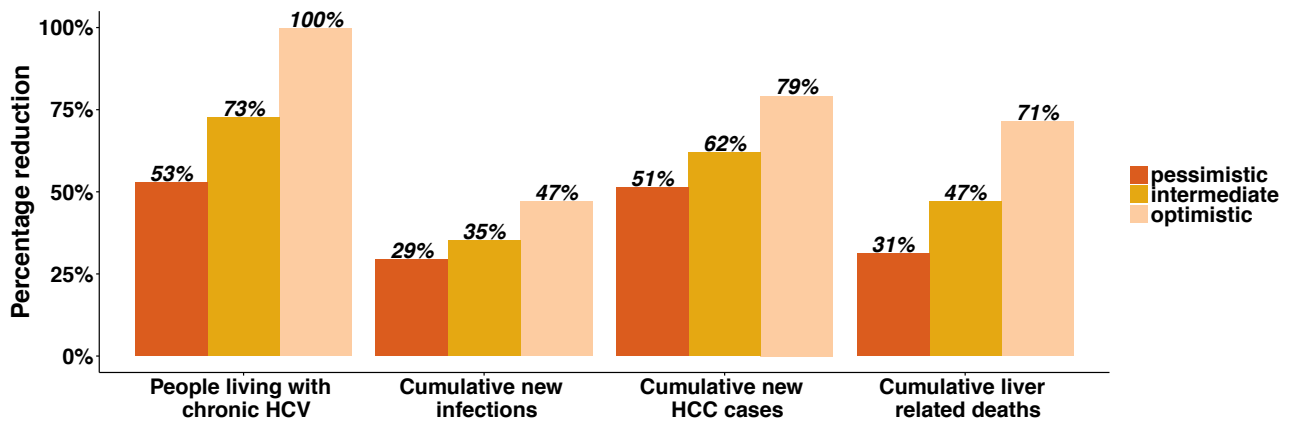
Table 8.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	9,070 (7,280 – 9,360)	3,970 (2,180 – 4,260)	2,300 (470 – 2,590)	30 (6 – 70)
New infections (all)	230 (210 – 240)	70 (50 – 80)	50 (20 – 60)	5 (0 – 10)
Chronic HCV prevalence	1.0% (0.8% - 1.0%)	0.4% (0.2% - 0.4%)	0.2% (0.0% - 0.2%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	8,300 (5,930 – 9,490)	3,270 (1,600 – 3,990)	1,940 (390 – 2,430)	30 (4 – 70)
Cirrhosis (F4)	670 (370 – 980)	600 (260 – 740)	310 (50 – 370)	0 (0 – 1)
Decompensated cirrhosis	60 (30 – 100)	60 (20 – 80)	30 (3 – 40)	0 (0 – 0)
New HCC cases ²	20 (10 – 40)	20 (10 – 30)	10 (2 – 10)	0 (0 – 0)
Annual liver-related deaths	30 (20 – 50)	30 (10 – 40)	20 (2 – 20)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	2,870 (2,580 – 3,080)	2,030 (1,900 – 2,330)	1,860 (1,740 – 2,180)	1,520 (1,400 – 1,880)
New HCC cases	500 (280 – 700)	350 (180 – 490)	270 (140 – 390)	150 (80 – 240)
Liver-related deaths	720 (390 – 1,000)	490 (250 – 700)	380 (180 – 560)	210 (100 – 340)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 8.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Western Sydney will meet the WHO elimination targets by 2032 in the intermediate scenario and by 2027 in the optimistic scenario (Table 8.3). Due to an initial treatment coverage of 9%, Western Sydney will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%). To meet these targets by 2028 Western Sydney would have to increase treatment roll-out by 48% from the intermediate scenario to 1,040 in 2017, 870 in 2018 and 700 from 2019.

Table 8.3 Estimated year Western Sydney meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2034	2031	2027
80% of people living with chronic HCV treated	2037	2032	2026
65% reduction in HCV-related deaths	2039	2032	2024

Note: Treatment roll-out scenarios are presented in Table 8.1

9. Northern Sydney LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Northern Sydney LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Northern Sydney (Table 9.1) based on the estimated number treated in 2016 (Table 1.1).

Table 9.1 Scenarios for the annual number of people in Northern Sydney initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	160	710	410	310	310
Intermediate roll-out	160	710	610	510	410
Optimistic roll-out	160	710	710	710	710

Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

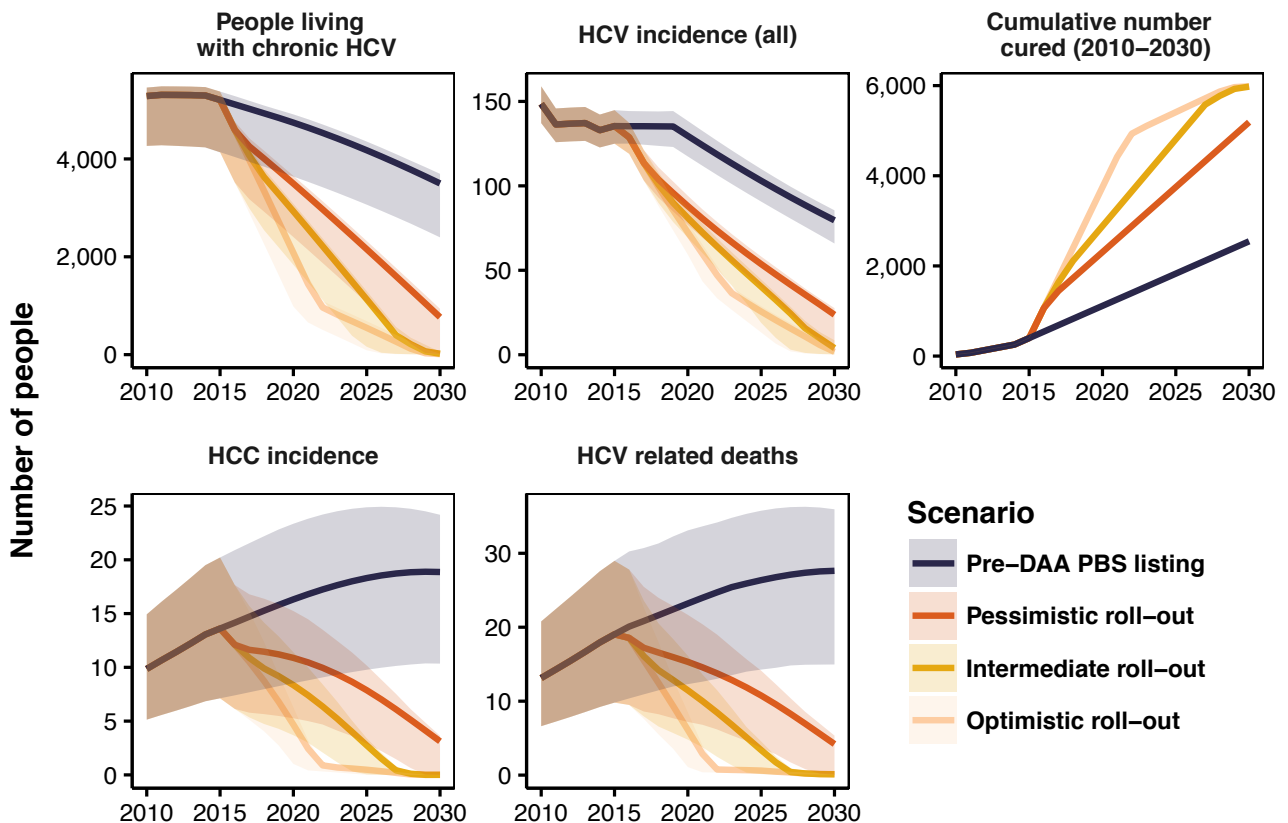
We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Northern Sydney

Model projections in Northern Sydney over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Northern Sydney LHD due to DAA treatment roll-out (Figure 9.1).

Figure 9.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Northern Sydney (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 14% of people living with chronic HCV have initiated DAA treatment in Northern Sydney. Table 9.2 and Figure 9.2 show the projected change in HCV epidemiology in Northern Sydney due to DAA treatment roll-out

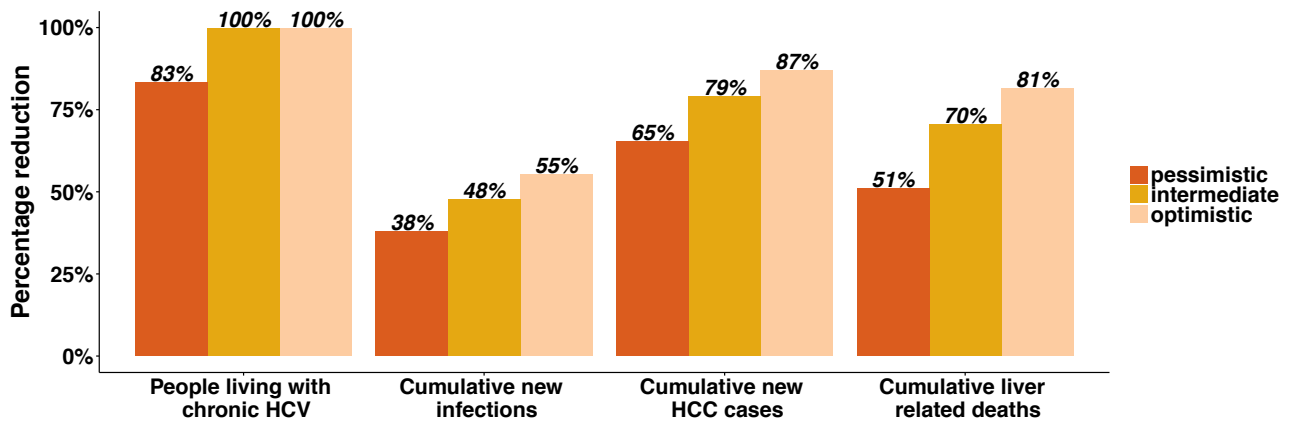
Table 9.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	5,210 (4,140 – 5,380)	770 (10 – 940)	20 (4 – 60)	10 (4 – 20)
New infections (all)	140 (120 – 140)	20 (2 – 30)	4 (0 – 9)	2 (0 – 5)
Chronic HCV prevalence	0.6% (0.5% - 0.6%)	0.1% (0.0% – 0.1%)	0.0% (0.0% – 0.0%)	0.0% (0.0% – 0.0%)
F0-F3 ¹	4,760 (3,370 – 5,450)	660 (10 – 880)	20 (3 – 60)	10 (2 – 20)
Cirrhosis (F4)	380 (210 – 570)	90 (0 – 110)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	40 (20 – 60)	7 (0 – 10)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	10 (7 – 20)	3 (0 – 4)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	20 (10 – 30)	4 (0 – 5)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,680 (1,500 – 1,800)	1,040 (950 – 1,240)	880 (800 – 1,100)	750 (710 – 970)
New HCC cases	260 (140 – 360)	130 (60 – 190)	80 (40 – 130)	50 (30 – 90)
Liver-related deaths	370 (200 – 510)	180 (80 – 280)	110 (50 – 180)	70 (40 – 130)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 9.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Northern Sydney will meet the WHO elimination targets by 2027 in the intermediate scenario and by 2025 in the optimistic scenario (Table 9.3). Due to a slightly lower initial treatment coverage, Northern Sydney will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 9.3 Estimated year Northern Sydney meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2030	2027	2025
80% of people living with chronic HCV treated	2030	2026	2022
65% reduction in HCV-related deaths	2029	2024	2020

Note: Treatment roll-out scenarios are presented in Table 9.1

10. Mid North Coast LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Mid North Coast LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Mid North Coast (Table 10.1) based on the estimated number treated in 2016 (Table 1.1).

Table 10.1 Scenarios for the annual number of people in the Mid North Coast initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	150	660	370	280	280
Intermediate roll-out	150	660	560	470	370
Optimistic roll-out	150	660	660	660	660

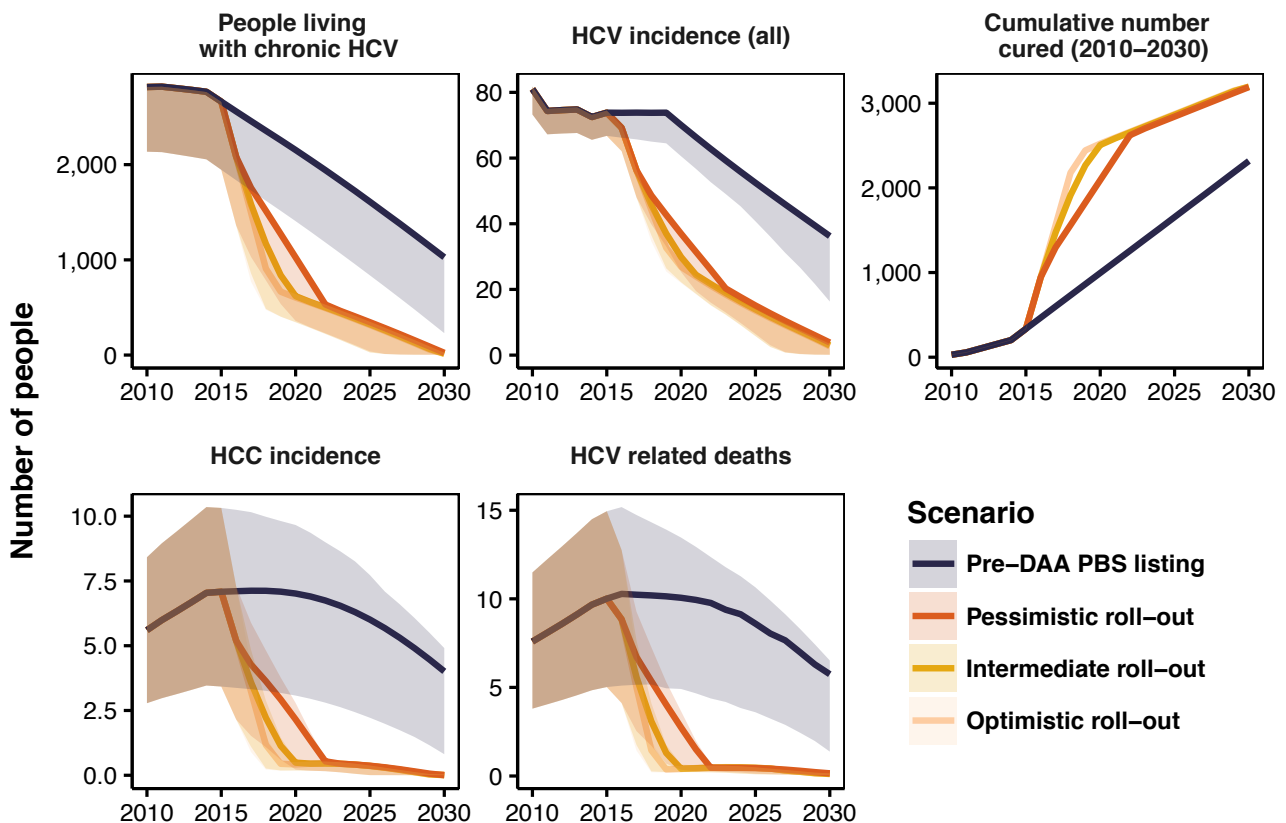
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Mid North Coast over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Mid North Coast due to DAA treatment roll-out (Figure 10.1).

Figure 10.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Mid North Coast (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



Mid North Coast

By the end of 2016, we estimate 25% of people living with chronic HCV have initiated DAA treatment in the Mid North Coast. Table 10.2 and Figure 10.2 show the projected change in HCV epidemiology in the Mid North Coast due to DAA treatment roll-out.

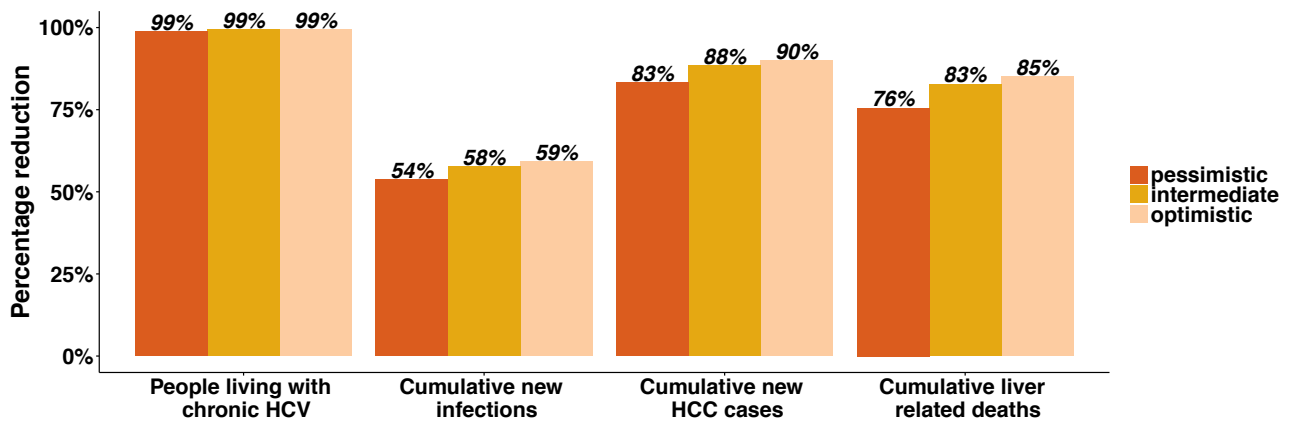
Table 10.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	2,660 (1,950 – 2,660)	20 (3 – 50)	10 (3 – 30)	10 (3 – 20)
New infections (all)	70 (70 – 70)	4 (0 – 4)	3 (0 – 4)	3 (0 – 3)
Chronic HCV prevalence	1.2% (0.9% - 1.2%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	2,430 (1,630 – 2,750)	20 (2 – 50)	10 (1 – 30)	10 (1 – 20)
Cirrhosis (F4)	200 (110 – 280)	0 (0 – 1)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	20 (7 – 30)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	7 (3 – 10)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	10 (5 – 10)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	880 (700 – 880)	410 (340 – 480)	370 (330 – 440)	360 (320 – 430)
New HCC cases	90 (40 – 120)	20 (10 – 40)	20 (10 – 30)	10 (10 – 30)
Liver-related deaths	130 (60 – 170)	30 (20 – 60)	20 (10 – 50)	20 (10 – 40)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 10.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Mid North Coast will meet the WHO elimination targets by 2025 in the intermediate scenario and by 2025 in the optimistic scenario (Table 10.3). Due to an initial treatment coverage of 25%, the Mid North Coast will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 10.3 Estimated year the Mid North Coast meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2025	2025	2025
80% of people living with chronic HCV treated	2022	2022	2021
65% reduction in HCV-related deaths	2020	2018	2018

Note: Treatment roll-out scenarios are presented in Table 10.1

11. Illawarra Shoalhaven LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Illawarra Shoalhaven LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Illawarra Shoalhaven (Table 11.1) based on the estimated number treated in 2016 (Table 1.1).

Table 11.1 Scenarios for the annual number of people in the Illawarra Shoalhaven initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	160	700	400	300	300
Intermediate roll-out	160	700	600	500	400
Optimistic roll-out	160	700	700	700	700

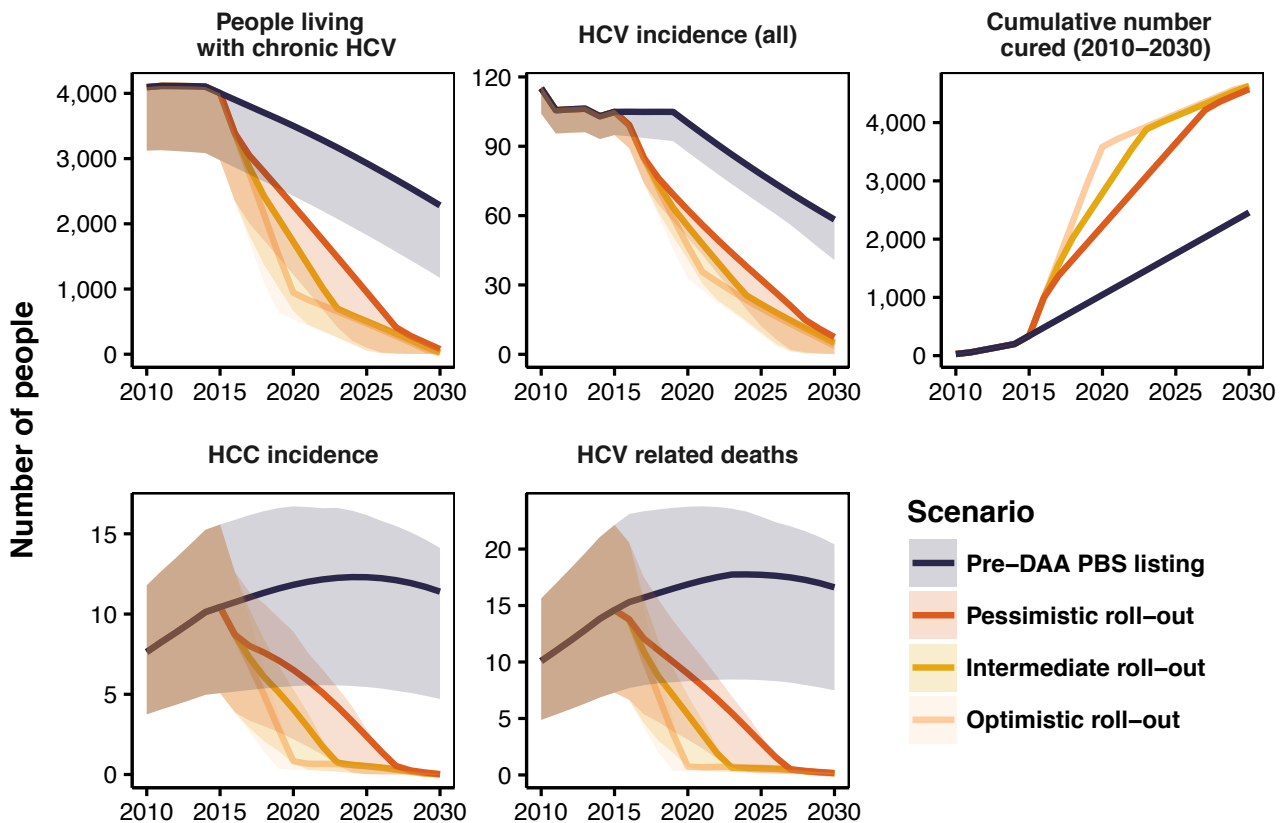
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Illawarra Shoalhaven over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Illawarra Shoalhaven due to DAA treatment roll-out (Figure 11.1).

Figure 11.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Illawarra Shoalhaven (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 18% of people living with chronic HCV have initiated DAA treatment in the Illawarra Shoalhaven. Table 11.2 and Figure 11.2 show the projected change in HCV epidemiology in the Illawarra Shoalhaven due to DAA treatment roll-out.

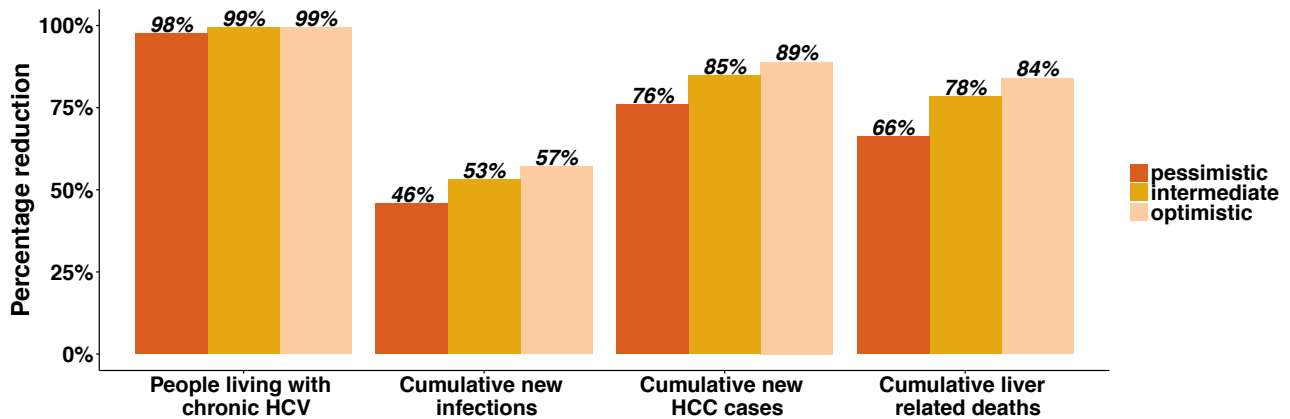
Table 11.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	4,000 (2,980 – 4,000)	80 (4 – 120)	20 (4 – 60)	20 (3 – 30)
New infections (all)	100 (90 – 100)	7 (0 – 8)	5 (0 – 6)	4 (0 – 5)
Chronic HCV prevalence	1.0% (0.7% - 1.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	3,660 (2,480 – 4,150)	80 (2 – 120)	20 (2 – 60)	20 (2 – 30)
Cirrhosis (F4)	290 (150 – 420)	1 (0 – 2)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	30 (10 – 40)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	10 (5 – 20)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	10 (7 – 20)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,280 (1,080 – 1,290)	690 (580 – 790)	600 (510 – 710)	550 (490 – 660)
New HCC cases	180 (80 – 240)	60 (20 – 100)	40 (20 – 70)	30 (10 – 50)
Liver-related deaths	250 (120 – 340)	90 (40 – 140)	50 (30 – 100)	40 (20 – 80)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 11.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Illawarra Shoalhaven will meet the WHO elimination targets by 2026 in the intermediate scenario and by 2025 in the optimistic scenario (Table 11.3). Due to an initial treatment coverage of 18%, the Illawarra Shoalhaven will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 11.3 Estimated year the Illawarra Shoalhaven meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2027	2026	2025
80% of people living with chronic HCV treated	2026	2023	2022
65% reduction in HCV-related deaths	2024	2021	2019

Note: Treatment roll-out scenarios are presented in Table 11.1

12. Central Coast LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Central Coast LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Central Coast (Table 12.1) based on the estimated number treated in 2016 (Table 1.1).

Table 12.1 Scenarios for the annual number of people in the Central Coast initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	120	520	300	220	220
Intermediate roll-out	120	520	450	370	300
Optimistic roll-out	120	520	520	520	520

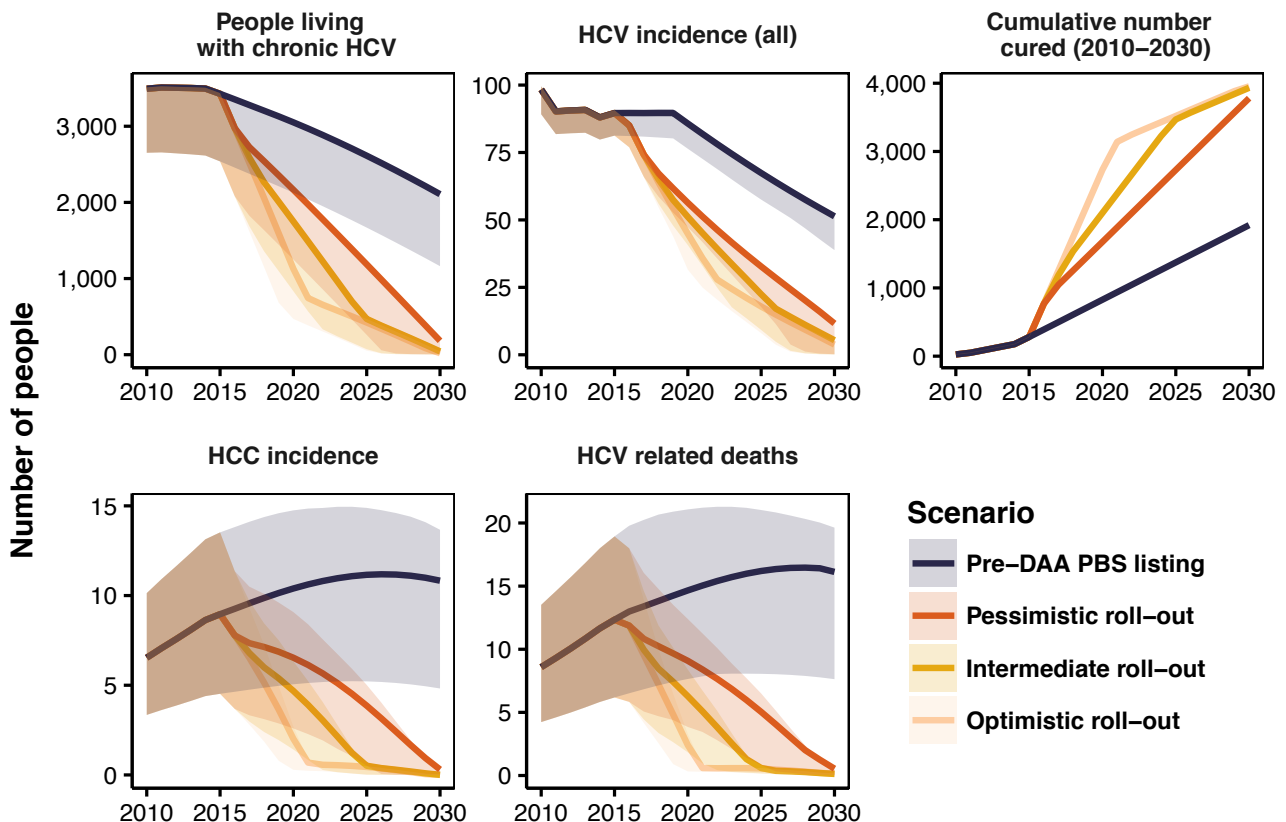
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Central Coast over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Central Coast due to DAA treatment roll-out (Figure 12.1).

Figure 12.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Central Coast (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 15% of people living with chronic HCV have initiated DAA treatment in the Central Coast. Table 12.2 and Figure 12.2 show the projected change in HCV epidemiology in the Central Coast due to DAA treatment roll-out.

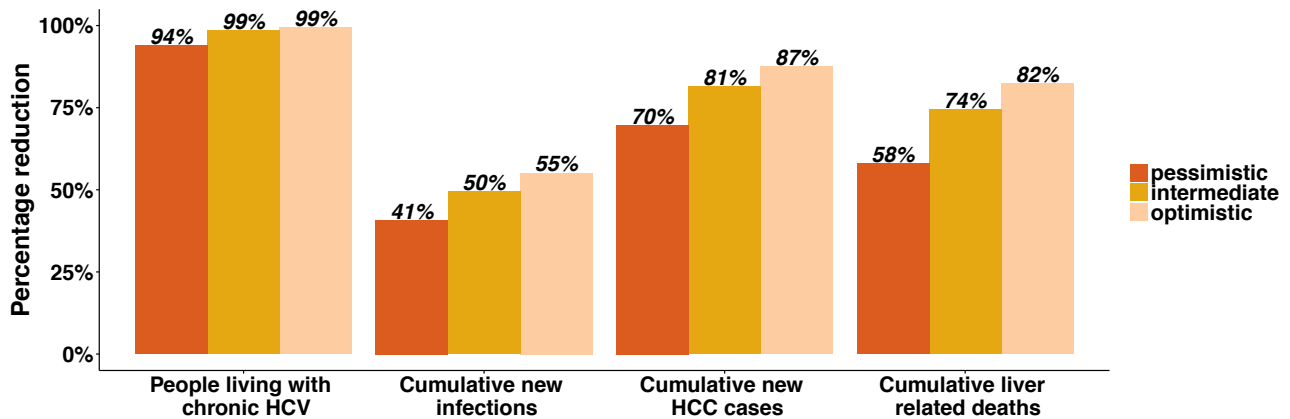
Table 12.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	3,430 (2,540 – 3,440)	180 (5 – 200)	40 (4 – 80)	20 (3 – 50)
New infections (all)	90 (80 – 90)	10 (0 – 10)	5 (0 – 6)	4 (0 – 5)
Chronic HCV prevalence	1.0% (0.8% - 1.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	3,130 (2,160 – 3,550)	170 (2 – 190)	40 (2 – 80)	20 (2 – 40)
Cirrhosis (F4)	250 (130 – 360)	9 (0 – 10)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	20 (9 – 40)	1 (0 – 1)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	9 (5 – 10)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	10 (6 – 20)	1 (0 – 1)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,100 (960 – 1,120)	650 (550 – 740)	560 (470 – 650)	500 (440 – 590)
New HCC cases	160 (80 – 220)	70 (30 – 110)	40 (20 – 70)	30 (10 – 50)
Liver-related deaths	230 (110 – 310)	100 (40 – 150)	60 (30 – 100)	40 (20 – 80)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 12.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Central Coast will meet the WHO elimination targets by 2026 in the intermediate scenario and by 2025 in the optimistic scenarios (Table 12.3). Due to an initial treatment coverage of 15%, the Central Coast will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 12.3 Estimated year the Central Coast meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2029	2026	2025
80% of people living with chronic HCV treated	2028	2024	2022
65% reduction in HCV-related deaths	2026	2022	2020

Note: Treatment roll-out scenarios are presented in Table 12.1

13. Southern NSW LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Southern NSW LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Southern NSW (Table 13.1) based on the estimated number treated in 2016 (Table 1.1).

Table 13.1 Scenarios for the annual number of people in Southern NSW initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	80	350	200	150	150
Intermediate roll-out	80	350	300	250	200
Optimistic roll-out	80	350	350	350	350

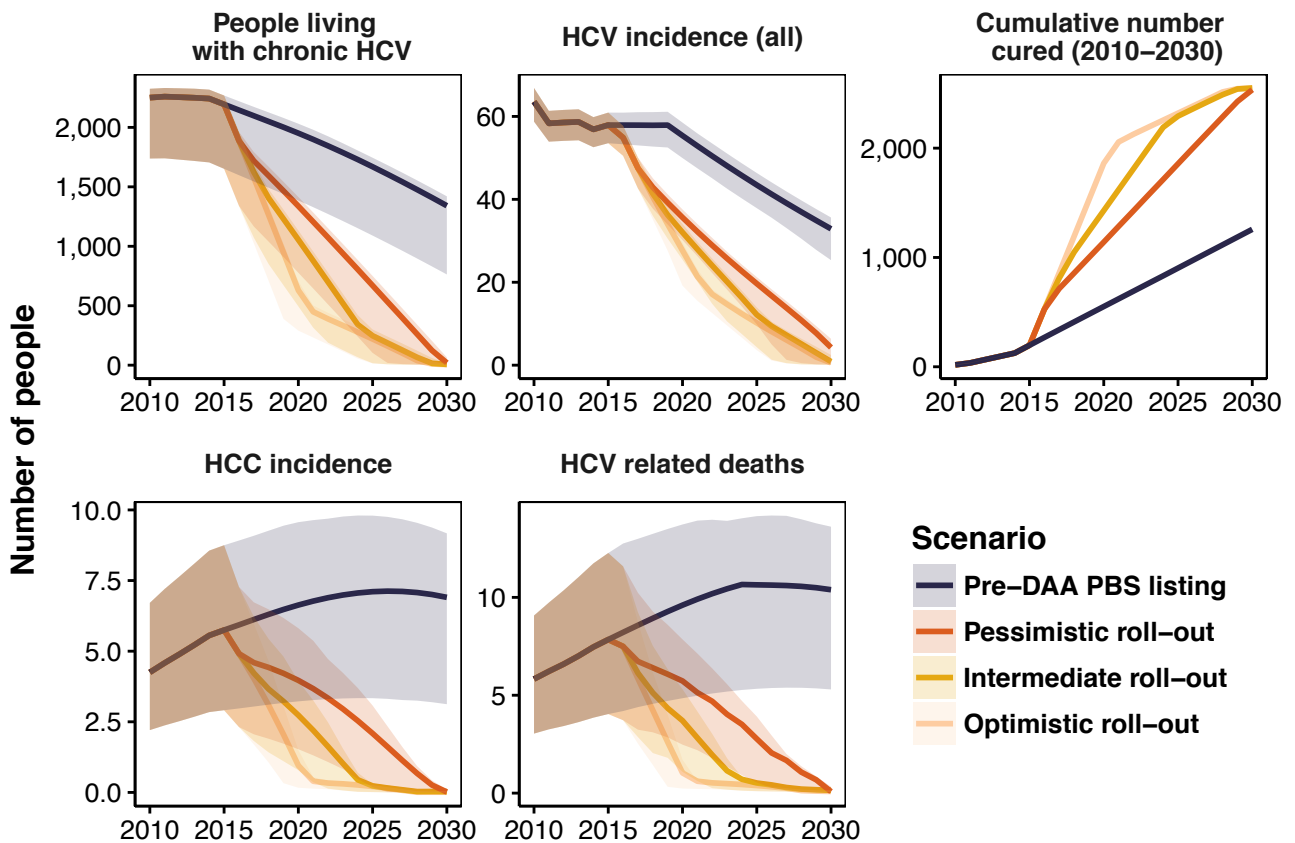
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Southern NSW over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Southern NSW due to DAA treatment roll-out (Figure 13.1).

Figure 13.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Southern NSW (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 16% of people living with chronic HCV have initiated DAA treatment in Southern NSW. Table 13.2 and Figure 13.2 show the projected change in HCV epidemiology in Southern NSW due to DAA treatment roll-out.

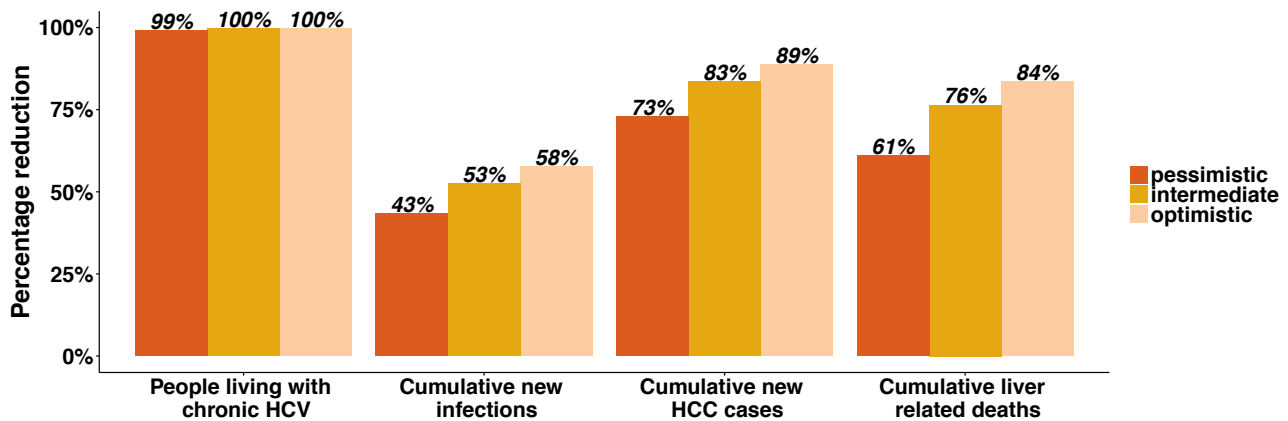
Table 13.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	2,190 (1,650 – 2,270)	20 (3 – 70)	7 (3 – 10)	5 (3 – 9)
New infections (all)	60 (50 – 60)	4 (0 – 6)	1 (0 – 2)	1 (0 – 2)
Chronic HCV prevalence	1.1% (0.8% - 1.1%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	2,010 (1,380 – 2,320)	20 (2 – 60)	5 (1 – 10)	4 (1 – 9)
Cirrhosis (F4)	160 (90 – 230)	0 (0 – 3)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	10 (5 – 20)	0 (0 – 1)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	6 (3 – 9)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	8 (4 – 10)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	710 (630 – 760)	400 (350 – 490)	340 (300 – 420)	300 (280 – 380)
New HCC cases	100 (50 – 140)	40 (20 – 70)	20 (10 – 50)	20 (10 – 30)
Liver-related deaths	150 (80 – 210)	60 (30 – 90)	40 (20 – 60)	20 (10 – 50)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 13.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Southern NSW will meet the WHO elimination targets by 2026 in the intermediate scenario and by 2025 in the optimistic scenario (Table 13.3). Due to an initial treatment coverage of 16%, Southern NSW will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%)

Table 13.3 Estimated year Southern NSW meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2028	2026	2025
80% of people living with chronic HCV treated	2027	2024	2021
65% reduction in HCV-related deaths	2025	2022	2019

Note: Treatment roll-out scenarios are presented in Table 13.1

14. Western NSW LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Western NSW LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in Western NSW (Table 14.1) based on the estimated number treated in 2016 (Table 1.1).

Table 14.1 Scenarios for the annual number of people in Western NSW initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	100	430	250	180	180
Intermediate roll-out	100	430	370	310	250
Optimistic roll-out	100	430	430	430	430

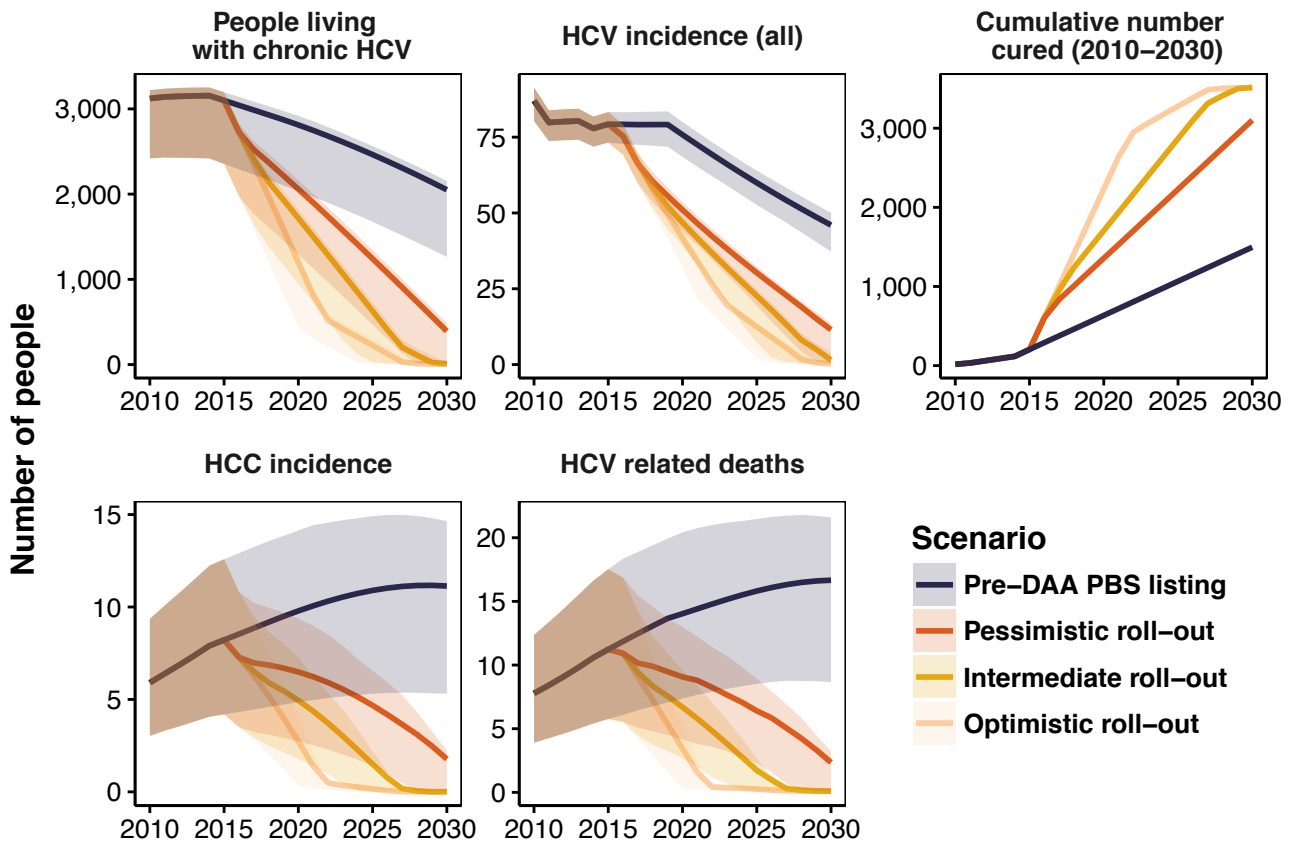
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in Western NSW over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within Western NSW due to DAA treatment roll-out (Figure 14.1).

Figure 14.1 Annual change in key HCV and Hepatocellular carcinoma indicators in Western NSW (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 14% of people living with chronic HCV have initiated DAA treatment in Western NSW. Table 14.2 and Figure 14.2 show the projected change in HCV epidemiology in Western NSW due to DAA treatment roll-out.

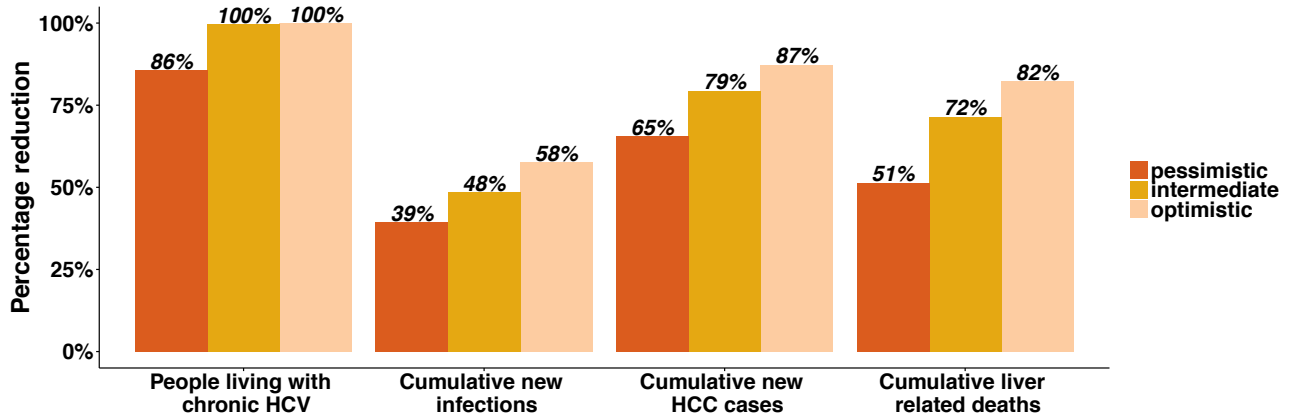
Table 14.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	3,100 (2,350 – 3,200)	390 (5 – 490)	9 (3 – 20)	4 (3 – 5)
New infections (all)	80 (70 – 80)	10 (0 – 10)	1 (0 – 4)	0 (0 – 0)
Chronic HCV prevalence	1.1% (0.8% - 1.1%)	0.1% (0.0% - 0.1%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	2,830 (1,970 – 3,280)	330 (3 – 440)	9 (2 – 20)	3 (1 – 5)
Cirrhosis (F4)	230 (120 – 340)	50 (0 – 60)	0 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	20 (10 – 40)	3 (0 – 5)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	8 (4 – 10)	2 (0 – 2)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	10 (6 – 20)	2 (0 – 3)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	980 (870 – 1,040)	590 (520 – 700)	500 (440 – 620)	420 (390 – 530)
New HCC cases	150 (80 – 220)	80 (30 – 120)	50 (20 – 80)	30 (10 – 50)
Liver-related deaths	220 (120 – 310)	110 (50 – 170)	60 (30 – 110)	40 (20 – 80)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 14.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects Western NSW will meet the WHO elimination targets by 2027 in the intermediate scenario and by 2024 in the optimistic scenario (Table 14.3). Due to a slightly lower initial treatment coverage, Western NSW will reach the WHO targets slightly later than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 14.3 Estimated year Western NSW meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2029	2027	2024
80% of people living with chronic HCV treated	2029	2025	2022
65% reduction in HCV-related deaths	2029	2023	2020

Note: Treatment roll-out scenarios are presented in Table 14.1

15. Nepean Blue Mountains LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Nepean Blue Mountains LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Nepean Blue Mountains (Table 15.1) based on the estimated number treated in 2016 (Table 1.1).

Table 15.1 Scenarios for the annual number of people in Nepean Blue Mountains initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	80	350	200	150	150
Intermediate roll-out	80	350	300	250	200
Optimistic roll-out	80	350	350	350	350

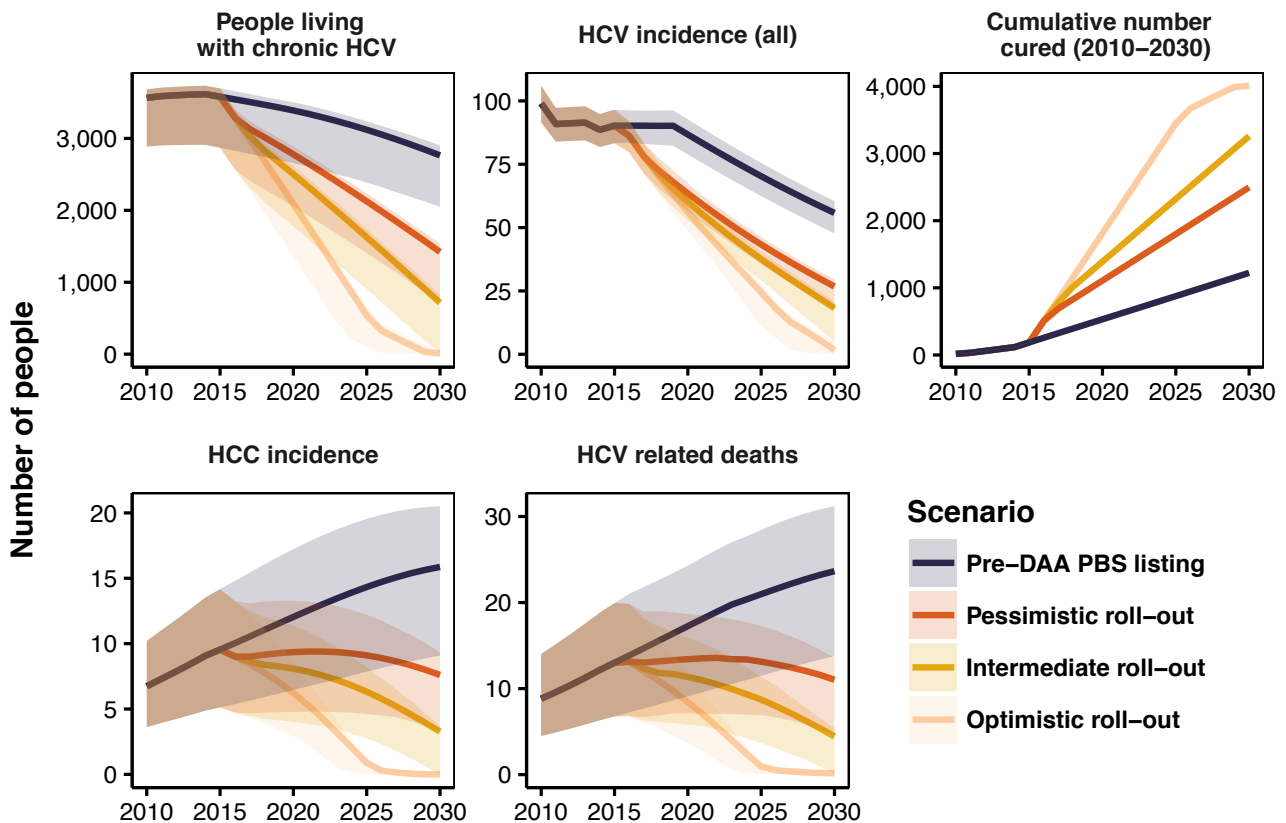
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Nepean Blue Mountains over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Nepean Blue Mountains due to DAA treatment roll-out (Figure 15.1).

Figure 15.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Nepean Blue Mountains (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 10% of people living with chronic HCV have initiated DAA treatment in the Nepean Blue Mountains. Table 15.2 and Figure 15.2 show the projected change in HCV epidemiology in the Nepean Blue Mountains due to DAA treatment roll-out.

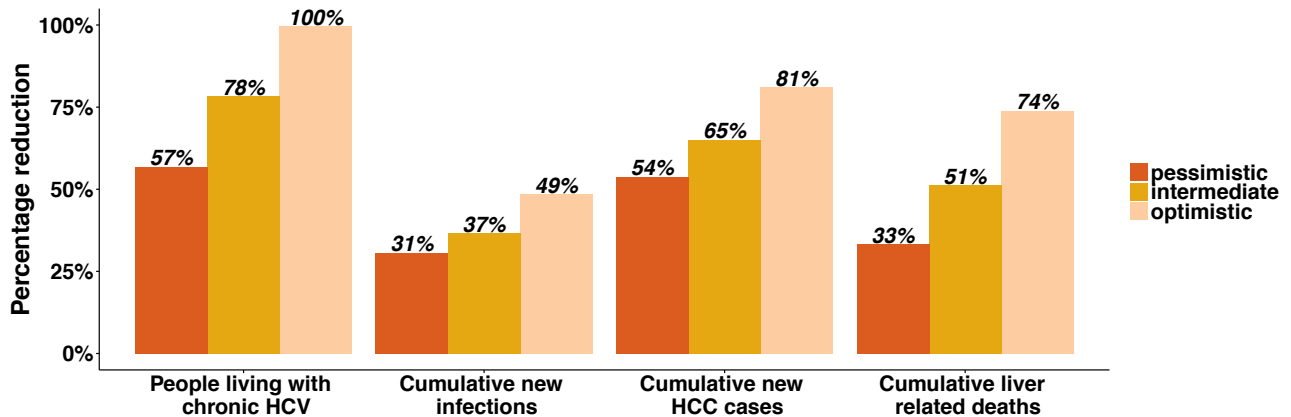
Table 15.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	3,580 (2,870 – 3,700)	1,420 (720 – 1,540)	720 (20 – 830)	10 (4 – 30)
New infections (all)	90 (80 – 100)	30 (20 – 30)	20 (5 – 20)	2 (0 – 5)
Chronic HCV prevalence	1.0% (0.8% - 1.0%)	0.3% (0.2% - 0.4%)	0.2% (0.0% - 0.2%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	3,270 (2,330 – 3,740)	1,170 (530 – 1,430)	610 (20 – 770)	10 (2 – 30)
Cirrhosis (F4)	270 (150 – 400)	210 (90 – 260)	90 (1 – 110)	0 (0 – 1)
Decompensated cirrhosis	20 (10 – 40)	20 (7 – 30)	7 (0 – 10)	0 (0 – 0)
New HCC cases ²	10 (5 – 10)	8 (3 – 9)	3 (0 – 4)	0 (0 – 0)
Annual liver-related deaths	10 (7 – 20)	10 (5 – 10)	4 (0 – 5)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	1,140 (1,020 – 1,220)	790 (740 – 910)	720 (670 – 850)	590 (540 – 730)
New HCC cases	200 (110 – 270)	130 (70 – 190)	100 (50 – 150)	50 (30 – 90)
Liver-related deaths	290 (160 – 400)	190 (100 – 270)	140 (70 – 210)	80 (40 – 130)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 15.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Nepean Blue Mountains will meet the WHO elimination targets by 2031 in the intermediate scenario and by 2026 in the optimistic scenario (Table 15.3). Due to an initial treatment coverage of 10%, the Nepean Blue Mountains will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%). To meet these targets by 2028 Nepean Blue Mountains would have to increase treatment roll-out by 38% from the intermediate scenario to 410 in 2017, 340 in 2018 and 270 from 2019.

Table 15.3 Estimated year the Nepean Blue Mountains meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2033	2030	2026
80% of people living with chronic HCV treated	2036	2031	2025
65% reduction in HCV-related deaths	2037	2030	2023

Note: Treatment roll-out scenarios are presented in Table 15.1

16. Murrumbidgee LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Murrumbidgee LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Murrumbidgee (Table 16.1) based on the estimated number treated in 2016 (Table 1.1).

Table 16.1 Scenarios for the annual number of people in the Murrumbidgee initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	70	320	180	140	140
Intermediate roll-out	70	320	270	230	180
Optimistic roll-out	70	320	320	320	320

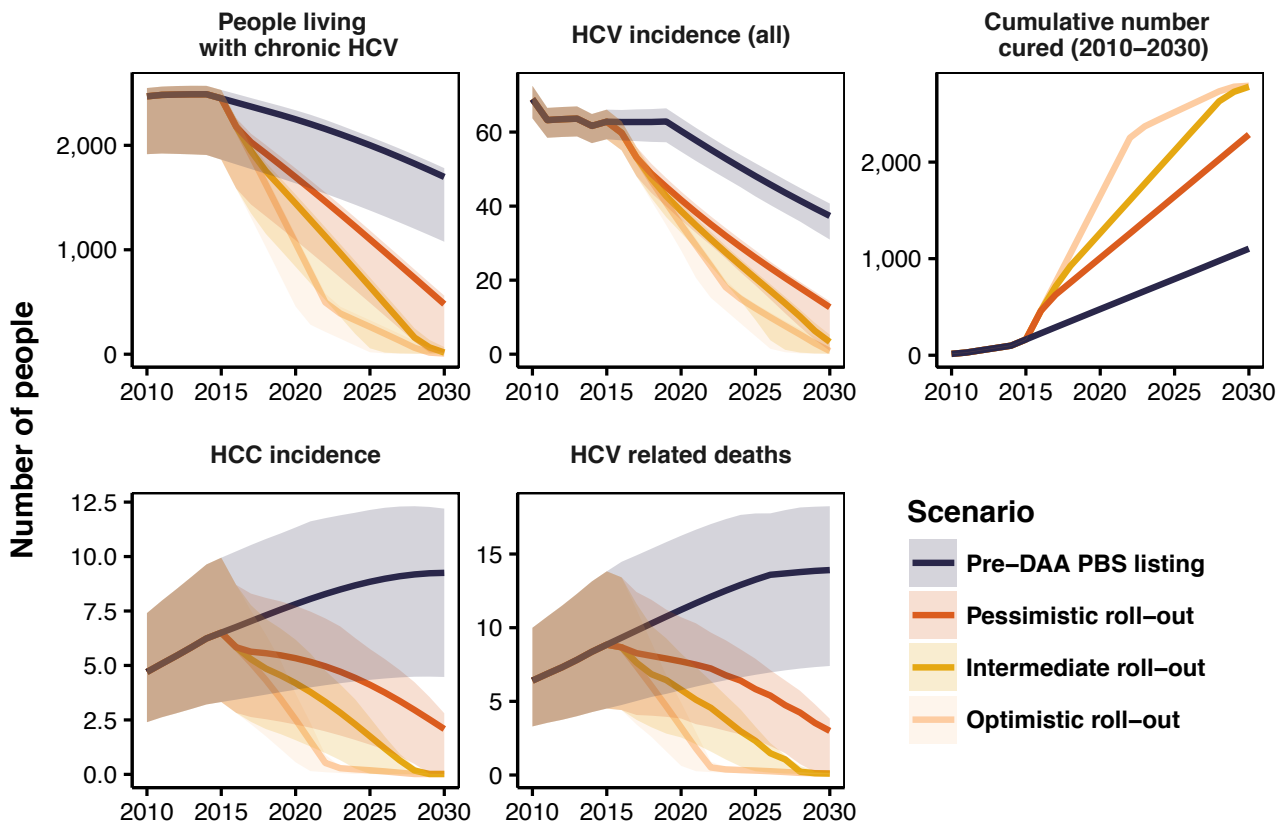
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Murrumbidgee over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Murrumbidgee due to DAA treatment roll-out (Figure 16.1).

Figure 16.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Murrumbidgee (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 13% of people living with chronic HCV have initiated DAA treatment in the Murrumbidgee. Table 16.2 and Figure 16.2 show the projected change in HCV epidemiology in the Murrumbidgee due to DAA treatment roll-out.

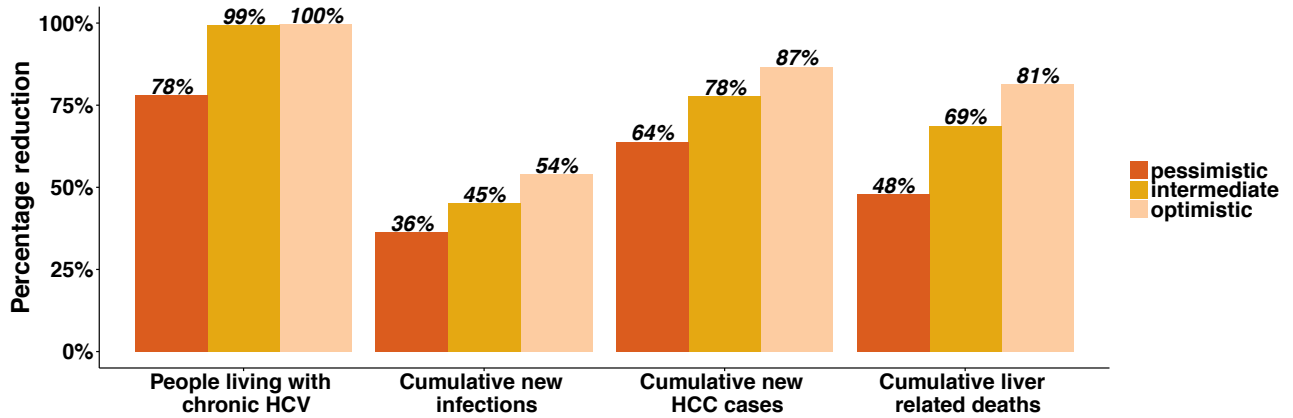
Table 16.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	2,450 (1,860 – 2,530)	480 (10 – 560)	20 (3 – 70)	7 (3 – 10)
New infections (all)	60 (60 – 70)	10 (1 – 10)	3 (0 – 5)	1 (0 – 3)
Chronic HCV prevalence	1.0% (0.8% - 1.0%)	0.2% (0.0% - 0.2%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	2,240 (1,560 – 2,600)	410 (6 – 520)	10 (2 – 70)	5 (2 – 10)
Cirrhosis (F4)	180 (100 – 270)	60 (0 – 80)	1 (0 – 1)	0 (0 – 1)
Decompensated cirrhosis	20 (6 – 30)	4 (0 – 6)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	7 (3 – 10)	2 (0 – 3)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	9 (5 – 10)	3 (0 – 4)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	780 (700 – 830)	500 (450 – 580)	430 (370 – 520)	360 (330 – 450)
New HCC cases	120 (60 – 170)	70 (30 – 100)	40 (20 – 70)	20 (10 – 50)
Liver-related deaths	180 (90 – 250)	100 (40 – 140)	60 (30 – 100)	30 (20 – 70)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 16.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Murrumbidgee will meet the WHO elimination targets by 2028 in the intermediate scenario and by 2025 in the optimistic scenario (Table 16.3). Due to an initial treatment coverage of 13%, the Murrumbidgee will reach the WHO targets later than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 16.3 Estimated year Murrumbidgee meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2031	2028	2025
80% of people living with chronic HCV treated	2031	2026	2022
65% reduction in HCV-related deaths	2030	2024	2021

Note: Treatment roll-out scenarios are presented in Table 16.1

17. Far West LHD

The Kirby Institute conducted mathematical modelling to project the hepatitis C virus (HCV) prevalence, incidence, and HCV-morbidities in the Far West LHD over 2016-2030. We assumed three scenarios for the roll-out of direct-acting antiviral (DAA) treatment for HCV in the Far West (Table 17.1) based on the estimated number treated in 2016 (Table 1.1).

Table 17.1 Scenarios for the annual number of people in the Far West initiating DAA treatment

Treatment roll-out scenarios	2015 (interferon + DAA)	2016	2017	2018	From-2019
Pessimistic roll-out	10	50	30	20	20
Intermediate roll-out	10	50	40	30	30
Optimistic roll-out	10	50	50	50	50

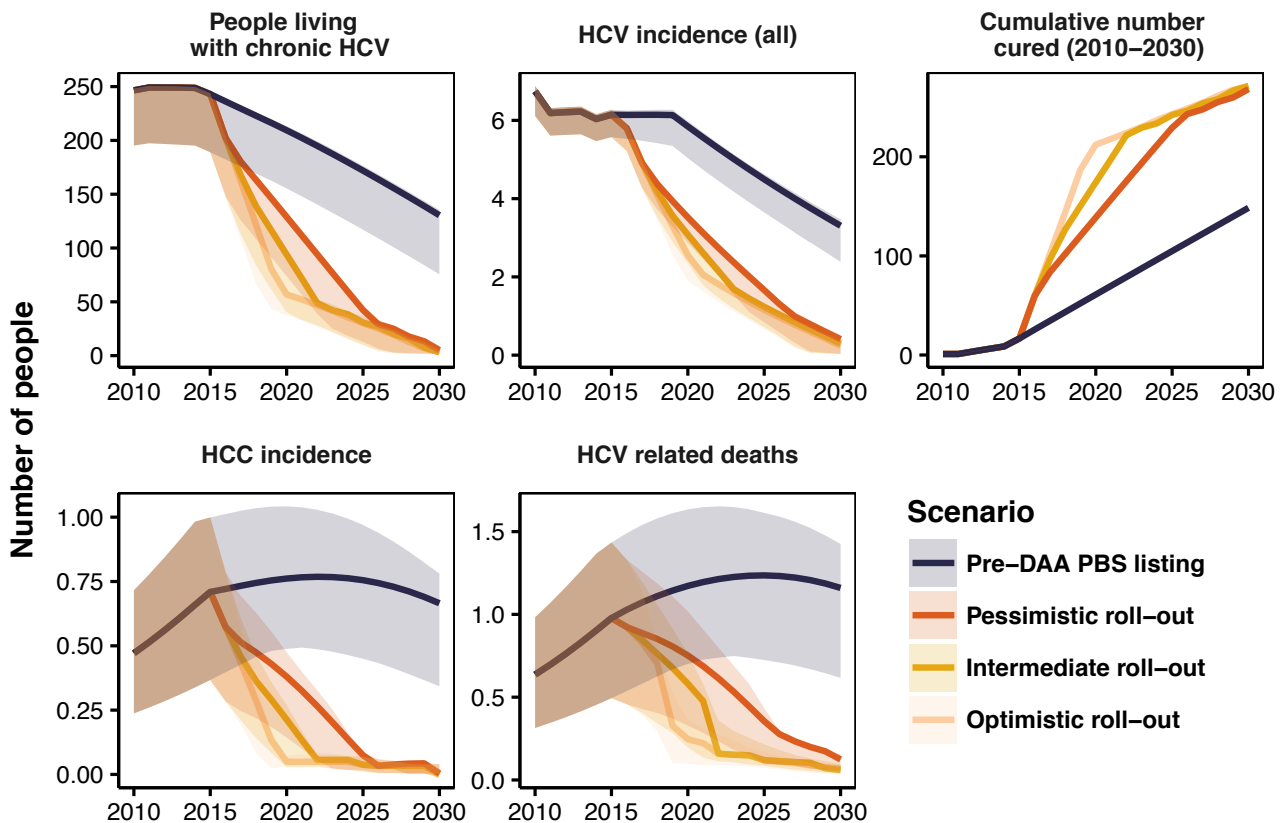
Note: Pessimistic roll-out: sharp decrease of DAA uptake from 2017; Intermediate roll-out: moderate decrease of DAA uptake from 2017; Optimistic roll-out: where DAA uptake remains at 2016 level.

We also ran a pre-DAA Pharmaceutical Benefits Scheme (PBS) listing scenario with the number treated remaining at the 2015 level and HCV incidence held constant until 2020. Note, interpreting the results requires care as the model excludes population movement.

Model projections in the Far West over 2010-2030

By 2030, there will be a large reduction in chronic HCV and associated disease within the Far West due to DAA treatment roll-out (Figure 17.1).

Figure 17.1 Annual change in key HCV and Hepatocellular carcinoma indicators in the Far West (2010-2030): best estimate (solid line) and 95% confidence intervals (shading)



By the end of 2016, we estimate 19% of people living with chronic HCV have initiated DAA treatment in the Far West. Table 17.2 and Figure 17.2 show the projected change in HCV epidemiology in the Far West due to DAA treatment roll-out.

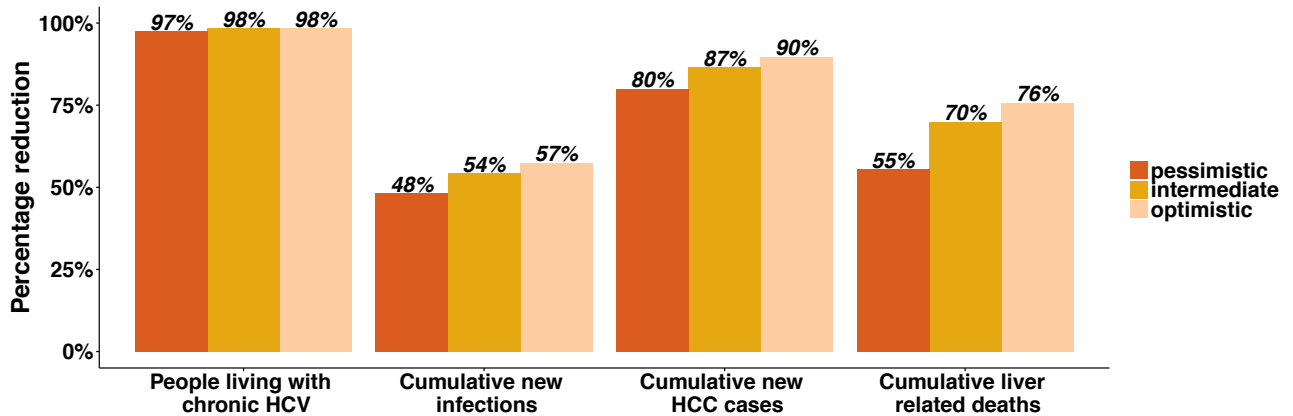
Table 17.2 Change in HCV indicators by 2030

	End of 2015	2030		
	Baseline	Pessimistic	Intermediate	Optimistic
People living with chronic HCV	240 (190 – 240)	5 (2 – 9)	3 (2 – 6)	3 (2 – 4)
New infections (all)	6 (6 – 6)	0 (0 – 1)	0 (0 – 0)	0 (0 – 0)
Chronic HCV prevalence	0.8% (0.6% - 0.8%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)	0.0% (0.0% - 0.0%)
F0-F3 ¹	220 (160 – 250)	4 (1 – 9)	3 (1 – 6)	2 (1 – 5)
Cirrhosis (F4)	20 (10 – 30)	0 (0 – 1)	0 (0 – 1)	1 (0 – 1)
Decompensated cirrhosis	2 (1 – 3)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
New HCC cases ²	1 (0 – 1)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Annual liver-related deaths	1 (0 – 1)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Cumulative cases over 2016-2030	Baseline	Pessimistic	Intermediate	Optimistic
New infections (all)	70 (60 – 80)	40 (30 – 50)	30 (30 – 40)	30 (30 – 40)
New HCC cases	10 (7 – 10)	4 (2 – 6)	2 (1 – 4)	2 (1 – 4)
Liver-related deaths	20 (10 – 20)	8 (4 – 10)	5 (3 – 9)	4 (2 – 7)

Note: ¹ Fibrosis stage from 0 to 3;

² Hepatocellular carcinoma (HCC)

Figure 17.2 Relative change in HCV indicators by 2030 (compared to the pre-DAA scenario)



ACHIEVING WORLD HEALTH ORGANIZATION HCV TARGETS

Our model projects the Far West will meet the WHO elimination targets by 2025 in the intermediate scenario and by 2025 in the optimistic scenario (Table 17.3). Due to an initial treatment coverage of 19%, the Far West will reach the WHO targets earlier than in the overall NSW projections (which have an initial treatment coverage of 14%).

Table 17.3 Estimated year Far West meets targets

WHO target compared to 2015 estimates	Treatment scenario		
	Pessimistic	Intermediate	Optimistic
80% reduction in new chronic infections	2027	2025	2025
80% of people living with chronic HCV treated	2025	2022	2022
65% reduction in HCV-related deaths	2026	2022	2019

Note: Treatment roll-out scenarios are presented in Table 17.1

