

Monitoring hepatitis C treatment uptake in Australia

Issue #14 July 2024

Executive summary

A total of 105,947 individuals have initiated direct acting antiviral (DAA) therapy for chronic hepatitis C virus (HCV) infection in Australia through the Pharmaceutical Benefits Scheme during 2016 to 2023. The number of new treatment initiations decreased between 2016 to 2022. An increase in treatment initiations was observed in 2023. The proportion of people who did not complete a full course of treatment has increased, over time, most notably among women.

Retreatment has accounted for an increasing proportion of all DAA prescriptions over time. By end 2023, 10,567 (10%) of the treated population had been retreated at least once. The total number of retreatments prescribed during this period was 13,465. Over the past five years retreatment for reinfection has increased, while retreatment for treatment failure has stabilised.

HCV prescriber patterns and the population treated have changed over time. Between 2016 to 2023, the median age of those treated declined from 52 to 44 years. During 2016 to 2023 the proportion of people treated by gastroenterologists declined (50% to 19%), whereas the proportion of people treated by general practitioners increased (31% to 55%). During 2019 to 2023, prescribing of treatment, and notably retreatment, by nurse practitioners increased. By 2023, 11% of treatment and 19% of retreatment was prescribed by nurse practitioners.

Reference for citations: Carson JM, Hajarizadeh B, Dore GJ. Monitoring hepatitis C treatment uptake in Australia (Issue 14). The Kirby Institute, UNSW, Sydney NSW, Australia, July 2024, DOI: 10.26190/unsworks/30340

<https://www.kirby.unsw.edu.au/research/reports/monitoring-hepatitis-c-treatment-uptake-australia-issue-14-july-2024>

An online version of this report with interactive figures can be viewed here: <https://github.com/jojocarson/monitoring-hcv-treatment>

Image files and code can download here: <https://jojocarson.github.io/monitoring-hcv-treatment>

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Box 1. Direct-acting antiviral therapies

Government subsidised direct-acting antiviral (DAA) regimens for hepatitis C virus (HCV), were listed on the Pharmaceutical Benefits Scheme (PBS) from 2016. There were no restrictions on the prescribers that could treat HCV and no restrictions on the that could receive treatment.

Genotype-specific regimens

- March 2016: sofosbuvir/ledipasvir (Harvoni®), sofosbuvir+daclatasvir (Sovaldi®+Daklinza®), sofosbuvir+ribavirin (Sovaldi®+Ibavyr®)
- May 2016: paritaprevir/ritonavir/ombitasvir+dasabuvir (Viekira PAK®)
- January 2017: elbasvir/grazoprevir (Zepatier®)

Pangenotypic regimens

- August 2017: sofosbuvir/velpatasvir (Epclusa®)
- August 2018: glecaprevir/pibrentasvir (Maviret®)
- April 2019: sofosbuvir/velpatasvir/voxilaprevir (Vosevi®)

From 2022, genotype-specific DAAs had been delisted from the PBS and genotype testing was no longer required to gain PBS approval to prescribe. Pangenotypic DAAs continue to be available.

Monitoring hepatitis C treatment uptake in Australia

Issue #14 newsletter reports national HCV treatment and retreatment trends in Australia during 2016 to 2023. This newsletter describes trends in HCV treatment, retreatment for reinfection and treatment failure, the population receiving treatment and the clinicians prescribing treatment along with trends for the states and territories of Australia. PBS data of DAAs dispensed in Australia between March 2016 and December 2023 were used to prepare this report. Detailed methodology can be found on page 13.

DAA trends

Treatment

A total of 105,947 people initiated DAA therapy for chronic HCV infection in Australia through the PBS (**Box 1**) during 2016 to 2023. The number of new treatment initiations declined between 2016 to 2022. In 2023, the number of people initiating treatment exceeded the number initiating treatment in 2022. This is the first annual increase in treatment initiations since DAAs were listed on the PBS. The annual number of individuals initiating DAA treatment included 32,458 in 2016, 21,249 in 2017, 15,355 in 2018, 11,433 in 2019, 8,215 in 2020, 6,563 in 2021, 5,175 in 2022, and 5,499 in 2023. Annual DAA treatment initiations and retreatments in Australia are illustrated in **Figure 1**. In 2023, the number of individuals initiating treatment increased from 1,316 in the first quarter to 1,467 in the third quarter, declining to 1,332 in the last quarter. Quarterly DAA treatment initiations, retreatments and total DAA courses dispensed in Australia are illustrated in **Figure 2**.

Retreatment

The number of individuals receiving retreatment increased during 2016 to 2023. By end 2023, 10,567 (10%) of the treated population had been retreated at least once. Individuals retreated for the first time were 113 in 2016, 732 in 2017, 1,024 in 2018, 1,921 in 2019, 1,800 in 2020, 1,576 in 2021, 1,512 in 2022 and 1,889 in 2023. By end 2023, 2,215 (21%) of the retreated population had been retreated multiple times. Total retreatments dispensed were 13,456.

Figure 1: Annual DAA treatments and retreatments

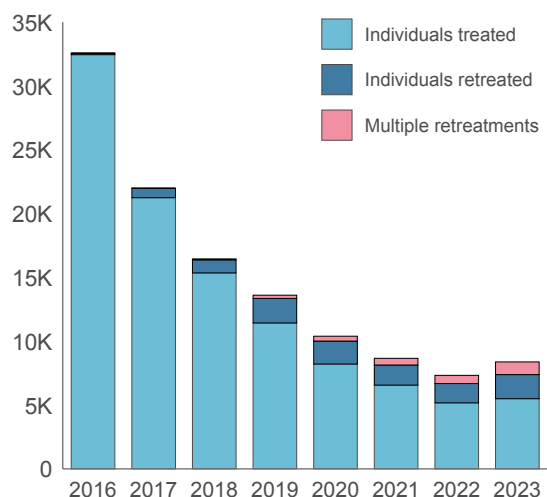
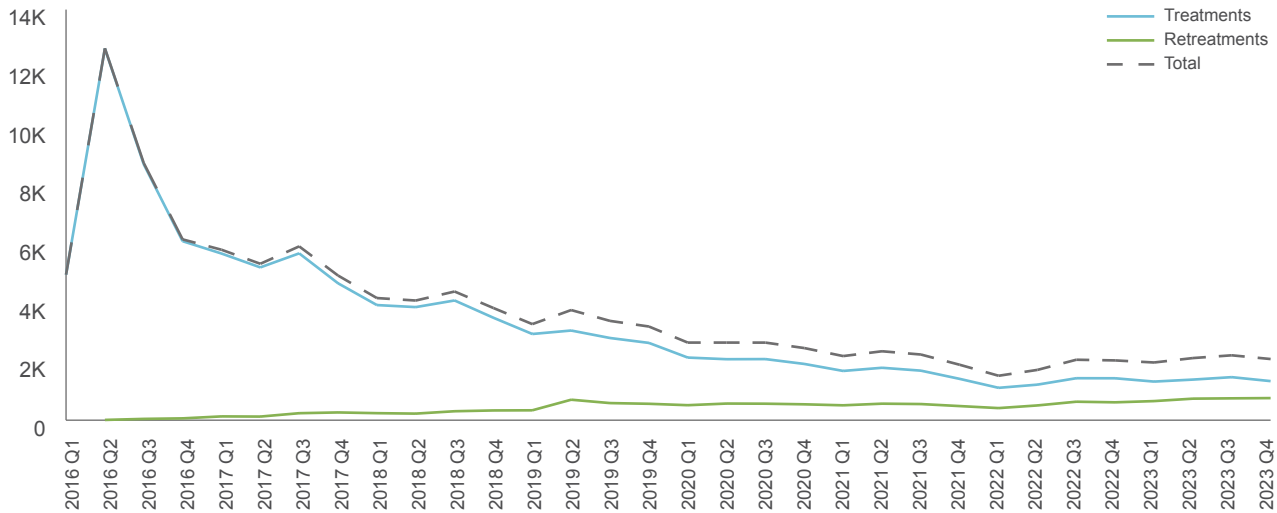




Figure 2: Quarterly DAA treatment initiations and retreatments



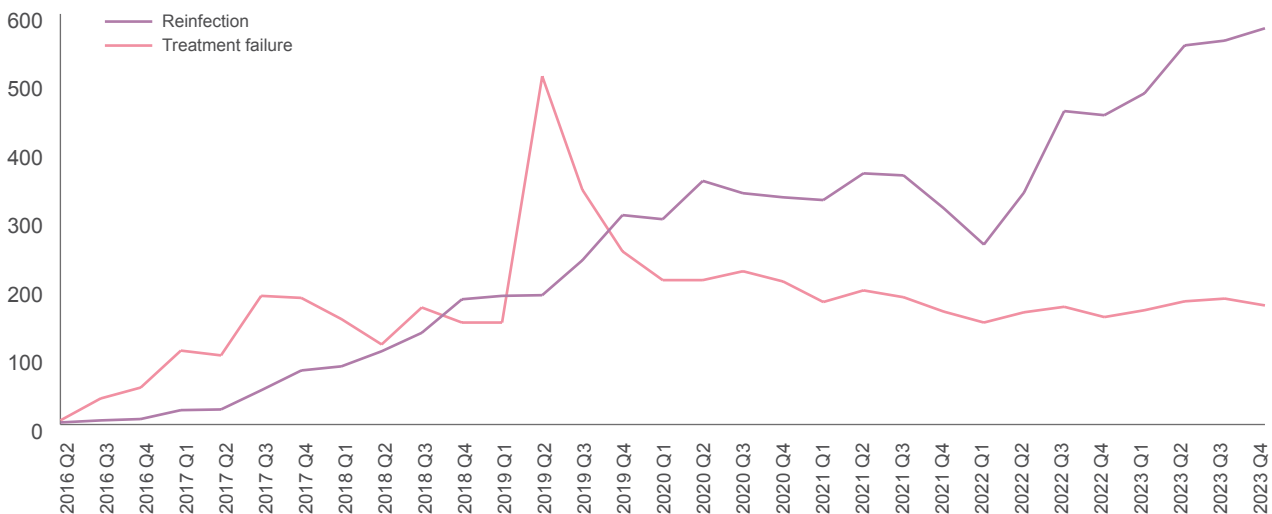
Treatment and retreatments

Considering all treatment and retreatments, the total number of DAAs dispensed in Australia was 119,412. During 2023, the total number of DAAs dispensed increased, rising from 7,329 in 2022 to 8,382 in 2023. The increases in DAAs dispensed during 2023 were largely due to increases in retreatments. In 2023, 35% of all DAA prescriptions in Australia were retreatments.

Retreatment trends

Of 13,456 retreatments occurring during 2016 to 2023, 60% (n=8,012) were estimated for reinfection and 40% (n=5,453) for treatment failure. Quarterly trends in retreatments for reinfection and treatment failure are illustrated in **Figure 3**. Numbers of retreatments and multiple treatments are illustrated in **Figure 4**.

Figure 3: Quarterly DAA retreatments for treatment failure and reinfection



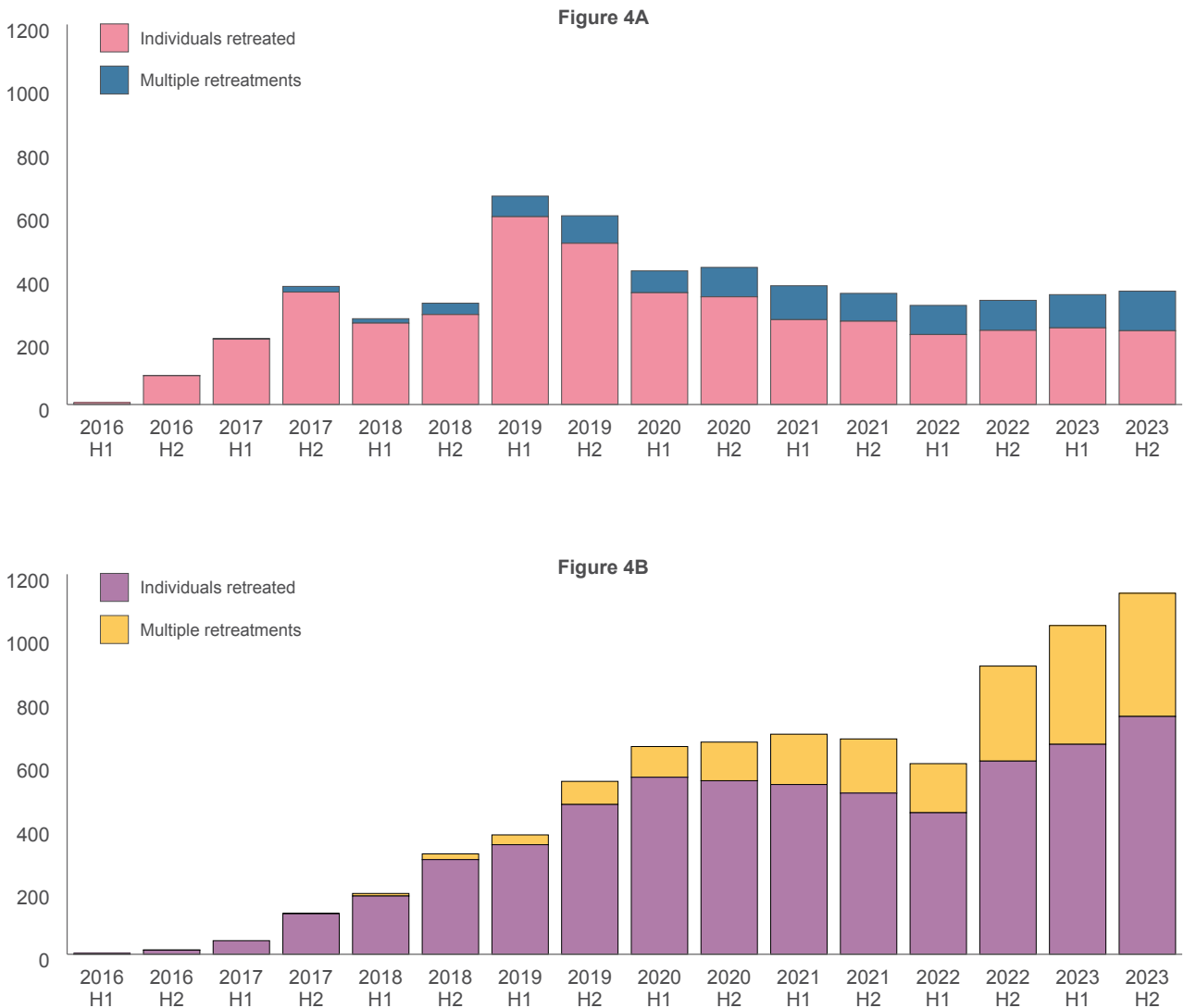
Retreatment for treatment failure

The number of retreatment initiations for treatment failure increased between the first and second quarters of 2019, corresponding to when sofosbuvir/velpatasvir/voxilaprevir was listed on the PBS in April 2019. Since 2021, the trend in number of retreatments for treatment failure has stabilised. The number of retreatments for treatment failure was 605 in 2023, increasing to 705 in 2023.

Retreatment for reinfection

An increasing trend in retreatments for reinfection was observed. The deceleration in retreatment for reinfection during 2020-2021 was followed by a distinct acceleration from 2022. The recent increases in retreatment for reinfection may be due to increased HCV testing and detection following COVID-19 restrictions.

Figure 4: Six-monthly retreatments for (A) treatment failure and (B) reinfection



Population trends

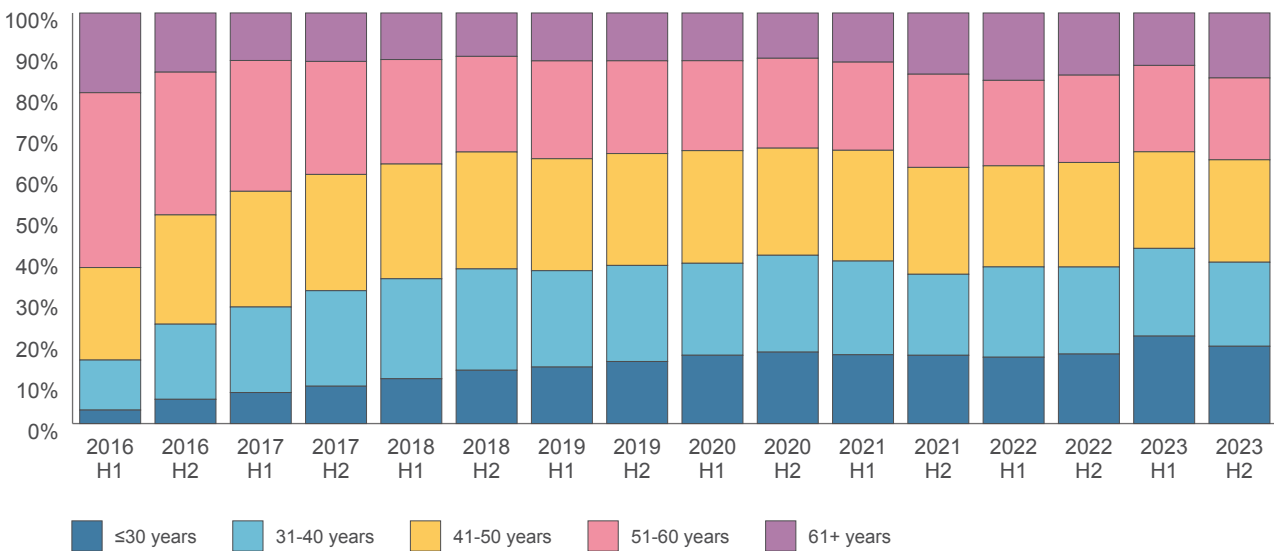
Age

The median age of individuals initiating HCV treatment during 2016 to 2023 was 48 years. Median age declined from 52 years in 2016 to 44 years in 2023. DAA treatment uptake by age group is illustrated in **Figure 5**. An increasing trend of younger people initiating treatment was observed, with the largest increases among people ≤ 30 years.

Age distribution among individuals retreated for treatment failure was consistent with that observed for treatment. Median age was 47 years; declining from 56 in 2016 to 44 years in 2023.

A younger age distribution was observed among individuals retreated for reinfection. Median age was 36 years; declining from 45 in 2016 to 36 years in 2023.

Figure 5: Age distribution of the DAA treated population



Gender

Of individuals initiating HCV treatment between 2016 and 2023, 69% (n=72,870) were men and 31% (n=33,077) women. During this period the proportion of women initiating treatment declined from 34% to 26%. Age distribution for treatment or retreatment was consistent between genders.

Treatment discontinuation

Despite increased prescribing of shorter duration pangenotypic DAA therapy (**Figure 6**), treatment discontinuation continued to rise. Treatment discontinuation, defined as missing at least 4 weeks of treatment, was higher among women compared to men.

In 2023, treatment discontinuation rates were 17% among women compared to 10% among men. The trends in treatment discontinuation for men and women are illustrated in **Figure 7**.

Figure 6: Distribution of DAA treatment (A) regimens and (B) durations

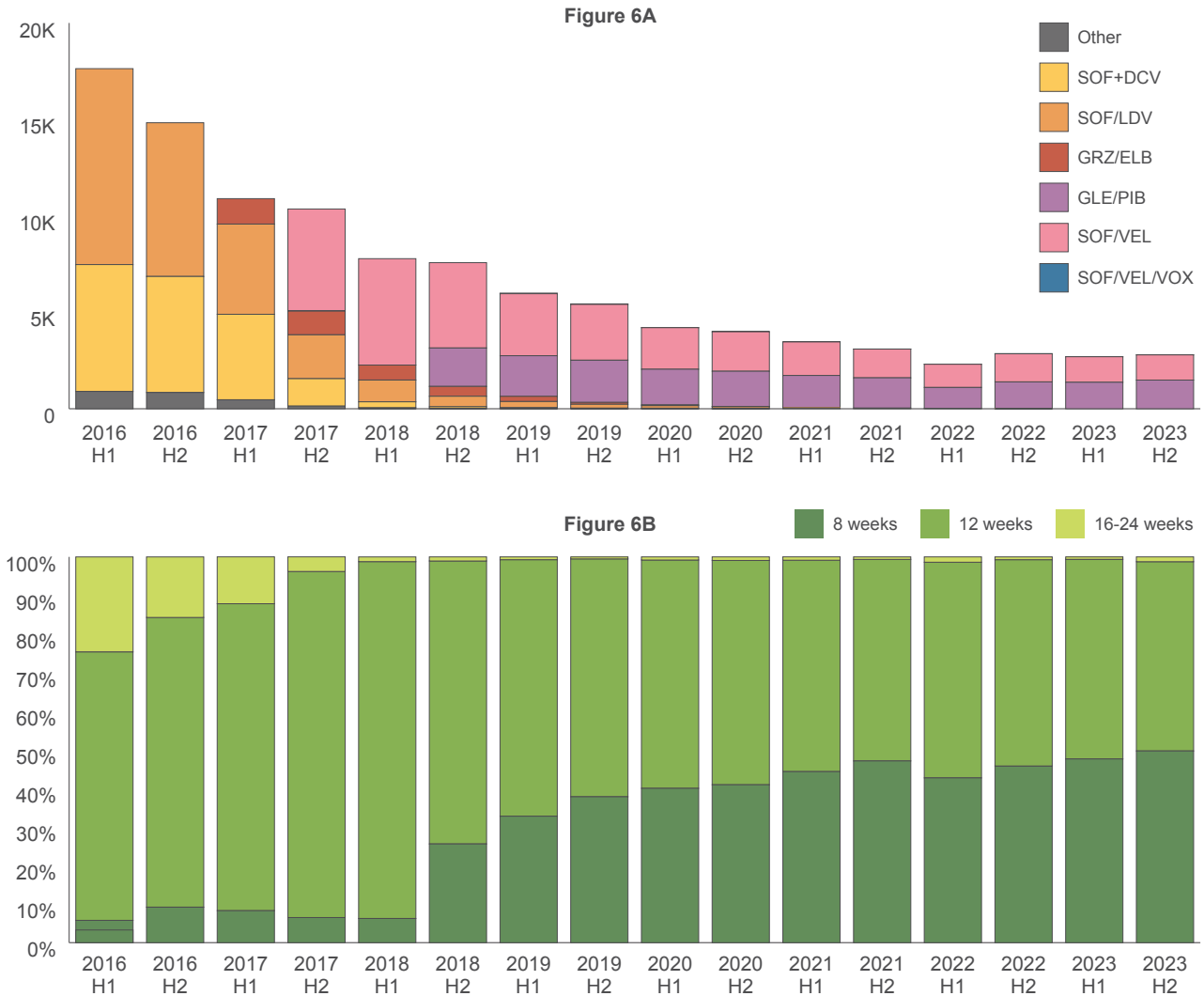
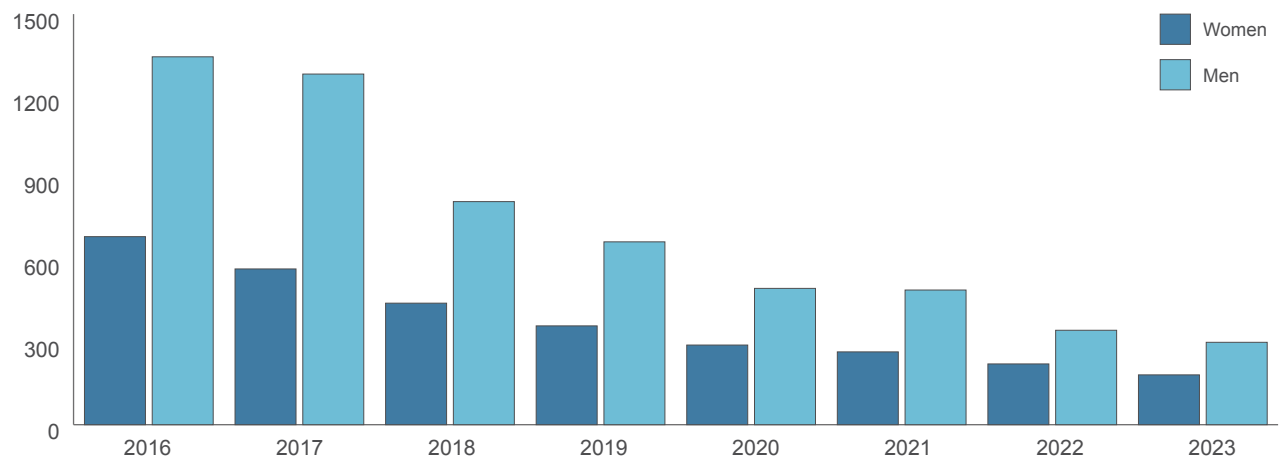


Figure 7: Treatment discontinuation trends by gender



Retreatment

Patterns of retreatment differed by gender. Among men an increasing trend in retreatment for reinfection was observed (**Figure 8**). An increasing trend in retreatment for treatment failure was observed among women, consistent with rising treatment discontinuation rate.

Prescriber trends

Prescribing of DAA therapy by Primary Care Clinicians (general Practitioners and nurse practitioners) has increased over time, while prescribing by HCV specialists (gastroenterologists and infectious disease physicians) has declined. In 2023, Primary Care Clinicians prescribed 66% of treatment and 73% of retreatments.

Treatment

The most common prescribers of HCV treatment in Australia were General Practitioners (46%). The proportion of people treated by people treated by general practitioners increased from 31% in 2016 to 55% in 2023. During this period prescribing by

gastroenterologists declined from 50% to 19%. Prescribing by Nurse Practitioners has increased during the past five years, rising from 2% in 2019 to 11% in 2023. Prescriber trends are illustrated in **Figure 9**.

Retreatment for treatment failure

Most people retreated for treatment failure were retreated by HCV specialists (51%). During the past five years, however, prescribing of retreatment for treatment failure by Primary Care Clinicians increased (**Figure 9**). In 2023, 46% of retreatments for treatment failure were prescribed by General practitioners and 12% were prescribed by Nurse Practitioners.

Retreatment for reinfection

Most people retreated for reinfection were retreated by Primary Care Clinicians (72%). During the past five years, prescribing of retreatments for reinfection by Nurse Practitioners increased (**Figure 9**). In 2023, 56% of retreatments for reinfection were prescribed by General Practitioners and 21% were prescribed by Nurse Practitioners.

Figure 8: Distribution of DAA treatment and retreatment among (A) men and (B) women

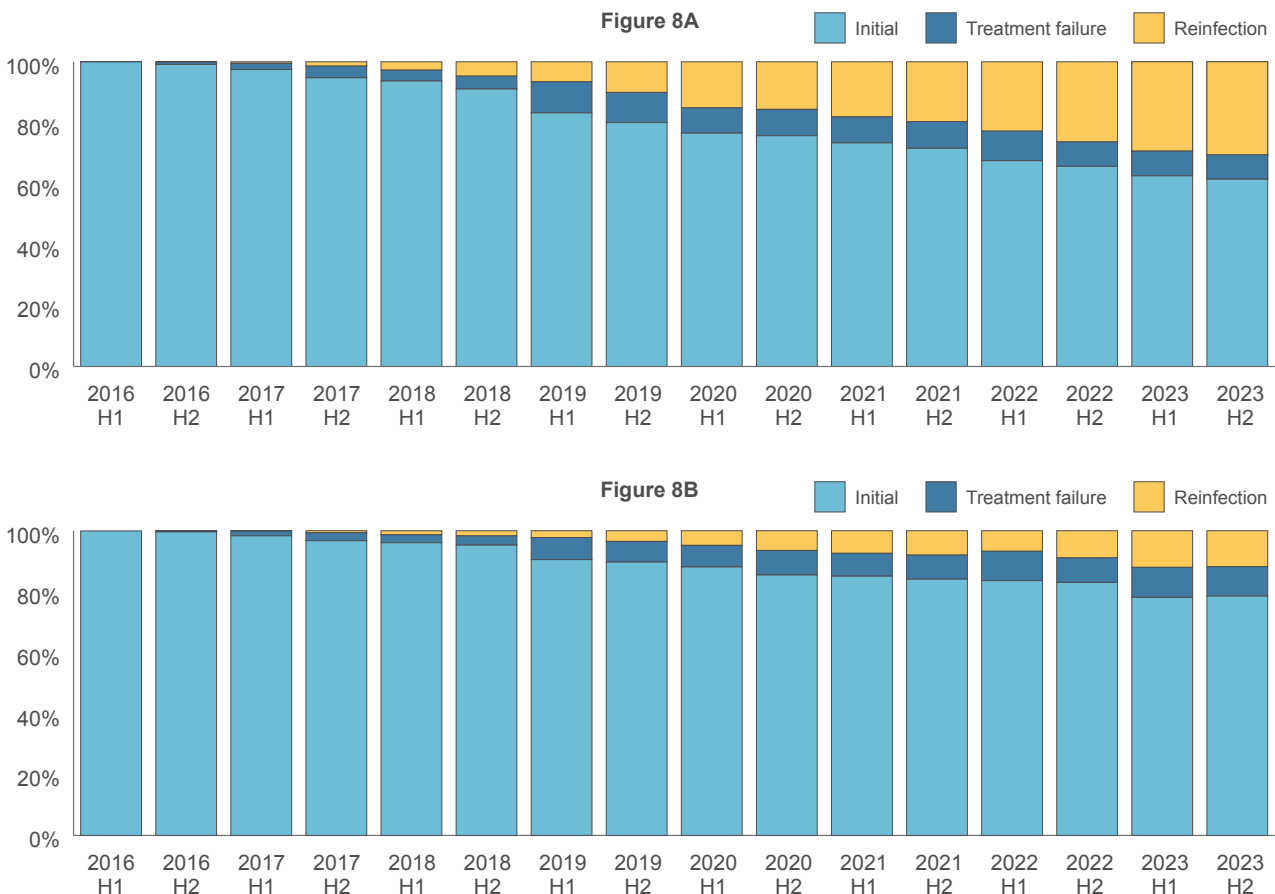
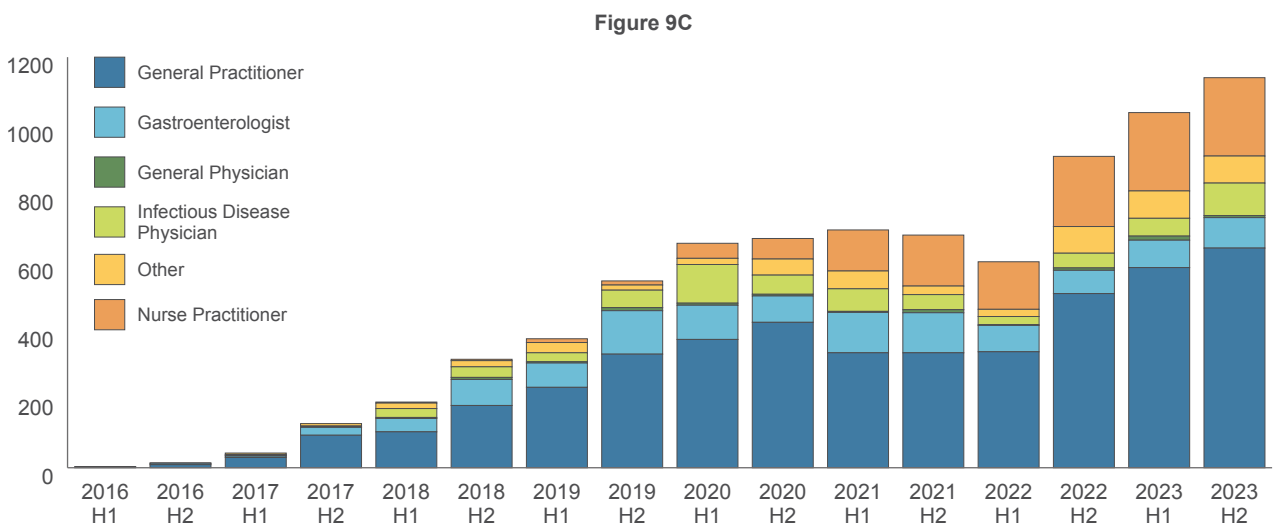
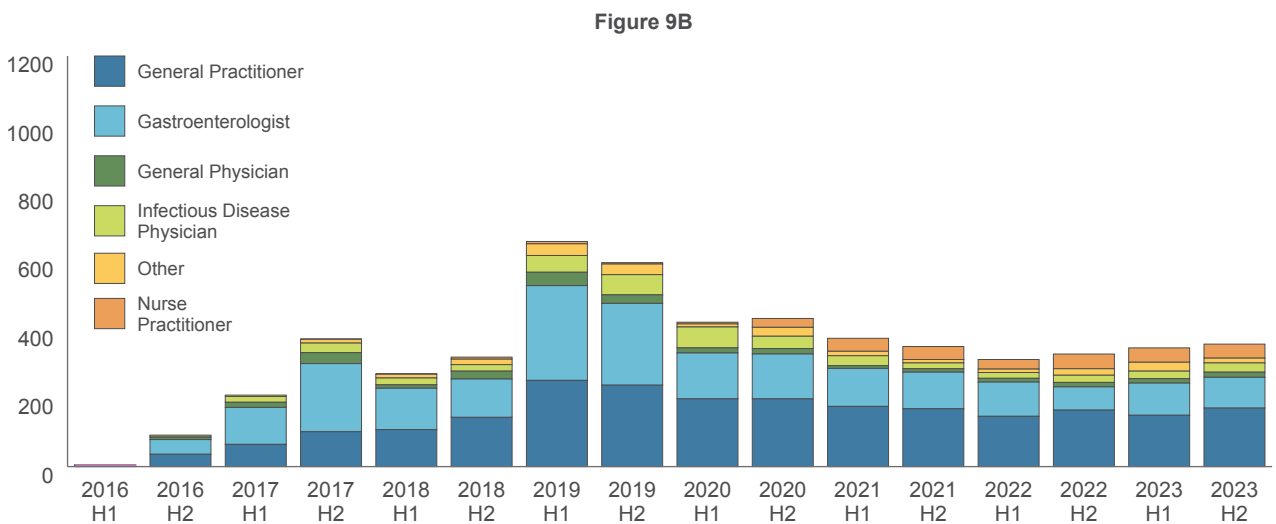
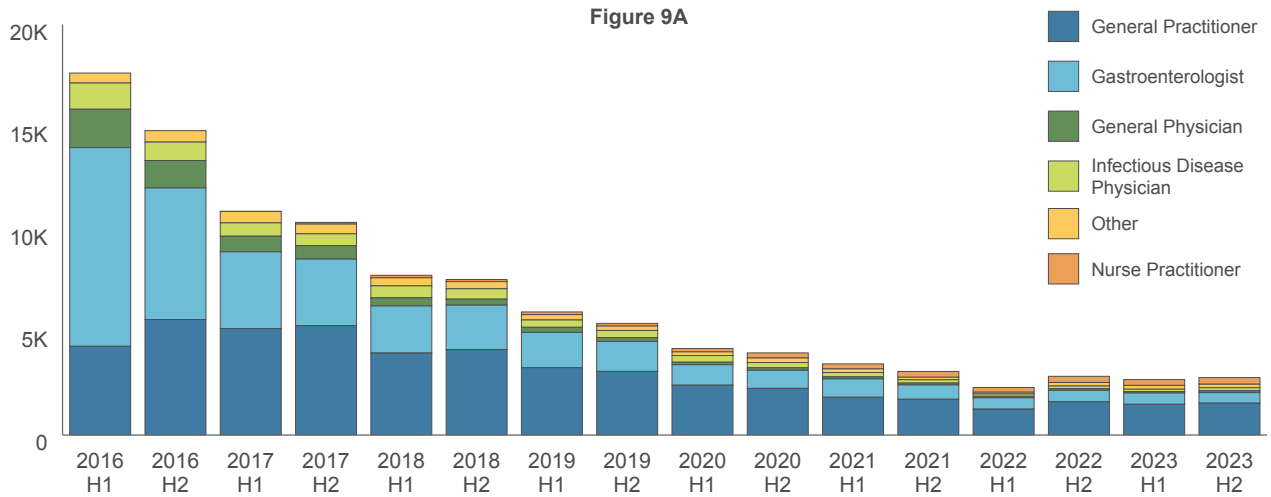


Figure 9: Prescriber trends for (A) treatment, (B) retreatment for treatment failure and (C) retreatment for reinfection



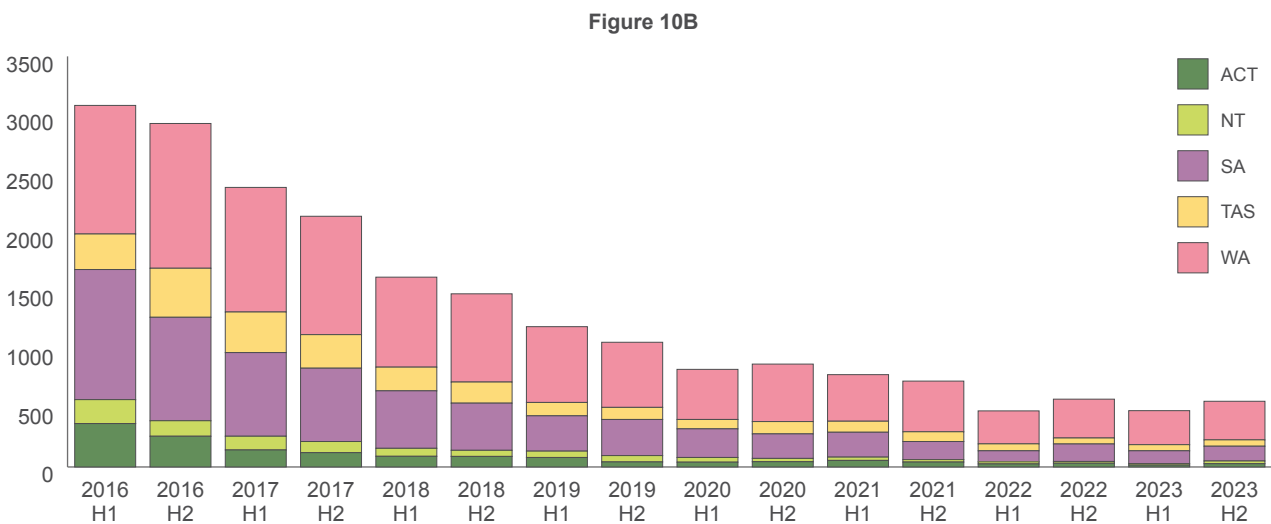
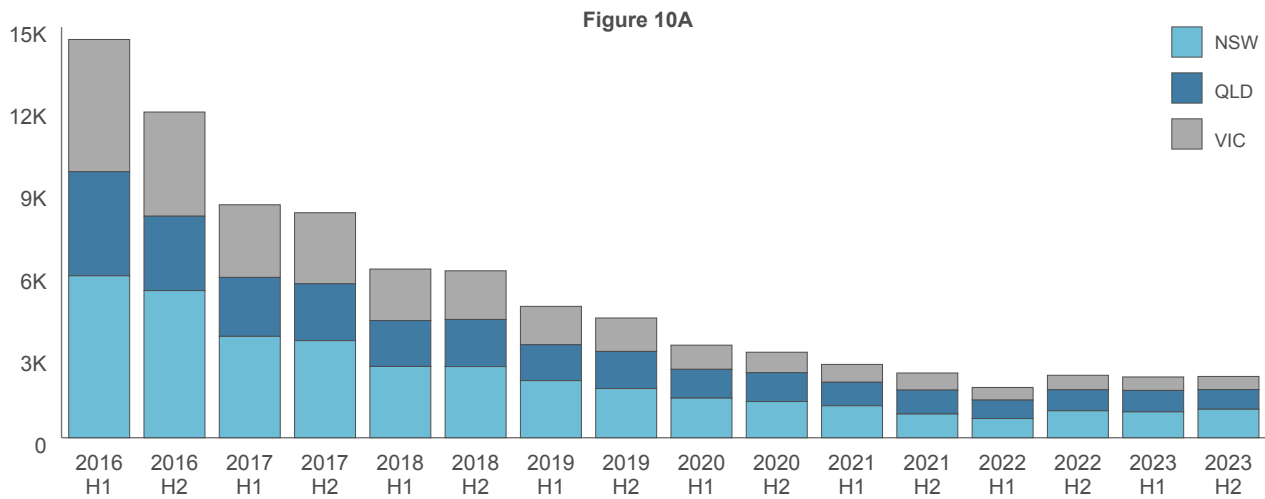
State and Territory trends

Treatment

Similar trends in treatment initiations were observed for all States and Territories in Australia. Number of individuals initiating treatment were 36,101 in New South Wales, 25,044 in Victoria, 23,595 in Queensland,

10,098 in Western Australia, 6,606 in South Australia, 2,530 in Tasmania, 1,490 in Australian Capital Territory, and 962 in Northern Territory. The jurisdictional trends of treatment initiation are illustrated in **Figures 10 and 13**. For jurisdictions with smaller populations treated for HCV, the trends were presented on separate panel in **Figure 10**.

Figure 10: Treatment trends by jurisdiction (A) NSW, QLD, VIC, (B) ACT, NT, SA, TAS, WA



Abbreviations:

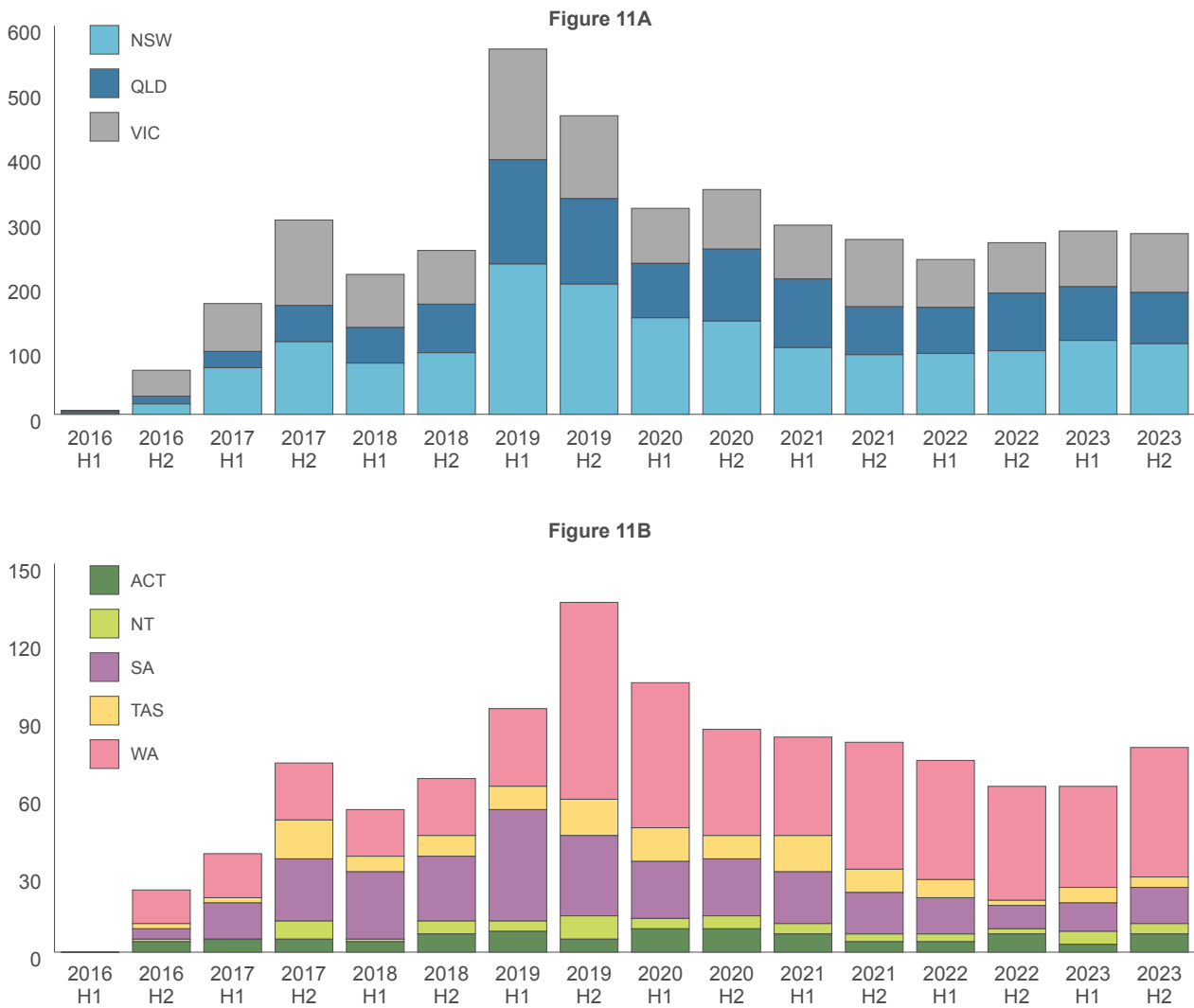
NSW: New South Wales; VIC: Victoria; QLD: Queensland; SA: South Australia; WA: Western Australia; ACT: Australian Capital Territory; TAS: Tasmania; NT: Northern Territory

Retreatment for treatment failure

There were similar trends in retreatment for treatment failure in all Australian Jurisdictions (**Figures 11 and 14**). The estimated number of retreatments for treatment failure were 1,712 in New South Wales, 1,404 in Victoria, 1,216 in Queensland, 561 in

Western Australia, 295 in South Australia, 120 in Tasmania, 88 in Australian Capital Territory, and 57 in Northern Territory. For jurisdictions with smaller populations retreated for treatment failure, trends were presented on separate panel in **Figure 11**.

Figure 11: Retreatment for treatment failure trends by jurisdiction (A) NSW, QLD, VIC, (B) ACT, NT, SA, TAS, WA



Abbreviations:

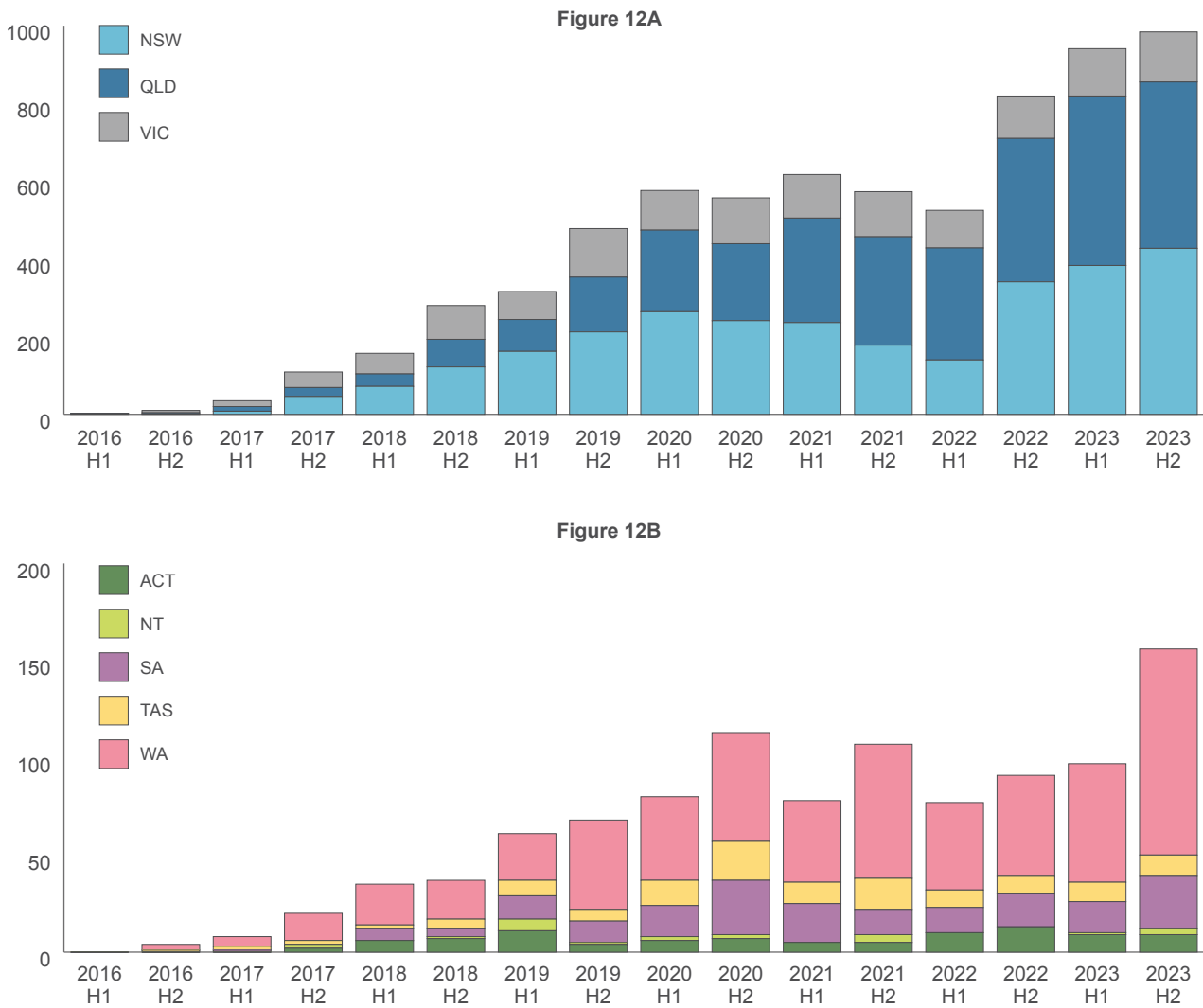
NSW: New South Wales; VIC: Victoria; QLD: Queensland; SA: South Australia; WA: Western Australia; ACT: Australian Capital Territory; TAS: Tasmania; NT: Northern Territory

Retreatment for reinfection

Retreatment for reinfection trends varied by Australian Jurisdiction (**Figures 12 and 15**). Over the past five years, retreatment for reinfection has increased considerably in New South Wales and Queensland. A notable decline was observed during 2020 to 2021 for New South Wales, followed by a sharp increase from 2022. The estimated number of retreatments for

reinfection were 2,835 in New South Wales, 1,304 in Victoria, 2,481 in Queensland, 607 in Western Australia, 184 in South Australia, 125 in Tasmania, 94 in Australian Capital Territory, and 22 in Northern Territory. For jurisdictions with smaller populations retreated for reinfection, trends were presented on separate panel in **Figure 12**.

Figure 12: Retreatment for reinfection trends by jurisdiction (**A**) NSW, QLD, VIC, (**B**) ACT, NT, SA, TAS, WA



Abbreviations:

NSW: New South Wales; VIC: Victoria; QLD: Queensland; SA: South Australia; WA: Western Australia; ACT: Australian Capital Territory; TAS: Tasmania; NT: Northern Territory

Figure 13: Quarterly treatment trends by Australian jurisdiction

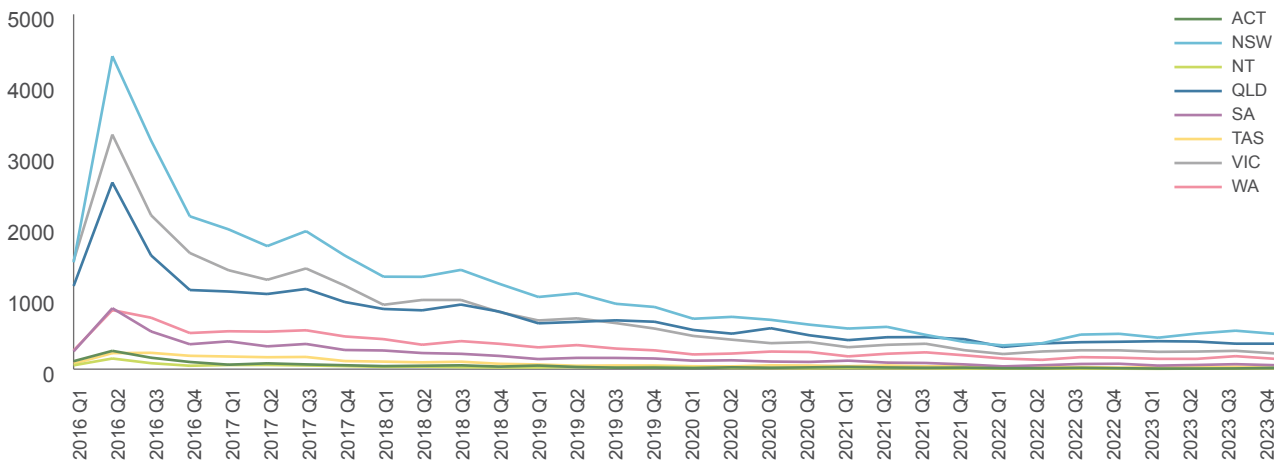


Figure 14: Quarterly retreatment for treatment failure trends by Australian jurisdiction

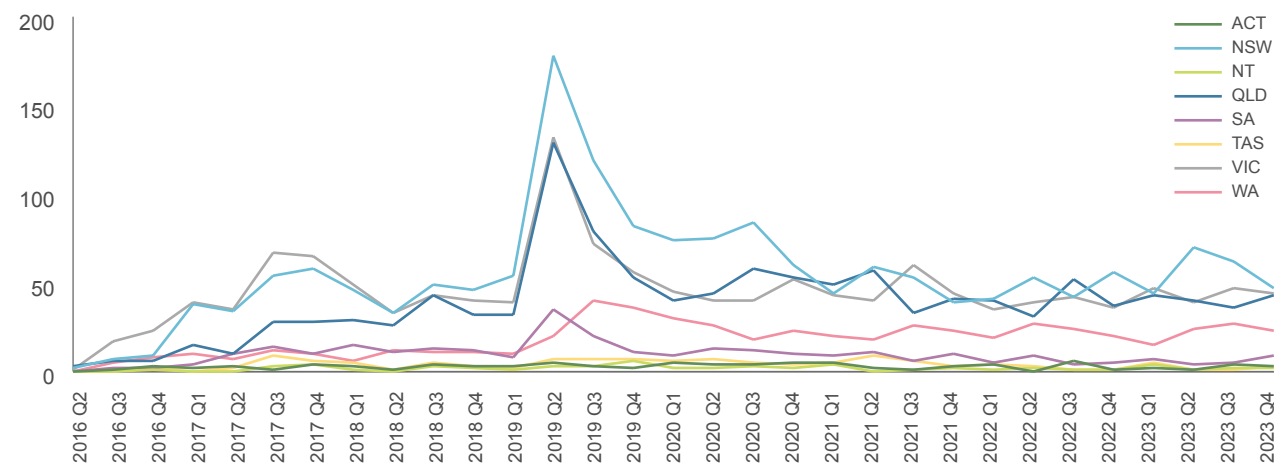
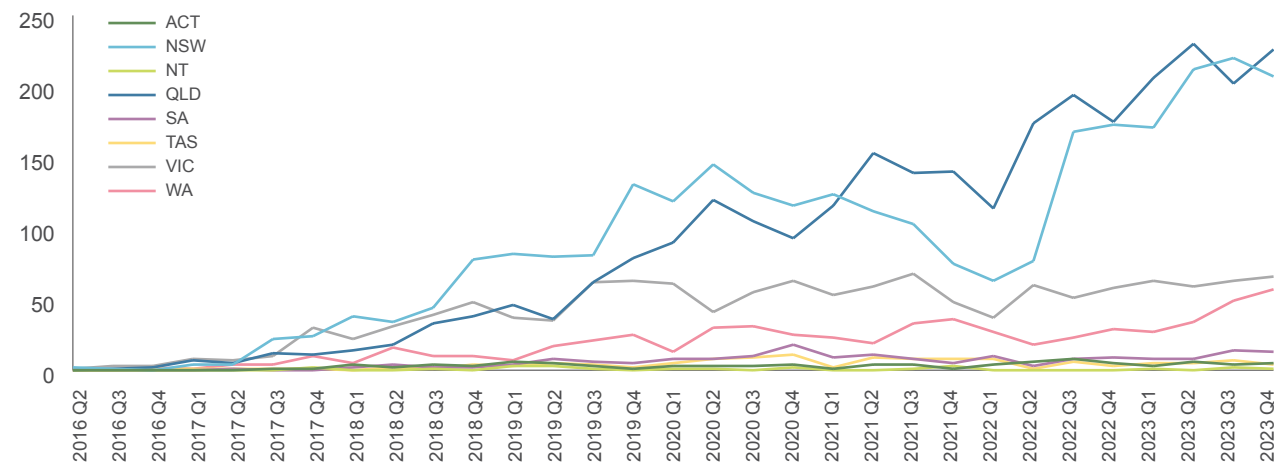


Figure 15: Quarterly retreatment for reinfection trends by Australian jurisdiction



Abbreviations:

NSW: New South Wales; VIC: Victoria; QLD: Queensland; SA: South Australia; WA: Western Australia; ACT: Australian Capital Territory; TAS: Tasmania; NT: Northern Territory

Methodology

Pharmaceutical Benefits Scheme (PBS) data of all DAA prescriptions dispensed in Australia between March 2016 and December 2023 in Australia were used in the analysis. The first DAA prescription was considered initial treatment. Prescriber type was defined based on the prescriber derived major speciality codes recorded by PBS. In this coding system, medical trainees (i.e., registrars) are considered as specialists. Jurisdictions are based on the patient residence at the time of treatment or retreatment prescription. More details of methodology were described previously¹.

Treatment discontinuation

DAA treatment is typically dispensed in 28-day supplies. Treatment discontinuation was defined as one or more repeat prescription (28-days or more) of the authorised duration not dispensed. Individuals who discontinued initial treatment and restarted a different regimen ≤ 28 days before the estimated end of treatment date (calculated as date of dispensation plus the number of daily doses dispensed) were considered treatment switches or lost prescriptions and were not considered treatment discontinuations. Where the first DAA prescribed was discontinued and the second DAA prescribed was initiated within 28 days, this was considered the same treatment to account for extended durations of therapy. Individuals commencing treatment in the last quarter of 2023 were given at least three months of follow up following initial dispensation to fill prescription repeats ensure sufficient time for completion of treatment. Individuals who were dispensed the whole treatment course at a single time were also excluded from this analysis. More details of methodology were described previously².

Retreatment

Retreatment was defined as commencement of a different DAA prescription any time after estimated end of treatment date (unless initial regimen was discontinued). Reason for retreatment (treatment failure or reinfection) is not captured in PBS data.

A supervised machine learning model (random forest architecture; sensitivity 96%, specificity 97%) was developed using real-world standard-of-care data from the REACH-C study (10,843 treated; 350 retreated with reason available)^{3,4}. The model was applied to pharmaceutical benefits scheme data to assess trends in retreatment for reinfection and treatment failure. Details of the machine learning algorithm, model training procedure, and model performance metrics were described previously⁵.

References

1. Hajarizadeh B, Grebely J, Matthews GV, Martinello M, Dore GJ. Uptake of direct acting antiviral treatment for chronic hepatitis C in Australia. *Journal of Viral Hepatitis* 2018; 25(6): 640-8
2. Carson J, Barbieri S, Matthews GV, Dore GJ, Hajarizadeh B. Increasing national trend of direct-acting antiviral discontinuation among people treated for HCV 2016–2021. *Hepatology Communications* 2023; 7(4): e0125.
3. Carson JM, Hajarizadeh B, Hanson J, O'Beirne J, Iser D, Read P, Balcomb A, Davies J, Doyle JS, Yee J, Martinello M, Marks P, Dore GJ, Matthews GV. Effectiveness of treatment for hepatitis C virus reinfection following direct acting antiviral therapy in the REACH-C cohort. *International Journal of Drug Policy* 2021; 96: 103422.
4. Carson JM, Hajarizadeh B, Hanson J, O'Beirne J, Iser D, Read P, Balcomb A, Davies J, Doyle JS, Yee J, Martinello M, Marks P, Matthews GV, Dore GJ. Retreatment for hepatitis C virus direct-acting antiviral therapy virological failure in primary and tertiary settings: The REACH-C cohort. *Journal of Viral Hepatitis* 2022; 29(8): 661–76.
5. Carson JM, Barbieri S, Matthews GV, Dore GJ, Hajarizadeh B. National trends in retreatment of HCV due to reinfection or treatment failure in Australia. *Journal of Hepatology* 2023; 78(2): 260-70.