

HEPATITIS C MAPPING PROJECT

Estimates of geographic diversity in chronic hepatitis C prevalence, diagnosis, monitoring and treatment



NATIONAL REPORT 2016

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WHO COLLABORATING CENTRE FOR VIRAL HEPATITIS
THE PETER DOHERTY INSTITUTE FOR INFECTION AND IMMUNITY
AUSTRALASIAN SOCIETY FOR HIV, VIRAL HEPATITIS AND SEXUAL HEALTH MEDICINE



Hepatitis C Mapping Project: Estimates of geographic diversity in chronic hepatitis C prevalence, diagnosis, monitoring and treatment - National Report 2016

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AHPRA	Australian Health Practitioner Regulation Agency
ASHM	Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine
CHC	Chronic hepatitis C infection
DAAs	Direct-acting antivirals
DHHS	Department of Health and Human Services
ERP	Estimated Resident Population
GHSS	Global Health Sector Strategy on Viral Hepatitis 2016-2021
GP	General practitioner
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
HCV RNA	Hepatitis C virus ribonucleic acid
MBS	Medicare Benefits Schedule
NNDSS	Department of Health National Notifiable Diseases Surveillance System
NSW	New South Wales
NT	Northern Territory
PBS	Pharmaceutical Benefits Scheme
PCR	Polymerase chain reaction
PHN	Primary Health Network
QLD	Queensland
Regional Action Plan	Regional Action Plan for Viral Hepatitis in the Western Pacific 2016-2020
SA	South Australia
SA2	Statistical Area 2 Geographic Boundary
SA3	Statistical Area 3 Geographic Boundary
TAS	Tasmania
VIC	Victoria
WA	Western Australia
WHO	World Health Organization
WHO Targets	Set of global targets defined in the GHSS by the WHO that are aligned with the 2030 Agenda for Sustainable Development and relevant World Health Assembly resolution

For a full list of commonly used data terms and definitions, see Section 3.

EXECUTIVE SUMMARY

CHRONIC HEPATITIS C PREVALENCE AND DIAGNOSIS

- The estimated prevalence of chronic hepatitis C (CHC) was highest in the Primary Health Networks (PHNs) of Northern Territory (1.87%), Western NSW (1.64%), and North Coast (NSW) (1.57%), and lowest in Northern Sydney (0.41%), Eastern Melbourne (0.52%), and Adelaide (0.58%).
- Estimated prevalence was generally higher in those PHNs comprising largely rural and regional locations and lower in metropolitan areas.
- The rate of notifications of new CHC diagnoses in 2016 increased by 12% compared to the previous year, the first increase since 2007, potentially reflecting increased testing in response to the availability of new antiviral treatments.

CHRONIC HEPATITIS C TREATMENT

- Treatment uptake was variable between and within PHNs, highest in the PHNs of Adelaide (25.9%), North Coast (NSW) (25.3%), South Eastern Melbourne (25.1%), and Eastern Melbourne (24.9%), and lowest in Western Queensland (6.9%) and the NT (9.4%).
- Treatment uptake was generally lower in areas of estimated high prevalence.
- Prescribing of CHC treatment by general practitioners (GPs) and providers other than specialist physicians has increased as a proportion of all treatments (from 14.6% to 36.8%), making up the majority of treatment prescribed in all states except NSW and VIC.
- Individuals prescribed treatment were most commonly males (67%) aged 40–60 years (63%), reflecting the demographics of diagnosed infection and higher prevalence of advanced liver disease in this cohort.
- Areas of lower treatment rates were often those with a lower concentration of specialist physicians per person living with CHC, such as NT, Brisbane South, and Perth South.

DATA SOURCES AND ESTIMATES

- This report contains analysis of publicly available population-level data and Medicare Benefits Schedule and Pharmaceutical Benefits Schedule utilisation data.
- The publicly available population data includes using communicable disease notifications to assess rates of diagnosis and also generate estimated prevalence according to area.
- These data are used to produce estimates of treatment uptake and assess patterns, demographics and provider details of CHC treatment.

Figure 1: Heat map of CHC prevalence, diagnosis and treatment uptake uptake by Primary Health Network, 2016 (green = lowest; red = highest)

	PREVALENCE	DIAGNOSIS	TREATMENT
Primary Health Network	Proportion of the population living with CHC	CHC notification rate per 100,000	Proportion of people with CHC who received treatment
Northern Territory	1.87%	80.3	9.4%
Western NSW	1.64%	71.1	12.6%
North Coast (NSW)	1.57%	90.4	25.3%
Northern Queensland	1.30%	56.0	14.1%
Brisbane South	1.28%	55.1	10.7%
Murrumbidgee	1.26%	74.5	10.8%
Western Queensland	1.23%	45.6	6.9%
Darling Downs and West Moreton	1.10%	46.8	13.5%
Central Queensland, Wide Bay, Sunshine Coast	1.09%	52.6	16.6%
South Eastern NSW	1.09%	55.6	19.9%
Country WA	1.08%	53.0	12.9%
Hunter New England and Central Coast	1.05%	60.9	19.3%
Tasmania	1.04%	45.2	17.0%
Central and Eastern Sydney	1.03%	44.5	20.1%
Gippsland	1.01%	51.7	21.9%
South Western Sydney	0.99%	46.9	16.7%
Murray (VIC)	0.98%	54.9	18.1%
Perth South	0.97%	45.0	11.2%
Gold Coast	0.97%	46.2	20.7%
Nepean Blue Mountains	0.94%	41.6	14.4%
North Western Melbourne	0.94%	45.4	19.0%
Brisbane North	0.89%	38.3	16.2%
Australian Capital Territory	0.88%	36.3	21.2%
Western Victoria	0.84%	43.4	23.8%
Perth North	0.81%	37.8	14.6%
South Eastern Melbourne	0.79%	33.9	25.1%
Western Sydney	0.74%	32.7	14.8%
Country SA	0.62%	33.7	19.8%
Adelaide	0.58%	25.3	25.9%
Eastern Melbourne	0.52%	22.1	24.9%
Northern Sydney	0.41%	16.4	21.6%
NATIONAL AVERAGE	0.94%	53.9	18.8%

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INTRODUCTION AND BACKGROUND

THE FIRST NATIONAL MAPPING REPORT FOR HEPATITIS C

Treatment for hepatitis C has undergone a revolution in recent years, with highly effective, short-duration, and well tolerated curative treatments now available and subsidised in Australia for all adults living with hepatitis C.

Initial uptake of these treatments has been strong, however it is important to track the delivery of these treatments and assess variation in the levels of uptake across Australia.

This report presents the first estimates of hepatitis C treatment uptake disaggregated according to geographic area within states and territories. It also assesses the rate of diagnosed infection and the accessibility of relevant specialist providers. This can help to guide responses to ensure all Australians affected by hepatitis C receive diagnosis and treatment.

This report complements the extensive work that has previously been undertaken in hepatitis C to model and estimate disparities in prevalence, diagnosis and treatment uptake in Australia.

WHAT DOES THIS REPORT INCLUDE?

- Estimates of CHC prevalence, notification rates, and treatment uptake by Primary Health Network (PHN)
- Detailed mapping at the Statistical Area 3 level (SA3) within each PHN, allowing local comparisons within each area
- Workforce data describing the proportion of prescribing for CHC by GPs and other non-specialist providers
- Level of access to specialist services in a given area and relationship to treatment uptake

HEPATITIS C IN AUSTRALIA

At the start of 2016 in Australia, an estimated 227,306 individuals were living with chronic hepatitis C (CHC), representing 0.94% of the total population (1). Of those affected, it was estimated that approximately 80% had been diagnosed, and 47% of those diagnosed had hepatitis C RNA testing to confirm their CHC infection (1). The World Health Organisation (WHO) has set targets for 90% of all chronic hepatitis infections to be diagnosed, and 80% of those eligible to be treated by 2030 (2). Australia is one of only a few countries globally which are on track to achieve the WHO elimination targets for hepatitis C if access to diagnosis, treatment and care continues at current levels.

The number of people who have ever received treatment for hepatitis C vastly increased after the listing of highly effective directly-acting antivirals (DAAs) on the Pharmaceutical Benefits Scheme (PBS) in March 2016. According to the Kirby Institute Annual Surveillance Report 2017 an estimated 32,550 people received treatment in the first 9 months, or 14% of those affected (between March and December 2016) (1). Of those treated, an estimated 93% were cured, corresponding to an estimated 30,434 people who were cured of hepatitis C in 2016 (1). Uptake has been demonstrated to vary between states and territories, however variation within jurisdictions has not previously been explored (3). We aimed to assess disparities in access to treatment according to geographic area, and identify gaps in progress towards elimination goals.

Treatment for CHC was previously restricted to specialist physicians. General Practitioners (GPs) who had completed formal s100 highly specialised drugs prescriber training or were under the supervision of a specialist physician could largely only prescribe maintenance treatment (apart from a small ASHM pilot of 11 GPs who could initiate treatment). However, DAA treatment can now be provided by any medical practitioner or authorised nurse practitioner experienced in the treatment of hepatitis C. This has led to opportunities for treatment in more settings and the removal of previous barriers to access that resulted from specialist-only prescribing requirements.

WHAT DOES THIS REPORT ESTIMATE?

There are currently no available estimates of sub-jurisdictional variation in the estimated prevalence of hepatitis C across Australia. However, all diagnosed cases of CHC are required to be reported to the National Notifiable Diseases Surveillance System (NNDSS), providing a measure of the number of newly diagnosed cases of CHC by area of residence. In this report, these data have been used to generate estimates of the number of people living with CHC nationally, and within each state and territory at both the PHN level, and within PHNs by SA3. Combined with PBS data on the number of people who have been prescribed hepatitis C treatment, this has permitted the production of estimates of the uptake of hepatitis C treatment by geographic area.

The PBS data have also been analysed to provide more information about patterns of treatment, including the age and sex distribution of those who have been prescribed therapy, and the provider type of those prescribing treatment. We have also collated medical practitioner registration data to assess the level of access to specialist physician services in a given area, to allow identification of those areas most in need of increased primary care prescribing of hepatitis C treatment.

HOW WERE THESE ESTIMATES GENERATED?

The prevalence of CHC by geographic area was estimated by applying the estimated Australian prevalence of CHC (0.94%) (1) and weighting this prevalence by geographic area using the proportional distribution of unspecified (chronic) hepatitis C notifications. This proportional distribution describes the variation in how many people resident in a given area have tested positive for hepatitis C. Notifications represent only those individuals who have been tested for hepatitis C and in whom a positive result has for the first time been notified to the health department. Residential location is recorded at the time the test was performed, which affects the geographic allocation of prevalent infections due to individuals changing residential address in the years after diagnosis. It is important to be aware of these limitations when using these prevalence estimates to calculate treatment uptake. Some locations (SA3s) have disproportionately high numbers of their populations residing in correctional facilities, which may lead to relatively high numbers of diagnosed cases and treatment uptake in temporary residents of the area. Regions where this may have a disproportionate impact on estimates are highlighted in the body of the report. See Section 3 for further details on the sourcing of this information.

The geographic distribution of hepatitis C notifications for the ten-year period 2007–2016 was selected to weight the population prevalence of hepatitis C by area. Because prevalence estimates are used as the denominator for treatment uptake calculations, shifts in the data used to calculate prevalence can have a substantial impact on treatment uptake estimates. If a shorter, more recent time period is used for this purpose, this could lead to overestimation of prevalence in areas with a recent increase in hepatitis C notifications; however using a longer period can lead to inaccuracy in current burden as a larger proportion of those diagnosed historically are likely to have moved away since diagnosis. Sensitivity analysis was performed using notifications between 1997–2016 to weight the prevalence estimates,

in order to assess the impact of different time periods being applied. No significant differences in resulting estimates were found (see Supplementary).

The estimates presented here aim to provide a comprehensive assessment of geographic variation in hepatitis C prevalence and treatment uptake. While derived from existing published national data (1), this report uses a different methodology for assigning prevalence according to geographic area, as well as varied time periods of measurement, and thus results will not concord exactly with other established estimates.

LOCALISED HEALTH INFORMATION

Australia's 31 PHNs were established to increase the efficiency and effectiveness of medical services for patients, and to improve coordination of patient-centred care, particularly for those at risk of poor health outcomes. A key element of this health reform is accurate population health data, allowing local areas to prioritise public health and medical services to those conditions disproportionately affecting specific regions. This report enables PHNs to identify their local prevalence of CHC and their progress in delivering care to those affected. It also highlights those places where improving access should be a priority.

The prevalence and treatment indicators in this report are also assessed within each PHN, at the level of SA3, standardised geographic regions usually comprising between 30,000 and 130,000 people. Given the large geographic size of many PHNs, and that three jurisdictions comprise only a single PHN (ACT, TAS, and NT), these further geographic breakdowns provide more detailed information by location to target responses to CHC.

To access the categorisation of PHNs and SA3s used in this report, as designated by the Australian Bureau of Statistics and the Australian Federal Department of Health, visit: <http://www.health.gov.au/internet/main/publishing.nsf/Content/PHN-Concordances>

FUTURE REPORTS

The National Hepatitis C Mapping Report will be produced annually, with new and updated data to help track progress in treatment uptake across Australia. Future reports will also aim to incorporate additional data sources, and to measure treatment uptake among specific priority populations, such as those in correctional facilities and Aboriginal and Torres Strait Islander people.

In subsequent reports, estimates with greater geographic specificity will be generated to report the level of GP prescribing by area. In addition, the incidence of liver cancer by geographic area will be reported, in order to assess the estimated prevalence of adverse outcomes across Australia and monitor trends over time.

SECTION 1: NATIONAL SNAPSHOT

IN THIS SECTION

- National and state/territory trends in prevalence, diagnosis and treatment
- Hotspots for estimated prevalence and treatment across Australia
- Analysis of treatment demographics, prescriber patterns and specialist access

PREVALENCE

At the start of 2016 in Australia, an estimated 227,306 individuals were living with CHC, representing 0.94% of the total population (1).

When this total national prevalence is broken down to state and territory based on the distribution of notifications, the proportion of people living with CHC in 2016 varied considerably (Table 1), from the highest prevalence of 1.84% in the NT to the lowest prevalence in SA, at 0.59%. The prevalence of CHC was above the national average in the NT, NSW and QLD, and below the average in SA, ACT, WA, VIC and TAS.

Table 1: Estimated prevalence of CHC by state and territory, start of 2016

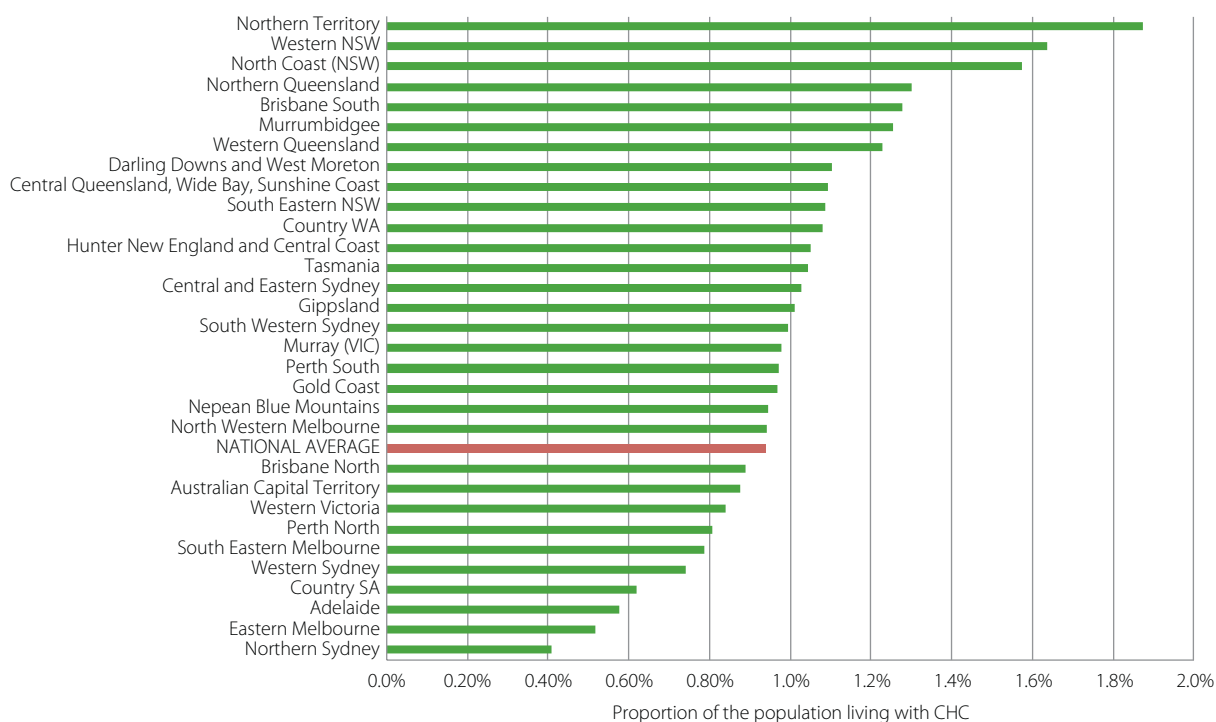
State/Territory	Total Population	People living with CHC	CHC prevalence
ACT	411,030	3,557	0.87%
NSW	7,755,498	77,083	0.99%
NT	237,919	4,374	1.84%
QLD	4,872,829	54,395	1.12%
SA	1,736,438	10,271	0.59%
TAS	528,674	5,515	1.04%
VIC	6,150,166	48,972	0.80%
WA	2,562,195	23,139	0.90%
AUSTRALIA	24,259,041	227,306	0.94%

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution. Totals may not add up due to the inclusions of those without state/territory of residence recorded in source data.

The prevalence of hepatitis C varied considerably between PHNs. The highest prevalence PHNs by state were in NT, followed by QLD and NSW. Prevalence was generally higher than the national average in non-metropolitan PHNs compared with metropolitan PHNs, however due to urban population concentration, the highest absolute numbers of people living with CHC were in metropolitan areas.

The highest prevalence PHNs in the country were the Northern Territory (1.87%), Western NSW (1.64%), North Coast (NSW) (1.57%), Northern Queensland (1.30%), Brisbane South (1.28%), Murrumbidgee (1.26%), and Western Queensland (1.23%).

Figure 2: CHC prevalence by PHN, start of 2016



Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

DIAGNOSIS

In 2016, 11,255 Australians were newly diagnosed with CHC, at a rate of 46.4 per 100,000. The number of new diagnoses in 2016 increased by 1,357 compared to 2015 (9,898 notifications), when the rate was 41.4 per 100,000 (12% increase). This may reflect increased testing in response to the availability of DAAs on the PBS as of 1 March 2016 (4, 5). The proportion of people living with hepatitis C who have been diagnosed has been estimated to be 81% (1). This is below the WHO target set for 90% of people living with CHC to be diagnosed by 2030, however Australia's diagnosis proportion is still significantly higher than the global estimate which is currently at 20%.

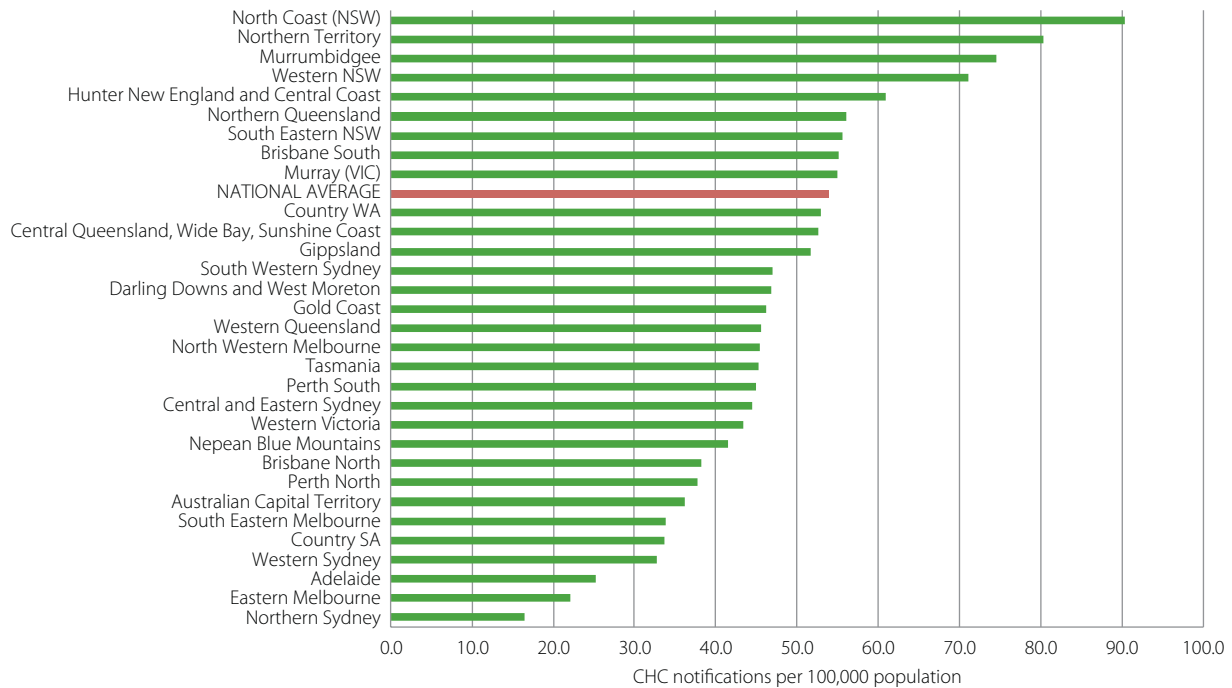
Table 2: CHC Notifications by state and territory, 2016

State/Territory	Total Population	CHC Notifications	Notification rate per 100,000
ACT	411,030	147	35.8
NSW	7,755,498	3,781	48.8
NT	237,919	190	79.9
QLD	4,872,829	2,399	49.2
SA	1,736,438	481	27.7
TAS	528,674	233	44.1
VIC	6,150,166	2,320	37.7
WA	2,562,195	1,097	42.8
AUSTRALIA	24,259,041	11,255	46.4

Data source: National Notifiable Disease Surveillance System; ABS Estimated Resident Population. Totals may not add up due to the inclusions of those without state/territory of residence recorded in source data.

Trends in hepatitis C notifications have varied over the past decade. The overall rate of notification in Australia remained stable between 2011 and 2015 (between 41 and 43 per 100,000), after declining between 2001 and 2010 (55.9 to 43.0 per 100,000). The rate of notification of hepatitis C diagnoses increased in all but five PHNs between 2015 and 2016 (Northern Sydney, ACT, Northern Queensland, Western NSW and NT).

Figure 3: CHC notification rate by PHN, 2016



Data source: National Notifiable Disease Surveillance System; ABS population data.

TREATMENT

Table 3: CHC treatment by state and territory, March 2016 – February 2017

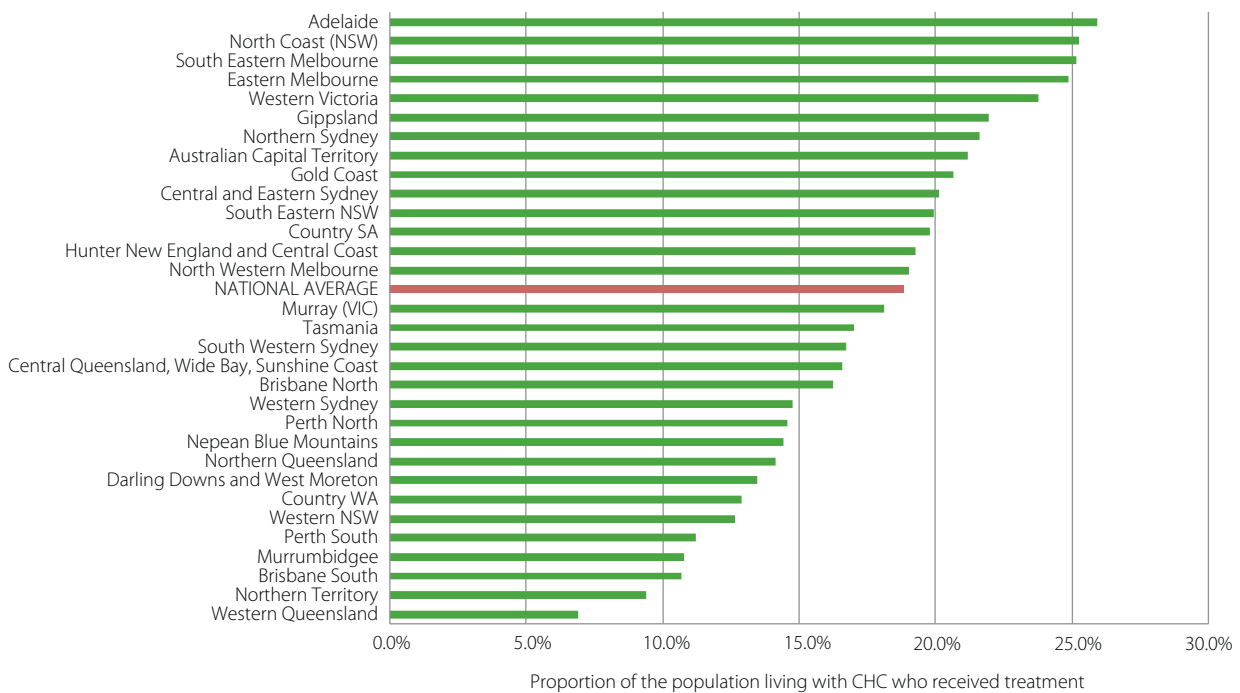
State/Territory	People living with CHC	Number receiving treatment, Mar 2016 – Feb 2017	Treatment uptake, Mar 2016 – Feb 2017
ACT	3,557	763	21.5%
NSW	77,083	14,102	18.3%
NT	4,374	418	9.6%
QLD	54,395	7,853	14.4%
SA	10,271	2,462	24.0%
TAS	5,515	937	17.0%
VIC	48,972	10,852	22.2%
WA	23,139	3,042	13.1%
AUSTRALIA	227,306	42,812	18.8%

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

The total estimated number of people living with hepatitis C in Australia who received treatment in the 12 months following the listing of DAAs on the PBS was 42,812, or 18.8%. This uptake level varied between jurisdictions, at its highest in SA (24.0%), VIC (22.2%), and the ACT (21.5%). Uptake was similar to the national average in NSW and TAS, while below average in QLD, WA, and the NT.

Treatment uptake was highest in the PHNs of Adelaide, North Coast (NSW), South Eastern Melbourne, and Eastern Melbourne, and lowest in Western Queensland. Treatment uptake was generally lower in areas of estimated high prevalence, with the ten PHNs with the lowest treatment uptake all having prevalence above the national average. Conversely, of the ten PHNs with the highest uptake, only four had a prevalence above the national average. PHNs with high treatment uptake were clustered in VIC, while QLD had the largest number of PHNs with a low treatment uptake.

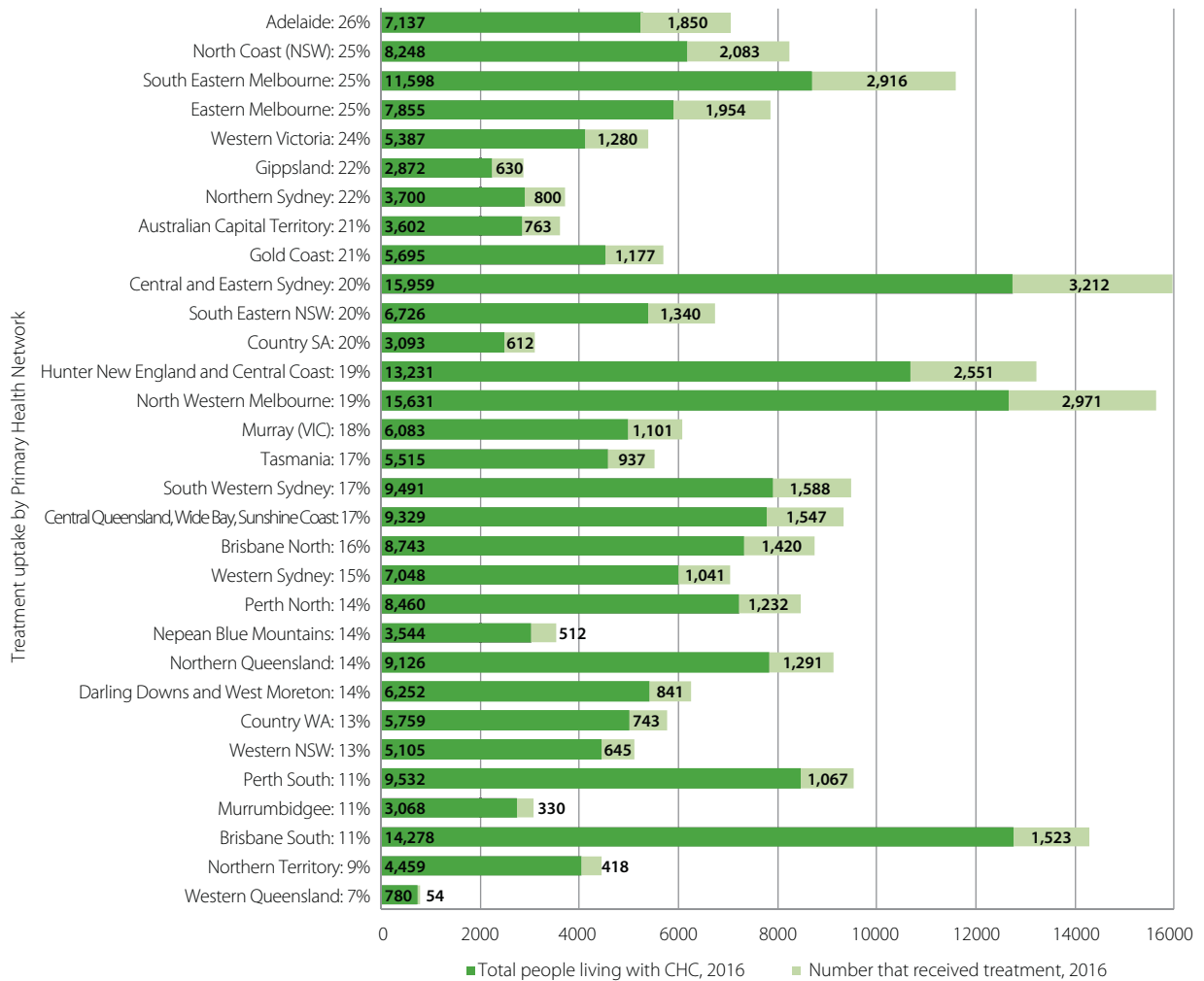
Figure 4: CHC treatment uptake by PHN, Mar 2016–Feb 2017



Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution. Data suppressed where number receiving treatment was <6.

Treatment uptake variation, when estimated as a proportion of the population, can obscure areas of relatively high uptake which nonetheless have a high number of individuals living with CHC (Figure 5). Some populous PHNs with high treatment uptake had a large population of people living with CHC who had not been treated, such as South Eastern Melbourne, Central and Eastern Sydney, and North Western Melbourne. Other areas, such as Brisbane South, are estimated to have both a high population of people living with CHC and low treatment uptake, leading to a large number of people who have not received CHC treatment. A number of PHNs with low treatment uptake, such as Western Queensland, Northern Territory, and Murrumbidgee, had low absolute numbers of people living with CHC.

Figure 5: CHC treatment uptake relative to CHC population size, Mar 2016–Feb 2017



Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution. Data suppressed where number receiving treatment was <6.

TREATMENT PATTERNS: TRENDS OVER TIME

Nationally and in most PHNs, treatment uptake was rapid in the initial period of DAA access (March–August 2016) and declined in the following six months, with an average 18.7% reduction in the number of people receiving treatment between these time periods. There were some exceptions, and treatment numbers increased in the PHNs of Country WA, Tasmania, Western NSW, Perth North, and Hunter New England. These were generally areas with moderate to low uptake overall (Western NSW and Country WA ranked 26th and 25th of 31 PHNs, respectively), but an increasing trend in uptake over the period was encouraging. The areas with the greatest decline in uptake (>25% reduction between time periods) were a combination of those with high uptake (Northern Sydney, Australian Capital Territory, Eastern Melbourne, and South Eastern Melbourne) and lower uptake (Northern Queensland, Brisbane North, Brisbane South, and Darling Downs and West Moreton).

TREATMENT PATTERNS: PROVIDER TYPE

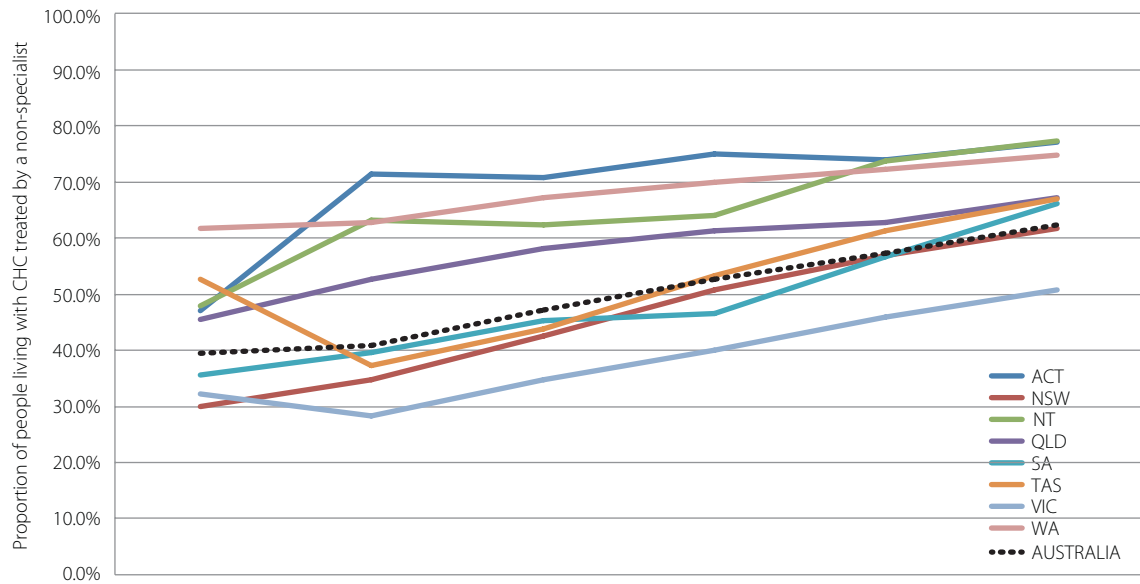
Figure 6: CHC treatment by provider type over time, Mar 2016–Feb 2017



Data source: Department of Human Services PBS statistics.

As has previously been reported (1), the proportion of hepatitis C treatment that was prescribed by practitioners other than specialist physicians has been steadily increasing over time. During March 2013–February 2016, prior to DAA availability, only 14.6% of patients were prescribed treatment by a GP, increasing to 18.5% after the introduction of DAAs March–May 2016. One year after the introduction of DAAs, the proportion prescribed by GPs had risen to 36.8% while the proportion prescribed by specialists declines from 60.5% to 37.6% in the same period. The proportion prescribed by other providers (including nurse practitioners and trainee medical practitioners) has remained stable over time at between 22–26%. The proportion of people prescribed treatment by a provider other than a specialist physician varied considerably between states and territories, and from March–May 2017 was highest in the ACT (77.4%), the NT (72.4%), QLD (71.0%), and WA (74.4%), compared to the national average of 62.0%. In the NT, prescribing was less common by GPs (29.9%) but more common by providers classified as other (42.5%). NSW and VIC were the only states in which specialists were the most common prescribers (38.3% and 49.2%, respectively).

Figure 7: CHC treatment prescribed by providers other than specialist physicians by state and territory over time, Mar 2016–Feb 2017

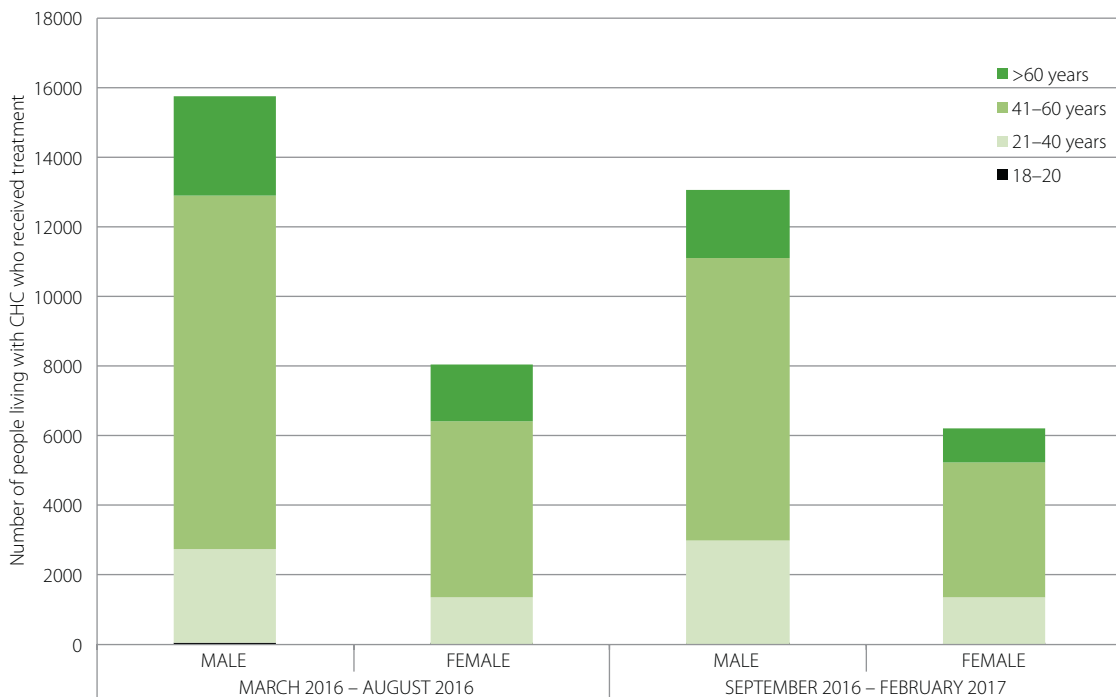


Data source: Department of Human Services PBS statistics.

TREATMENT PATTERNS: DEMOGRAPHICS

Individuals who received hepatitis C treatment were more commonly male (66.9% of the total) and most often in the 41–60 year age group (63.3% of the total). These proportions were stable between the two time periods, with the proportion male only shifting from 66.2% to 67.7% between March–August 2016 and September 2016–February 2017, and the proportion aged 41–60 slightly decreasing from 64.0% to 62.3%. A similar proportion of individuals receiving treatment were aged either 21–40 (19.3%) or over 60 (17.3%), while only a very small number were aged 18–20 (as currently DAA access through the PBS is restricted to people aged 18 or over) (0.2%). These proportions were also similar between states and territories, with males and those 41–60 predominant in all jurisdictions. The proportion aged 21–40 was slightly higher than the national average in the ACT (22.1%) and TAS (25.5%), while lower in SA (13.7%).

Figure 8: CHC treatment by age and sex, by time period, Mar 2016–Feb 2017



Data source: Department of Human Services Medicare and PBS statistics.

Comparison of demographic information from notifications and treatment data highlights the potential impact of these patterns on treatment uptake by geographic area. In Australia during 2007–2016, 42.9% of notifications for CHC were in people aged 40–59 years, which concords with the most common age group of the treated population. In a number of low treatment uptake PHNs, the proportion of the population aged 40–59 is lower relative to other age groups, notably in Brisbane South (32.6% aged 40–59), Western NSW (37.0%), and Darling Downs and West Moreton (34.9%). Conversely, North Coast (NSW), ranked second for treatment uptake across Australia, had the highest proportion of people aged 40–59 years (54.4%) of any PHN.

The age distribution of CHC within PHNs may be a factor in treatment uptake, as those in younger age groups generally have a shorter duration of infection, and may be less likely to be symptomatic or living with advanced liver disease. These demographic variations should be considered when assessing relative levels of uptake of treatment.

ASSESSMENT

Ordering of tests used to assess people living with CHC (such as HCV RNA viral load and genotype tests) by those other than specialist physicians was common in the pre-DAA era, and has increased since March 2016. During March 2013–February 2016, more than half of viral load (53.9%) and genotype (50.8%) tests were ordered by providers other than specialist physicians, most commonly by GPs (Supplementary Table). This proportion has increased over time, to 59.8% of viral load tests and 71.7% of genotype tests during September 2016–February 2017.

These findings suggest that a considerable proportion of GPs and other providers previously were providing monitoring and pre-treatment testing services to people living with CHC, and have now been able to extend the care provided to include treatment. However, there is still an apparent gap in the care cascade in primary care, with GPs and other providers ordering nearly three-quarters of HCV RNA or genotype tests but prescribing treatment to just over half the patients. More specific longitudinal and data on liver disease at time of treatment could help to identify the patterns of care transition in these health care settings, and assist in expanding treatment in primary care.

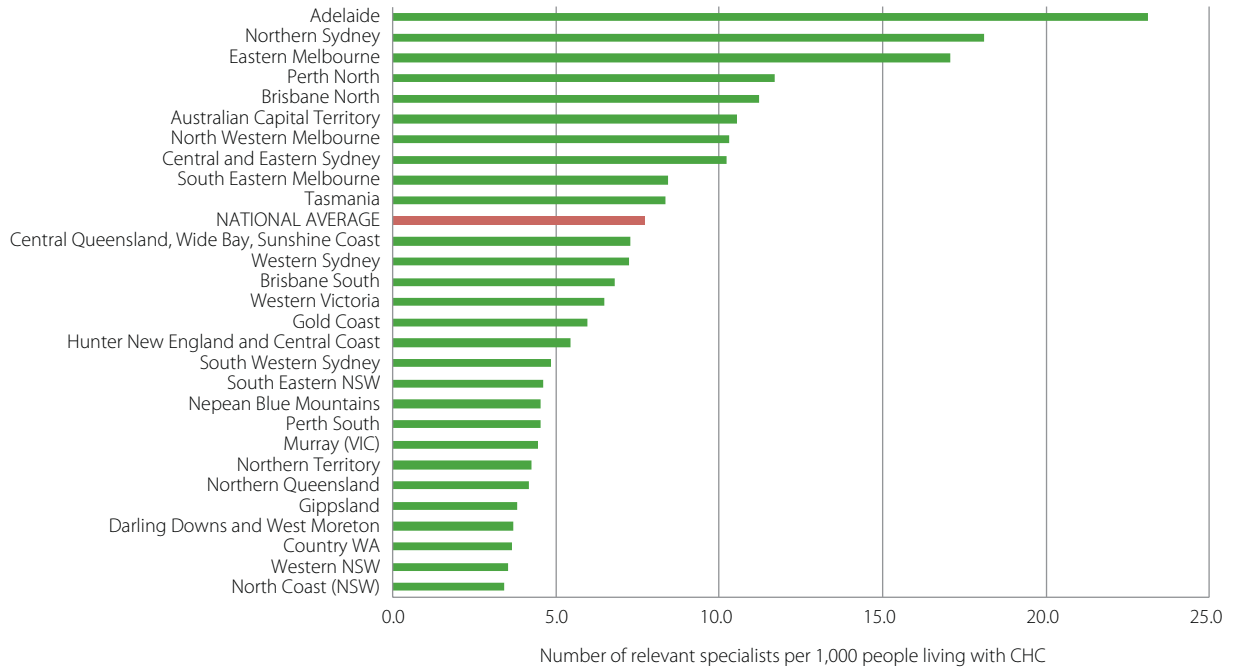
WORKFORCE

Treatment for CHC can be prescribed by both GPs and specialist physicians, however specialists are still the most common prescribers nationally. Identifying areas of low concentration of specialist physicians likely to prescribe treatment (referred to as relevant specialists; see Methodology for details) could help to target areas requiring increased community access.

The number of relevant specialists per person varied substantially between PHNs, from <5 to more than 160. When assessed as a prevalence per unit of population, the lowest levels were found predominantly in rural and regional PHNs, such as Gippsland, Country WA, Darling Downs and West Moreton, Nepean Blue Mountains, and Murray (VIC) (Figure 8). Metropolitan areas with relatively fewer specialist physicians per capita included Perth South, South Western Sydney, and Western Sydney. Geographic remoteness is also a key consideration when assessing specialist access by PHN, and a number of PHNs with a particularly large physical size have a small number of specialist physicians proportional to area, such as Northern Territory, Northern Queensland, and Central Queensland.

This is also emphasised when assessing the number of people estimated to be living with CHC compared with the number of specialist physicians, with areas such as North Coast (NSW), Western NSW, Country WA, Darling Downs and West Moreton, and Gippsland having approximately half the national average number of specialist physicians per 1,000 people living with CHC. These findings are not necessarily predictive of treatment uptake, with areas of high uptake having both high numbers (Adelaide, Northern Sydney) and low numbers (North Coast (NSW), Gippsland) of specialist physicians. These disparities may reflect the relative accessibility of care within primary care in these areas, and the increase in GPs and other providers willing to prescribe DAA treatment.

Figure 9: Relevant specialists per 1,000 people living with CHC by PHN, 2015



Data Source: Australian Health Practitioner Regulation Agency Health Workforce Data. Estimates of CHC prevalence based on published national estimates and notifications distribution. Data suppressed where number of relevant specialists was <6 (Country SA, Murrumbidgee, Western Queensland).

SECTION 2: GEOGRAPHIC DIVERSITY AND TRENDS IN CHRONIC HEPATITIS C ACROSS AUSTRALIA

IN THIS SECTION

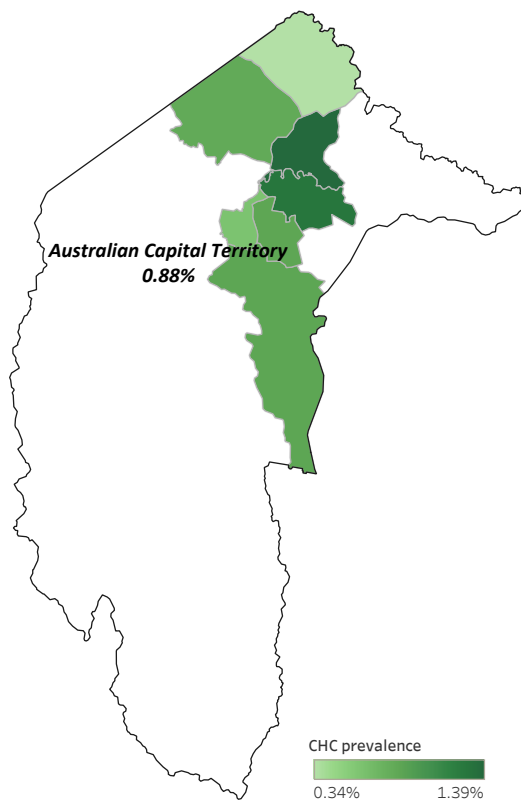
- Estimates of hepatitis C prevalence and treatment uptake for each PHN and SA3 across Australia

AUSTRALIAN CAPITAL TERRITORY

PREVALENCE

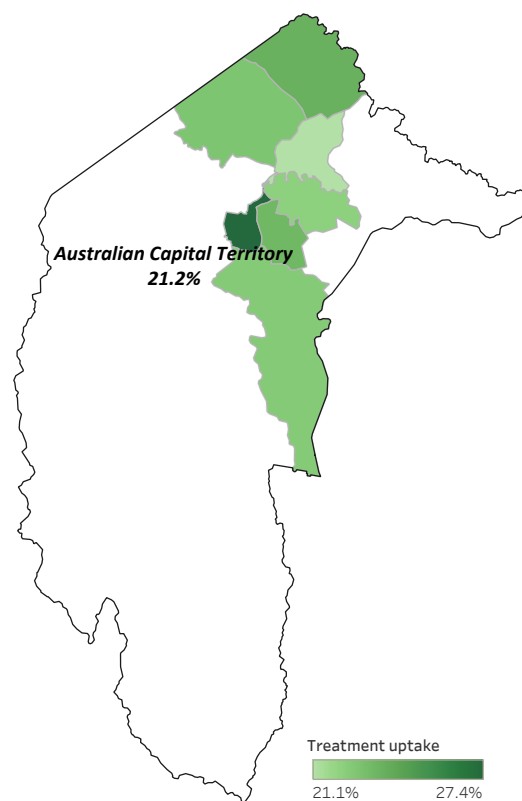
The prevalence of CHC in the ACT was below the national average (0.88%). A number of SA3s had a lower prevalence than the national average, however levels were higher in the metropolitan SA3s of North Canberra (1.39%) and South Canberra (1.29%). The other SA3s in the ACT ranged in prevalence from 0.34% to 0.87%.

Map 1: CHC prevalence in ACT by SA3, 2016



This map represents geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN. Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

Map 2: CHC treatment uptake in ACT by SA3, 2016



This map represents geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6). Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

DIAGNOSIS

The notification rate in the ACT of 36.3 per 100,000 people was lower than the national average of 46.4. The notification rate in the ACT was highest in the metropolitan SA3s of North Canberra (59.9) and South Canberra (49.9). The notification rates for the other SA3s were similar to the ACT average, ranging from 21.7 in Gungahlin to 35.0 in Tuggeranong.

TREATMENT

Hepatitis C treatment uptake overall in the ACT (21.2%) was relatively high, ranking eighth of all PHNs in Australia. Within the ACT, uptake was highly consistent between regions, ranging between 21–27% in all SA3s.

Table 4: CHC prevalence and treatment uptake by SA3, ACT 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 – Feb 2017	Treatment uptake (%)
Australian Capital Territory		411,030	3,602	0.88%	763	21.2%
	Belconnen	99,776	826	0.83%	188	22.7%
	Gungahlin	73,603	249	0.34%	59	23.7%
	North Canberra	55,048	763	1.39%	161	21.1%
	South Canberra	28,030	361	1.29%	80	22.2%
	Tuggeranong	88,446	769	0.87%	173	22.5%
	Weston Creek	29,103	183	0.63%	50	27.4%
	Woden Valley	36,104	313	0.87%	73	23.3%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

NEW SOUTH WALES

PREVALENCE

Eight of the ten PHNs in NSW had CHC prevalence above the national average, all but two of which were in non-metropolitan areas. The only metropolitan PHNs with prevalence above the national average were Central and Eastern Sydney (1.03%) and South Western Sydney (0.99%). Central and Eastern Sydney also had the highest estimated number of people living with CHC of any PHN in Australia at 15,959 people. The highest prevalence in NSW was in Western NSW (1.64%), closely followed by North Coast (NSW) (1.57%).

The lowest prevalence was in Northern Sydney (0.41%), and at an SA3 level the prevalence variance was very small. Pennant-Hills-Epping had the lowest prevalence with 0.27% and the highest was in North Sydney-Mosman at 0.48%.

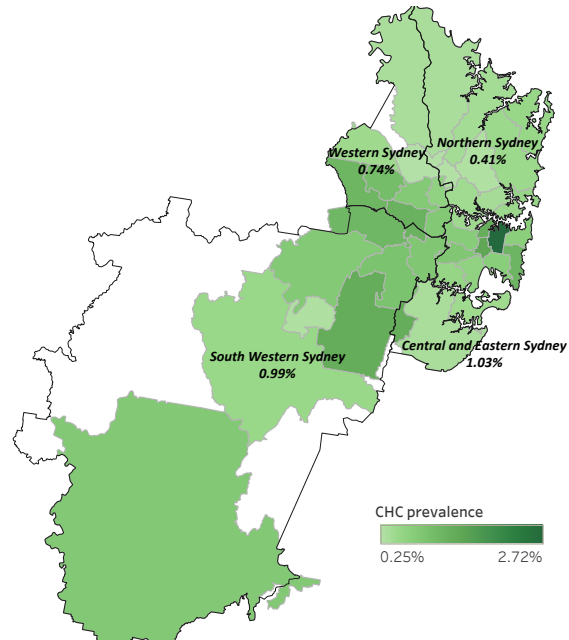
Within the highest prevalence PHN of Central and Eastern Sydney, the SA3 of Sydney Inner City had the highest prevalence at 2.72%. The next highest SA3s were in Marrickville-Sydenham-Petersham (1.48%) and Leichhardt (1.34%). The lowest prevalence was reported in Sutherland-Menai-Heathcote (0.35%), Canada Bay (0.45%) and Cronulla-Miranda-Caringbah (0.45%).

DIAGNOSIS

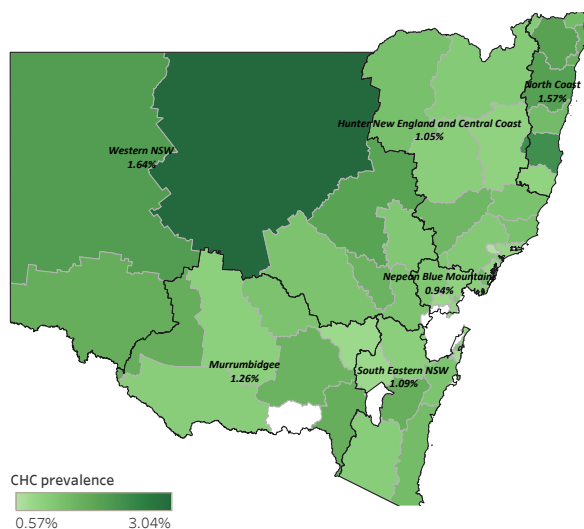
There were stark differences between notification rates in metropolitan and non-metropolitan PHNs in NSW. North Coast (NSW) had the highest rate nationally with 90.4, almost double the national average rate. Northern Sydney PHN had the lowest notification rate nationally at 16.4, which was just over one-quarter of the national average rate. Overall, non-metropolitan PHNs had higher rates; Murrumbidgee (74.5), Western NSW (71.1), Hunter New England and Central Coast (60.6), and South Eastern NSW (55.6) were all above the national average rate. In comparison, metropolitan PHNs demonstrated considerably lower notification rates, and were similar to or below the national average: South Western Sydney (46.9), Central and Eastern Sydney (44.5), and Western Sydney (32.7).

Hepatitis C notifications in North Coast (NSW), which had the highest notification rate for 2016, have been steadily increasing since 2011.

Map 3: CHC prevalence in Greater Sydney by PHN and SA3, 2016



Map 4: CHC prevalence in rest of NSW by PHN and SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN.

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

Prior to 2011, there had been a significant fall in notifications for this PHN, with the rate dropping from the second highest in the country to the fifth highest. A smaller drop was also evident in the majority of other PHNs in NSW in 2011.

TREATMENT

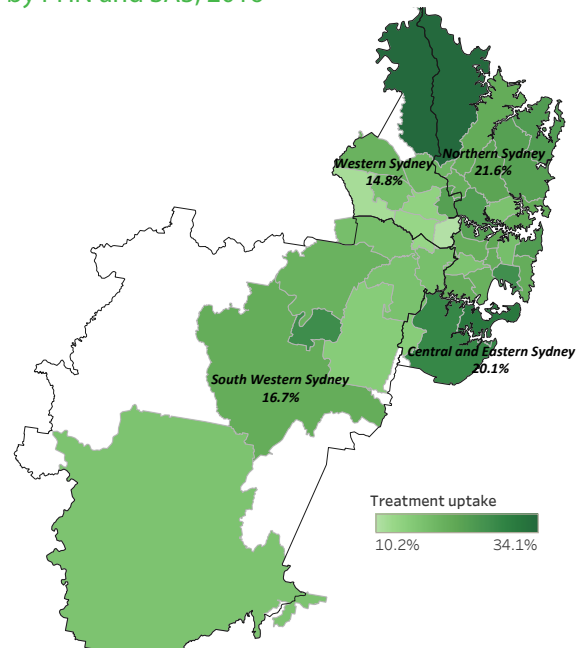
Treatment uptake varied considerably between PHNs in NSW, from Murrumbidgee (10.8%, third lowest in Australia) to North Coast (NSW) (25.3%, second highest in Australia). The PHN with the highest uptake in the metropolitan Sydney area was Northern Sydney (21.6%). Uptake within this PHN was relatively stable, however was higher in the areas of Pittwater (24.2%), Ryde-Hunters Hill (24.2%) and Warringah (23.5%) and lowest in Chatswood-Lane Cove (16.8%). Uptake was also similar within the Central and Eastern Sydney PHN (20.1%), with pockets of higher uptake in Cronulla-Miranda-Caringbah (31.3%), and Sutherland-Menai-Heathcote (28.4%).

Within South Western Sydney, uptake was between 15-21% in all SA3s except for Camden (27.3%). A similar pattern was seen within Western Sydney, which had the lowest uptake among urban Sydney PHNs (14.8%) and within which treatment was highest in Dural-Wisemans Ferry (34.1%) where it was more than double the PHN average, as well as elevated in Carlingford (23.4%), and lowest in Auburn (10.2%).

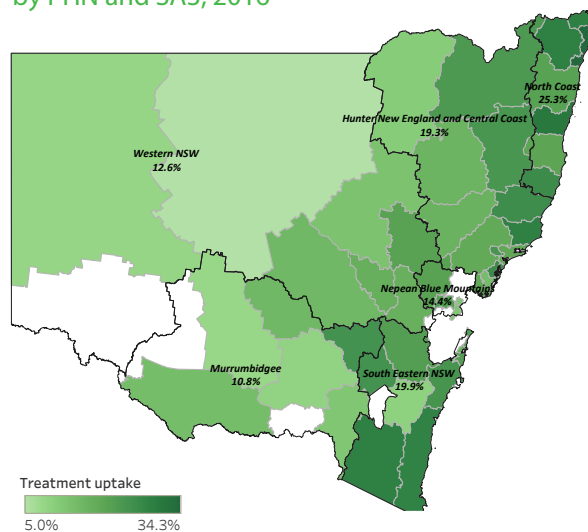
Within North Coast (NSW) uptake was relatively stable at between 26 and 34% in all SA3s, except for Clarence Valley (20.9%) and Kempsey-Nambucca (20.0%). Uptake varied within the Hunter New England PHN and was highest in those easternmost regions of Great Lakes (28.9%), Lake Macquarie-West (26.3%) and East (29.5%). Uptake was lowest in Moree-Narrabri (11.0%).

Nepean Blue Mountains PHN (uptake 14.4%) had higher levels of uptake in regions further from metropolitan Sydney, such as Blue Mountains (21.6%). Uptake within Western NSW was lowest in more remote areas, including Bourke-Cobar-Coonamble (5.0%), and Broken Hill and Far West (8.6%), and highest in Lithgow-Mudgee (20.7%). Uptake in Murrumbidgee was relatively stable within the PHN (8-14%), except for in Young-Yass (24.7%), which was over double the PHN average uptake (10.8%)

Map 5: CHC treatment uptake in greater Sydney by PHN and SA3, 2016



Map 6: CHC treatment uptake in rest of NSW by PHN and SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Table 5: CHC prevalence and treatment by PHN and SA3, NSW 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
Central & Eastern Sydney		1,553,920	15,959	1.03%	3,212	20.1%
	Botany	44,289	320	0.72%	86	26.9%
	Canada Bay	88,658	397	0.45%	93	23.4%
	Canterbury	126,653	1,094	0.86%	182	16.6%
	Cronulla - Miranda - Caringbah	111,158	495	0.45%	155	31.3%
	Eastern Suburbs - North	131,270	916	0.70%	221	24.1%
	Eastern Suburbs - South	157,927	1,897	1.20%	394	20.8%
	Hurstville	134,007	742	0.55%	156	21.0%
	Kogarah-Rockdale	150,573	950	0.63%	191	20.1%
	Leichhardt	58,278	779	1.34%	171	22.0%
	Marrickville-Sydenham-Petersham	55,629	822	1.48%	171	20.8%
	Strathfield-Burwood-Ashfield	158,922	1,196	0.75%	247	20.6%
	Sutherland-Menai-Heathcote	115,148	402	0.35%	114	28.4%
	Sydney Inner City	219,196	5,961	2.72%	1,057	17.7%
Northern Sydney		906,774	3,700	0.41%	800	21.6%
	Chatswood - Lane Cove	125,504	493	0.39%	83	16.8%
	Hornsby	82,136	326	0.40%	69	21.1%
	Ku-ring-gai	137,829	386	0.28%	87	22.5%
	Manly	53,714	290	0.54%	63	21.7%
	North Sydney-Mosman	84,186	404	0.48%	90	22.3%
	Pennant Hills-Epping	41,403	112	0.27%	23	20.6%
	Pittwater	71,337	368	0.52%	89	24.2%
	Ryde - Hunters Hill	139,485	598	0.43%	145	24.2%
	Warringah	137,607	644	0.47%	151	23.5%
South Western Sydney		954,815	9,491	0.99%	1,588	16.7%
	Bankstown	170,149	1,486	0.87%	260	17.5%
	Bringelly-Green Valley	100,265	822	0.82%	163	19.8%
	Camden	81,644	242	0.30%	66	27.3%
	Campbelltown (NSW)	167,109	2,260	1.35%	339	15.0%
	Fairfield	191,840	2,233	1.16%	392	17.6%
	Liverpool	129,766	1,215	0.94%	208	17.1%
	Southern Highlands	48,833	409	0.84%	68	16.6%
	Wollondilly	30,788	153	0.50%	32	20.9%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Western Sydney	953,429	7,048	0.74%	1,041	14.8%
	Auburn	97,290	813	0.84%	83	10.2%
	Baulkham Hills	207,408	527	0.25%	101	19.2%
	Blacktown	126,664	1,315	1.04%	227	17.3%
	Blacktown-North	96,035	434	0.45%	86	19.8%
	Carlingford	65,444	402	0.61%	94	23.4%
	Dural - Wisemans Ferry	17,965	62	0.34%	21	34.1%
	Merrylands - Guildford	126,618	1,580	1.25%	204	12.9%
	Mount Druitt	111,962	1,306	1.17%	148	11.3%
	Parramatta	166,923	1,349	0.81%	186	13.8%
	Hunter New England & Central Coast	1,260,336	13,231	1.05%	2,551	19.3%
	Armidale	38,830	365	0.94%	87	23.8%
	Gosford	174,430	1,785	1.02%	341	19.1%
	Great Lakes	31,780	409	1.29%	118	28.9%
	Inverell - Tenterfield	37,399	416	1.11%	95	22.9%
	Lake Macquarie - East	138,897	1,050	0.76%	272	25.9%
	Lake Macquarie - West	54,610	463	0.85%	122	26.3%
	Lower Hunter	82,854	931	1.12%	176	18.9%
	Maitland	96,984	555	0.57%	133	24.0%
	Moree - Narrabri	26,735	347	1.30%	38	11.0%
	Newcastle	166,444	1,906	1.15%	357	18.7%
	Port Stephens	72,116	621	0.86%	120	19.3%
	Tamworth - Gunnedah	83,836	863	1.03%	141	16.3%
	Taree - Gloucester	55,390	705	1.27%	182	25.8%
	Upper Hunter	31,295	463	1.48%	78	16.8%
	Wyong	168,809	2,370	1.40%	343	14.5%
	Murrumbidgee	244,371	3,068	1.26%	330	10.8%
	<i>Albury – see Murray (VIC) PHN in Victoria</i>					
	Griffith - Murrumbidgee (West)	47,571	477	1.00%	39	8.2%
	Tumut - Tumbarumba	14,182	235	1.66%	29	12.3%
	Upper Murray exc. Albury	41,405	434	1.05%	62	14.3%
	Wagga Wagga	98,605	1,523	1.54%	139	9.1%
	Young - Yass	36,228	283	0.78%	70	24.7%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Wagga Wagga	98,605	1,523	1.54%	139	9.1%
	Young - Yass	36,228	283	0.78%	70	24.7%
	Nepean Blue Mountains	375,164	3,544	0.94%	512	14.4%
	Blue Mountains	79,935	644	0.81%	139	21.6%
	Hawkesbury	11,489	107	0.93%	-	-
	Penrith	145,900	1,288	0.88%	159	12.3%
	Richmond - Windsor	59,229	676	1.14%	84	12.4%
	St Marys	62,491	537	0.86%	71	13.2%
	North Coast (NSW)	524,437	8,248	1.57%	2,083	25.3%
	Clarence Valley	49,808	963	1.93%	201	20.9%
	Coffs Harbour	90,477	1,269	1.40%	392	30.9%
	Kempsey - Nambucca	51,590	1,180	2.29%	236	20.0%
	Port Macquarie	80,930	751	0.93%	198	26.4%
	Richmond Valley - Coastal	81,906	1,340	1.64%	460	34.3%
	Richmond Valley - Hinterland	76,306	1,445	1.89%	418	28.9%
	Tweed Valley	93,020	1,299	1.40%	378	29.1%
	South Eastern NSW	618,544	6,726	1.09%	1,340	19.9%
	Dapto - Port Kembla	75,507	925	1.22%	158	17.1%
	Goulburn - Mulwaree	39,085	400	1.02%	87	21.8%
	Kiama - Shellharbour	96,088	676	0.70%	146	21.6%
	Queanbeyan	61,682	1,002	1.62%	98	9.8%
	Shoalhaven	102,275	1,260	1.23%	305	24.2%
	Snowy Mountains	20,180	215	1.06%	62	28.9%
	South Coast	73,304	1,009	1.38%	286	28.3%
	Wollongong	133,261	1,151	0.86%	248	21.6%
	Western NSW	312,117	5,105	1.64%	645	12.6%
	Bathurst	48,820	605	1.24%	105	17.4%
	Bourke - Cobar - Coonamble	24,166	735	3.04%	37	5.0%
	Broken Hill and Far West	20,953	418	1.99%	36	8.6%
	Dubbo	72,274	1,365	1.89%	180	13.2%
	Lachlan Valley	58,095	731	1.26%	114	15.6%
	Lithgow - Mudgee	48,059	559	1.16%	116	20.7%
	Lower Murray	13,315	219	1.65%	-	-
	Orange	59,977	931	1.55%	163	17.5%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

NORTHERN TERRITORY

PREVALENCE

The estimated prevalence of hepatitis C in the NT is 1.87%, which is the highest in the country and double the national prevalence of 0.94%. All SA3s in the NT also had prevalence above the national average, except Daly-Tiwi-West Arnhem (0.73%). The highest prevalence was in Darwin City (4.64%), and the remaining seven SA3s range from 1.01–1.89%. However the Darwin City SA3 has a disproportionately high proportion of its population in correctional facilities, which may lead to relatively high numbers of diagnosed cases in temporary residents of the area (see Introduction and Background, and Methodology for the impacts of this) (7,8).

DIAGNOSIS

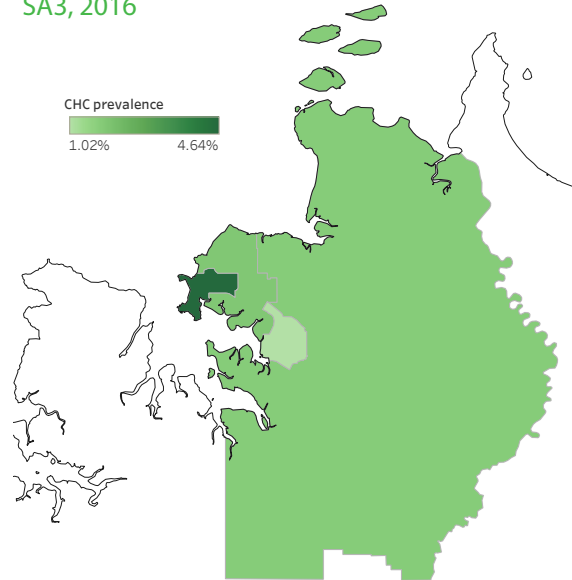
Notifications in the NT have consistently been higher than other PHNs for the past decade, which is the cause of the higher prevalence of CHC in these areas in 2016. Following a peak in notified cases in 2013, notifications fell substantially in 2014, but have been steadily rising since.

The NT had the second highest rate of notification in Australia, at 80.3 (close to 1.5 times the national average). SA3 notification rates vary significantly across the NT. Daly-Tiwi-West Arnhem had the lowest with 20, while Darwin City had the highest with 167.2, closely followed by Litchfield with 141.6. It is important to note that the location of correctional facilities may contribute to the elevated notification rates in these SA3s in the NT (see Introduction and Background, and Methodology for the impacts of this) (7, 8). However, other metropolitan SA3s in the NT, which do not contain correctional facilities, have similar rates to the territory average (Alice Springs, 73.8; Palmerston, 65.6; and Darwin Suburbs, 78.9), all considerably higher than the national average.

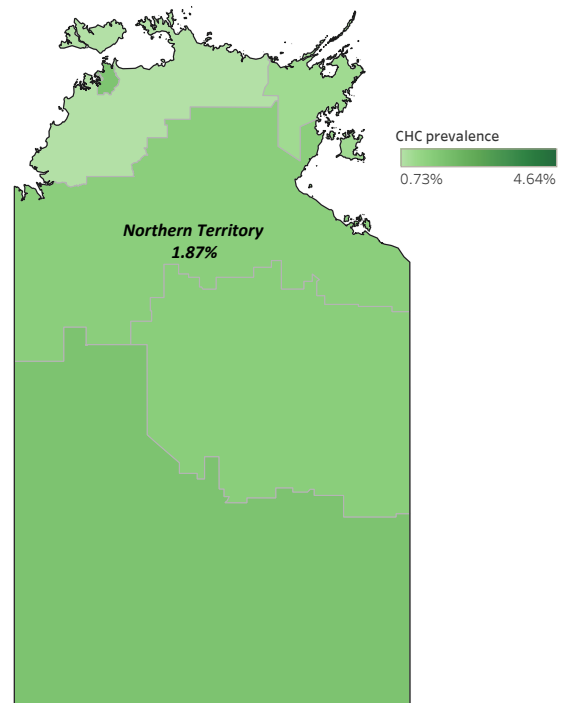
TREATMENT

Treatment uptake in the NT was the second lowest among Australia's PHNs (9.4%). A number of SA3s in the NT did not have data available for treatment uptake due to boundary changes, however uptake appeared to be highest in the regions surrounding Darwin, namely Palmerston (17.0%) and Litchfield (18.0%), while lower in Darwin City (11.3%) and

Map 7: CHC prevalence in greater Darwin by SA3, 2016

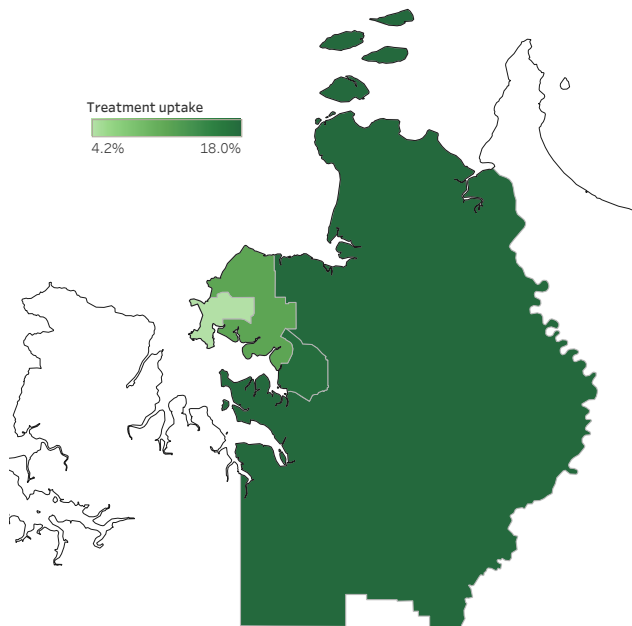


Map 8: CHC prevalence in rest of NT by SA3, 2016

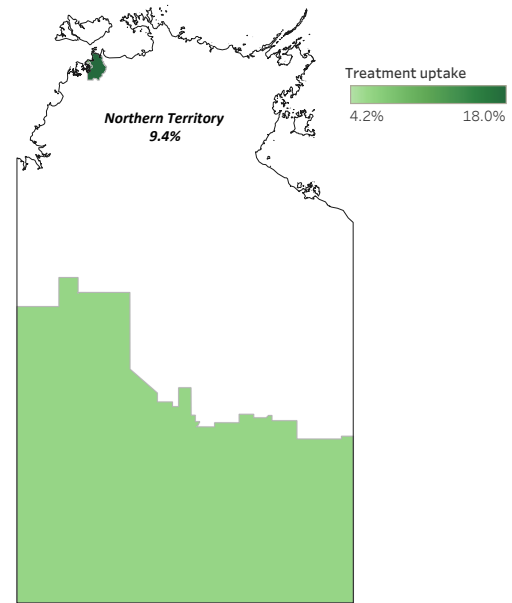


These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN. Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

Map 9: CHC treatment uptake in greater Darwin by SA3, 2016



Map 10: CHC treatment uptake in rest of NT by SA3



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Alice Springs (5.9%). However the Darwin City and Litchfield SA3s have a disproportionately high proportion of their populations in correctional facilities, which may lead to relatively high treatment uptake in temporary residents of the area (see Introduction and Background, and Methodology for the impacts of this) (7, 8).

Table 6: CHC prevalence and treatment uptake by SA3 in NT, 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 – Feb 2017	Treatment uptake (%)
Northern Territory		237,919	4,459	1.87%	418	9.4%
	Alice Springs	42,018	749	1.78%	44	5.9%
	Barkly	3,904	57	1.46%	-	-
	Daly - Tiwi - West Arnhem	29,286	212	0.73%	-	-
	Darwin City#	26,919	1,249	4.64%	53	4.2%
	Darwin Suburbs	55,742	1,053	1.89%	119	11.3%
	East Arnhem	6,322	64	1.01%	-	-
	Katherine	18,871	272	1.44%	-	-
	Litchfield#	19,769	349	1.77%	63	18.0%
	Palmerston	35,087	356	1.02%	63	17.7%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals. #Data may be impacted due to a significant proportion of the population residing in a correctional facility.

QUEENSLAND

PREVALENCE

Prevalence of CHC was higher than the national average in all PHNs in QLD except for Brisbane North (0.89%). This is congruent with QLD having the second highest prevalence of CHC in Australia.

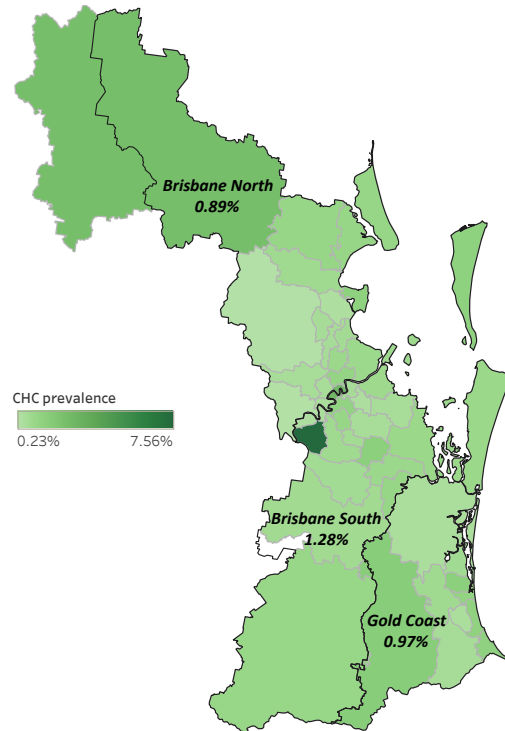
Some SA3s within Brisbane North were estimated to have a hepatitis C prevalence higher than the national average. The highest was in Brisbane Inner (2.86%), followed by Caboolture Hinterland (2.49%). However, Caboolture Hinterland SA3 has a higher than average proportion of the population resident in a correctional facility, which may lead to relatively high numbers of diagnosed cases in temporary residents of the area (see Introduction and Background, and Methodology for the impacts of this) (7, 8). The next highest rates were in Redcliffe (1.43%) and Brisbane Inner-North (1.18%). The lowest prevalence was also in this area with 0.23% in Hills District and 0.26 % in Kenmore-Brookfield-Moggill.

Forest Lake-Oxley in Brisbane South had the highest prevalence of any SA3 in Australia at 7.56%, however this SA3 has a higher than average proportion of its population resident in correctional facilities, which may contribute to relatively high numbers of diagnosed cases in temporary residents of the area (see Introduction and Background, and Methodology for the impacts of this) (7, 8). The high proportion of people living with CHC in Forest Lake-Oxley has likely contributed to the higher than national average in the Brisbane South PHN, however prevalence was also high in Springwood-Kingston (1.50%) and Holland Park-Yeronga (1.25%).

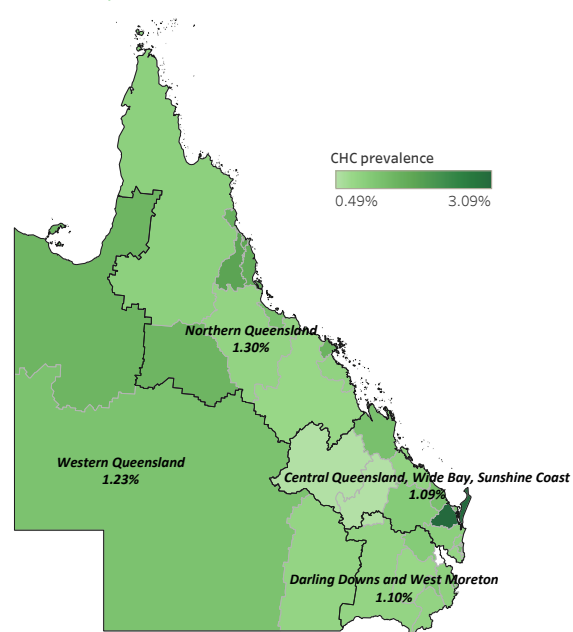
SA3s in the Gold Coast had less variation in prevalence, however five of the ten SA3s were higher than the national average prevalence. The highest were in Gold Coast Hinterland (1.67%) and Southport (1.52%). The lowest were in Robina (0.47%) and Ormeau-Oxenford (0.49%).

Both SA3s in Western QLD had substantially higher prevalence than the state and national average prevalence, with Outback North at 1.47% and Outback South with 1.22% prevalence. In Northern QLD all but three SA3s had prevalences higher

Map 11: CHC prevalence in greater Brisbane and Gold Coast by PHN and SA3, 2016



Map 12: CHC prevalence in rest of QLD by PHN and SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN. Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

than the national average, with the highest in Tablelands (East)-Kuranda (1.84%), Cairns – South (1.81%) and Innisfail-Cassowary Coast (1.67%).

While the prevalences in Central QLD, Wide Bay, Sunshine Coast (1.09%) and Darling Downs and West Moreton (1.10%) were similar, there was much more variation within the PHNs at an SA3 level. In Darling Downs and West Moreton, there was a smaller range of variation, between 0.77% in Darling Downs – East up to 1.51% in Ipswich Inner. However in Central QLD, Wide Bay, Sunshine Coast PHN, SA3s varied substantially from a low of 0.49% in Biloela to 3.09% in Maryborough.

DIAGNOSIS

In QLD, notification rates varied substantially between metropolitan and non-metropolitan PHNs, with five PHNs above the national average rate. Northern QLD was the PHN with the highest rate (56.0), which was nearly 1.5 times that of the lowest QLD PHN, Brisbane North (38.3). The highest metropolitan rate was in Brisbane South (55.1). The rates for the other non-metropolitan PHNs were similar in range, with Central QLD, Wide Bay, Sunshine Coast (52.6), Darling Downs and West Moreton (46.8), Gold Coast (46.2), and Western Queensland (45.6).

In Brisbane North, notifications were highest in Caboolture Hinterland (134.3). However, this SA3 has a higher proportion of the population within a correctional facility than average, which may have led to relatively high numbers of diagnosed cases (see Introduction and Background, and Methodology for the impacts of this) (7, 8). Other SA3s in the area are characterised by significantly lower notification rates, the next highest in Brisbane North is Caboolture with 79.7 per 100,000. Of the 16 other SA3s in Brisbane North, the range of rates was between 16.2 and 60.9.

Notification patterns were similar in Brisbane South, with an outlying peak in Forest Lake-Oxley with 349.9, and followed by much lower rates in the remaining SA3s. Again, this SA3 has a higher than average proportion of the population resident in correctional facilities, which may have led to relatively high numbers of diagnosed cases in temporary residents (see Introduction and Background, and Methodology for the impacts of this) (7, 8). Notification rates in other SA3s in the area were much lower, with the next highest rate in Springwood-Kingston with 73.3.

The Gold Coast Hinterland had the highest notification rate of SA3s in the Gold Coast PHN with 103.5 notifications per 100,000. Southport had the second highest rate in the area with 72.7. The variability between SA3s was less pronounced in other SA3s with a range from 22.4 in Robina to 61.2 in Coolangatta.

In non-metropolitan PHNs the rates of notification of hepatitis C by SA3 were similarly disparate. The rates of the two SA3s in Western QLD varied by almost two fold; Outback North had a rate of 23.4 and Outback South a rate of 71.3.

Northern QLD, which was the PHN with the highest rate of notification in QLD, had variations in SA3 rates from 23.9 in Bowen Basin – North to 96.1 in Cairns – South. There were similarly high rates in Tablelands (East)-Kuranda with 88.7 per 100,000 and in Innisfail-Cassowary Coast with 71.15.

Central QLD, Wide Bay, Sunshine Coast PHN SA3 notification rates were distributed relatively close to the PHN rate, except for Nambour which had an outlying rate of 193.2, and then relatively minimal variation between the other 13 SA3s in the area with the second highest in Maroochy (69.5) and lowest in Buderim (24.7).

The notification rates in Darling Downs and West Moreton SA3s were the least variable in the state with a range of between 35.1 in Darling Downs – East to 52.8 in Burnett. Darling Downs (West)-Maranoa had the second highest rate with 52.1, closely followed by Springfield-Redbank (50.5) and Toowoomba (50.4)

TREATMENT

Treatment uptake in QLD was low in a number of PHNs, four of which ranked in the lowest 10 PHNs in Australia, and were located in both metropolitan and rural and regional areas.

Uptake in QLD was highest in the Gold Coast PHN (20.7%), the tenth highest uptake PHN in Australia. There was a disparity within the PHN in treatment uptake by SA3, highest in Robina (31.3%), followed by the elevated cluster of Gold Coast-North (29.3%), and Coolangatta (29.8%). Meanwhile, it was only around half the PHN average in Gold Coast Hinterland (9.3%).

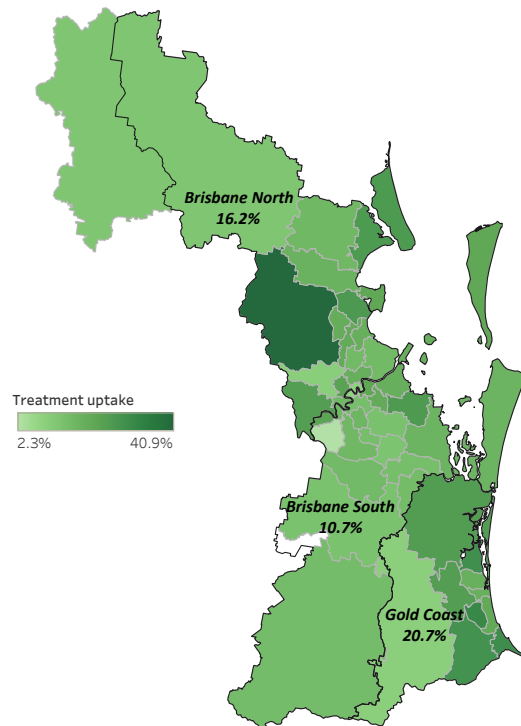
There was also considerable variation within Brisbane North (overall uptake 16.2%), where uptake was more than double the PHN average in The Hills District (40.9%), and elevated in Bribie-Beachmere (25.7%) and North Lakes (25.8%). Variation was substantial within the area of inner Brisbane, where it was high in Brisbane Inner West (22.6%), while below average in Brisbane Inner North (18.5%) and half the PHN average in Brisbane Inner (8.2%). Treatment coverage was also low in The Gap-Enoggera (9.7%).

Uptake in Brisbane South PHN was the second lowest in Australia (10.7%), at half the national average. This was driven largely by the very low uptake in Forest Lake-Oxley (2.3%), which accounts for nearly half of all people estimated to be living with hepatitis C in this PHN with treatment coverage at one-quarter of the PHN average. As noted in other areas of this report, this SA3 has a higher than average proportion of its population resident in correctional facilities, which may lead to relatively high numbers of diagnosed cases in temporary residents of the area (see Introduction and Background, and Methodology for the impacts of this) (7, 8). Uptake was between 13-26% in all remaining SA3s, with highest levels occurring in Brisbane Inner East (21.5%), Capalaba (25.7%), and Centenary (22.2%).

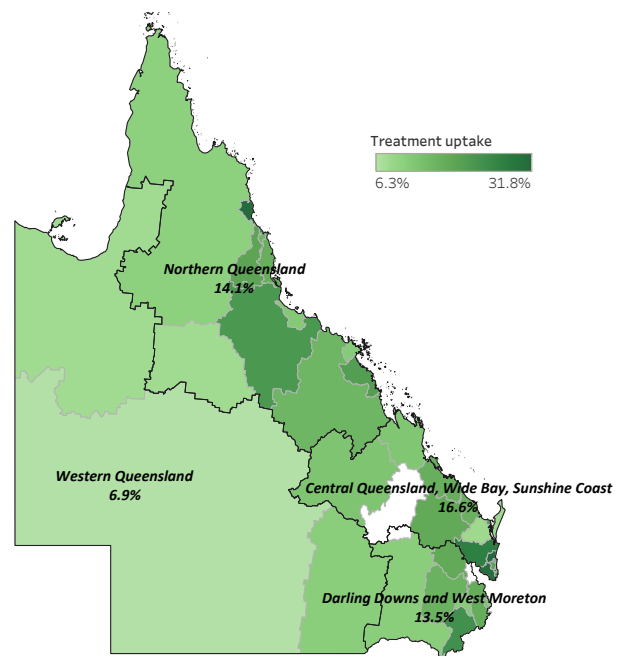
Variable treatment uptake was found within the Darling Downs and West Moreton PHN (overall 13.5%), higher in Granite Belt (23.9%) SA3s, while relatively low in areas closer to central Brisbane (Ipswich Inner, 13.5%, and Springfield-Redbank, 11.6%) and also in Toowoomba (11.8%) and Darling Downs (West)-Maranoa (11.0%).

In Central QLD, Wide Bay, Sunshine Coast PHN, the uptake of hepatitis C treatment was highest in Noosa Hinterland and Sunshine Coast Hinterland (30.9%), and lowest in Maryborough (8.4%) and Rockhampton (12.7%).

Map 13: CHC treatment uptake in greater Brisbane and Gold Coast by PHN and SA3, 2016



Map 14: CHC treatment uptake in rest of QLD by PHN and SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Treatment uptake was variable within Northern QLD (overall 14.1%), however did not tend to cluster geographically; uptake was high in in Port Douglas-Daintree (31.5%), Cairns North (25.4%) and Charters Towers-Ayr-Ingham (22.2%). Uptake was low in more remote areas, such as Far North (10.7%).

Western QLD, where uptake was the lowest in Australia (6.9%), had similarly low levels in each of its two SA3s, although slightly higher in Outback North (8.2%) than Outback South (6.3%).

Table 7: CHC prevalence and treatment uptake in QLD by PHN and SA3, 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 – Feb 2017	Treatment uptake (%)
	Brisbane North	982,618	8,743	0.89%	1,420	16.2%
	Bald Hills - Everton Park	52,436	324	0.62%	65	20.0%
	Bribie - Beachmere	28,293	299	1.06%	77	25.7%
	Brisbane Inner	74,046	2,114	2.86%	173	8.2%
	Brisbane Inner - North	106,372	1,253	1.18%	237	18.9%
	Brisbane Inner - West	52,003	288	0.55%	65	22.6%
	Caboolture	80,511	865	1.07%	139	16.1%
	Caboolture Hinterland	11,913	297	2.49%	36	12.1%
	Chermside	76,682	687	0.90%	106	15.4%
	Kenmore - Brookfield - Moggill	46,985	123	0.26%	30	24.3%
	Narangba - Burpengary	61,153	482	0.79%	87	18.1%
	North Lakes	76,605	295	0.38%	76	25.8%
	Nundah	40,180	354	0.88%	55	15.5%
	Redcliffe	61,766	884	1.43%	187	21.2%
	Sandgate	50,922	345	0.68%	65	18.9%
	Sherwood - Indooroopilly	61,849	285	0.46%	46	16.1%
	Strathpine	58,934	354	0.60%	69	19.5%
	The Gap – Enoggera	31,481	176	0.56%	17	9.7%
	The Hills District	73,411	171	0.23%	70	40.9%
	Brisbane South	1,117,268	14,278	1.28%	1,523	10.7%
	Beaudesert	21,890	212	0.97%	32	15.1%
	Beenleigh	57,348	605	1.05%	90	14.9%
	Brisbane Inner - East	41,795	256	0.61%	55	21.5%
	Browns Plains	67,642	482	0.71%	75	15.6%
	Capalaba	80,500	447	0.56%	115	25.7%
	Carindale	46,414	189	0.41%	38	20.1%
	Centenary	34,140	144	0.42%	32	22.2%
	Cleveland - Stradbroke	78,234	726	0.93%	126	17.4%
	Forest Lake - Oxley	67,170	5,075	7.56%	119	2.3%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 – Feb 2017	Treatment uptake (%)
	Holland Park - Yeronga	82,051	1,030	1.25%	149	14.5%
	Jimboomba	37,956	274	0.72%	36	13.1%
	Loganlea - Carbrook	67,445	598	0.89%	86	14.4%
	Mt Gravatt	79,887	445	0.56%	60	13.5%
	Nathan	27,852	301	1.08%	50	16.6%
	Rocklea - Acacia Ridge	59,990	466	0.78%	75	16.1%
	Springwood - Kingston	83,376	1,247	1.50%	158	12.7%
	Sunnybank	47,481	336	0.71%	48	14.3%
	Wynnum - Manly	73,173	614	0.84%	115	18.7%
	Gold Coast	589,352	5,695	0.97%	1,177	20.7%
	Broadbeach - Burleigh	65,545	870	1.33%	177	20.3%
	Coolangatta	57,170	795	1.39%	237	29.8%
	Gold Coast - North	38,882	290	0.75%	85	29.3%
	Gold Coast Hinterland	15,456	258	1.67%	24	9.3%
	Mudgeeraba - Tallebudgera	35,666	212	0.60%	60	28.3%
	Nerang	63,155	495	0.78%	121	24.4%
	Ormeau - Oxenford	122,114	594	0.49%	146	24.6%
	Robina	58,156	272	0.47%	85	31.3%
	Southport	90,791	1,377	1.52%	255	18.5%
	Surfers Paradise	42,416	516	1.22%	95	18.4%
	Central Qld, Wide Bay, Sunshine Coast	852,202	9,329	1.09%	1,547	16.6%
	Biloela	13,047	64	0.49%	-	0.0%
	Buderim	64,735	322	0.50%	91	28.3%
	Bundaberg	90,781	1,144	1.26%	192	16.8%
	Caloundra	83,625	582	0.70%	138	23.7%
	Central Highlands (Qld)	25,705	130	0.51%	17	13.1%
	Gladstone	64,023	548	0.86%	95	17.3%
	Gympie - Cooloola	52,865	498	0.86%	136	27.3%
	Hervey Bay	61,850	737	0.94%	152	20.6%
	Maroochy	62,309	676	1.19%	144	21.3%
	Maryborough	41,416	1,281	1.08%	108	8.4%
	Nambour	46,996	598	3.09%	119	19.9%
	Noosa	34,946	393	1.27%	85	21.6%
	Noosa Hinterland	23,376	217	1.12%	69	31.8%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 – Feb 2017	Treatment uptake (%)
	Rockhampton	126,747	1,589	0.93%	202	12.7%
	Sunshine Coast Hinterland	44,652	363	1.25%	112	30.9%
Darling Downs & West Moreton		566,593	6,252	1.10%	841	13.5%
	Burnett	49,253	516	1.05%	94	18.2%
	Darling Downs - East	39,839	306	0.77%	51	16.7%
	Darling Downs (West) - Maranoa	46,037	381	0.83%	42	11.0%
	Granite Belt	41,003	347	0.85%	83	23.9%
	Ipswich Hinterland	51,353	466	0.91%	82	17.6%
	Ipswich Inner	124,245	1,872	1.51%	253	13.5%
	Springfield - Redbank	87,151	897	1.03%	104	11.6%
	Toowoomba	160,848	1,813	1.13%	214	11.8%
Northern Queensland		701,231	9,126	1.30%	1,291	14.1%
	Bowen Basin - North	33,522	258	0.77%	41	15.9%
	Cairns - North	34,205	409	1.19%	104	25.4%
	Cairns - South	124,848	2,256	1.81%	358	15.9%
	Charters Towers - Ayr - Ingham	40,289	342	0.85%	76	22.2%
	Far North	27,246	253	0.93%	27	10.7%
	Innisfail - Cassowary Coast	39,155	653	1.67%	113	17.3%
	Mackay	120,466	1,059	0.88%	221	20.9%
	Port Douglas - Daintree	12,045	187	1.55%	59	31.5%
	Tablelands (East) - Kuranda	46,203	849	1.84%	164	19.3%
	Townsville	198,587	2,502	1.26%	303	12.1%
	Whitsunday	22,108	336	1.52%	39	11.6%
Western Queensland		63,566	780	1.23%	54	6.9%
	Outback - North	29,893	441	1.47%	36	8.2%
	Outback - South	18,226	221	1.22%	14	6.3%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals. #Data may be impacted due to a significant proportion of the population residing in a correctional facility.

SOUTH AUSTRALIA

PREVALENCE

Hepatitis C prevalence was estimated to be well below the national average in both of the SA PHNs of Adelaide (0.58%) and Country SA (0.62%). Within the Adelaide PHN, prevalence by SA3 varied. Adelaide City had the highest prevalence with 1.95%, and was one of only three SA3s with prevalence higher than the national average; the estimated prevalence in Port Adelaide – West was 1.02% and in Port Adelaide – East was 1.00%. Playford (0.93%) was the only other SA3 which had a higher prevalence estimate than the state average. While the remaining two SA3s within the PHN, Charles Sturt (0.63%) and Salisbury (0.64%), had prevalences below the state average.

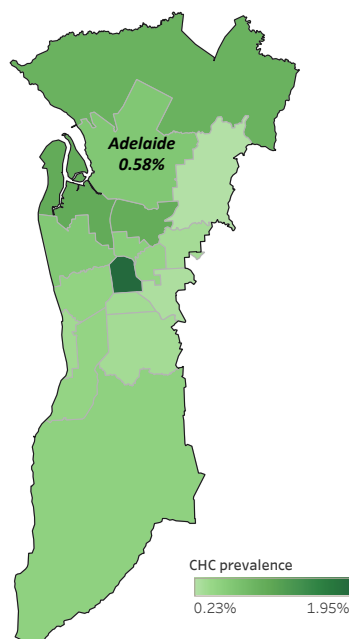
Prevalence estimates were less variable within Country SA. The highest prevalence was recorded in Outback – North and East (1.18%), followed by Murray and Mallee (1.01%). Estimated hepatitis C prevalence in the remaining SA3s was below the national average.

DIAGNOSIS

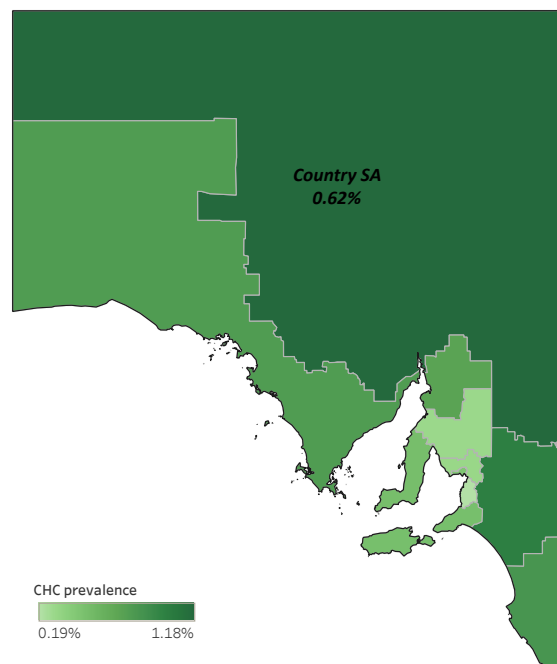
In SA the rate of hepatitis C notification in both PHNs was below the national average, although it was considerably higher in Country SA (33.7) than in Adelaide (25.3). The state average was 27.7 per 100,000.

Notification rates were highly variable between SA3s within these two PHNs. In Adelaide PHN, rates were highest in Adelaide City (130.9), followed by Port Adelaide – East (68.5) and Playford (51.8). These three SA3s had considerably higher rates than the rest of the SA3s in Adelaide PHN, with notification rates for hepatitis C in the remaining 13 SA3 between 5.0 and 24.7 per 100,000 residents.

Map 15: CHC prevalence in greater Adelaide by SA3, 2016



Map 16: CHC prevalence in rest of SA by SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN.

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

Similarly to the estimated prevalence, rates in Country SA were less variable between SA3s. The highest rates were recorded in Outback – North and East (76.2), followed by Murray and Mallee (58.8), Limestone Coast (44.5), and Yorke Peninsula (41.8). The rate of notification for hepatitis C in all other SA3s in Country SA PHN was below the PHN and state average.

TREATMENT

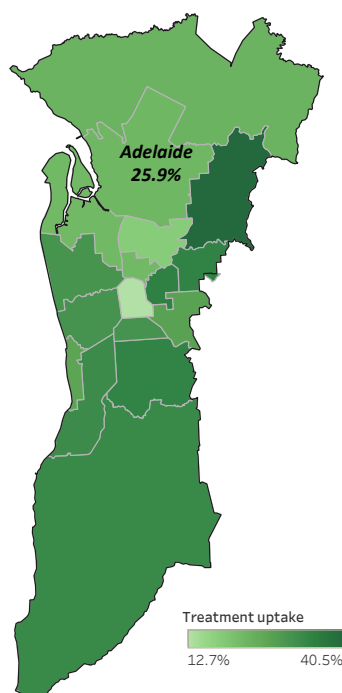
Uptake of treatment for hepatitis C in SA was high, with Adelaide achieving the highest level of access in the nation (25.9%) and Country SA ranked 12th (19.8% uptake).

Estimated treatment uptake within Adelaide was highly variable, greatest in the SA3s of Tea Tree Gully (40.5%), Norwood-Payneham-St Peters (35.3%), Campbelltown (34.9%), Mitcham (34.6%), and Onkaparinga (33.4%) but half the PHN average in the SA3 of Adelaide City (12.7%) and also lower in Port Adelaide–East (18.5%).

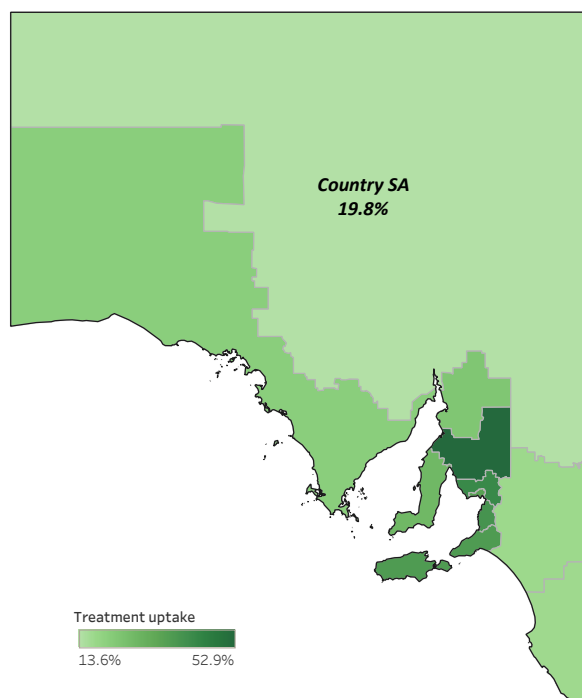
Within Country SA, uptake was generally higher in those SA3s closest to metropolitan Adelaide and lower in more rural and remote regions. Treatment uptake was highest in Lower North (52.9%) and Barossa (42.8%), while lowest in Outback North and East (13.6%).

Table 8: CHC prevalence and treatment uptake in SA by PHN and SA3, 2016

Map 17: CHC treatment uptake in greater Adelaide by SA3, 2016



Map 18: CHC treatment uptake in rest of SA by SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Adelaide	1,237,593	7,137	0.58%	1,850	25.9%
	Adelaide City	22,920	447	1.95%	57	12.7%
	Burnside	45,662	123	0.27%	34	27.6%
	Campbelltown (SA)	62,991	203	0.32%	71	34.9%
	Charles Sturt	102,555	651	0.63%	201	30.9%
	Holdfast Bay	42,267	148	0.35%	40	27.0%
	Marion	73,366	331	0.45%	109	32.9%
	Mitcham	76,967	251	0.33%	87	34.6%
	Norwood - Payneham - St Peters	33,972	153	0.45%	54	35.3%
	Onkaparinga	168,229	840	0.50%	281	33.4%
	Playford	92,688	861	0.93%	204	23.7%
	Port Adelaide - East	70,072	699	1.00%	129	18.5%
	Port Adelaide - West	63,623	651	1.02%	146	22.4%
	Prospect - Walkerville	32,921	183	0.55%	41	22.4%
	Salisbury	139,416	895	0.64%	204	22.8%
	Tea Tree Gully	94,065	212	0.23%	86	40.5%
	Unley	39,622	135	0.34%	42	31.2%
	West Torrens	76,259	361	0.47%	112	31.0%
	Country SA	498,845	3,093	0.62%	612	19.8%
	Adelaide Hills	73,565	139	0.19%	55	39.5%
	Barossa	35,905	105	0.29%	45	42.8%
	Eyre Peninsula and South West	58,961	457	0.77%	95	20.8%
	Fleurieu - Kangaroo Island	50,818	251	0.49%	93	37.0%
	Gawler - Two Wells	37,859	169	0.45%	59	34.9%
	Limestone Coast	67,370	562	0.83%	94	16.7%
	Lower North	23,526	66	0.28%	35	52.9%
	Mid North	28,219	201	0.71%	47	23.4%
	Murray and Mallee	71,383	721	1.01%	123	17.0%
	Outback - North and East	24,935	295	1.18%	40	13.6%
	Yorke Peninsula	26,304	130	0.49%	36	27.7%

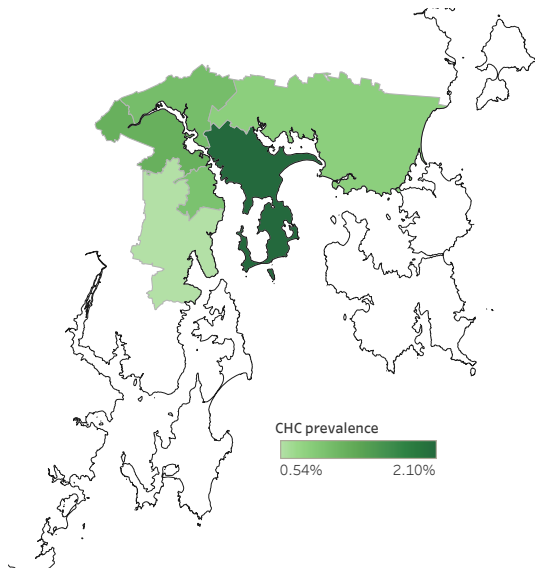
Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

TASMANIA

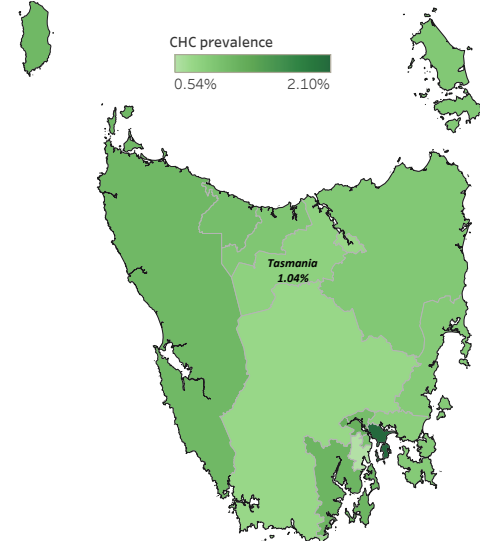
PREVALENCE

The estimated prevalence of CHC in TAS was 1.04%, above the national average of 0.94%. The prevalence was highest in North East and North West Hobart (2.10% and 1.20%), Huon-Bruny Island (1.14%) and West Coast Tasmania (1.11%).

Map 19: CHC prevalence in greater Hobart by SA3, 2016



Map 20: CHC prevalence in rest of TAS by SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN.

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

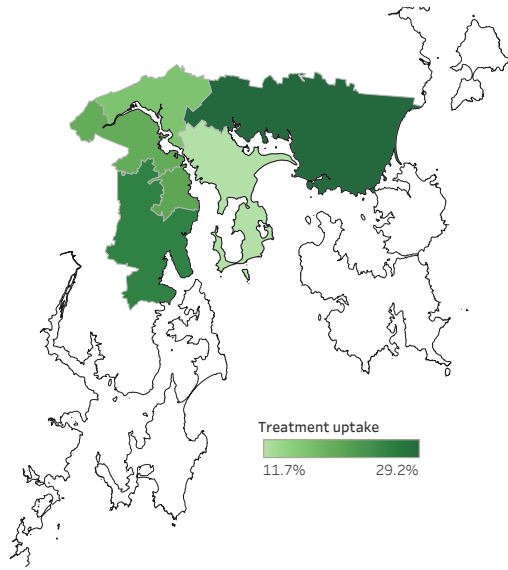
DIAGNOSIS

Tasmania's notification rate of 45.2 per 100,000 was similar to the national average of 46.4. However the overall number of notified cases in each SA3 was very low, with no more than 34 notifications recorded for any SA3 in 2016. This makes the results of comparative analysis more uncertain, as small fluctuations can lead to substantial variability. However, the SA3s of Meander Valley-West Tamar (77.4), Central Highlands (TAS) (62.2), Burnie-Ulverstone (58.9), and Hobart East (61.1) had rates higher the state average in 2016.

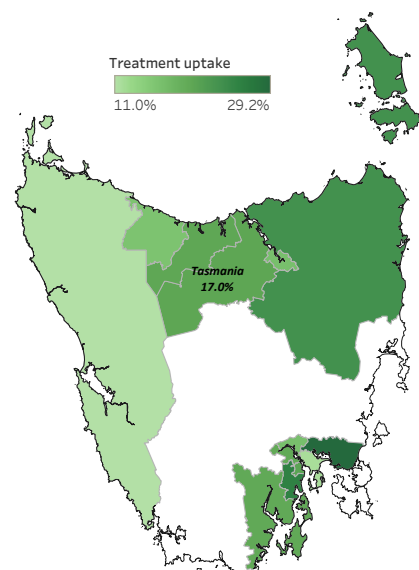
TREATMENT

Treatment uptake in TAS was 17.0%, ranking it in the middle of all Australian PHNs. However access to treatment within TAS was inconsistent. Uptake was high in the Sorell-Dodges Ferry region (29.2%), and Hobart South and West (25.7%), where it was notably greater than the adjacent areas of Hobart North and West (19.6%), and Hobart North East (11.7%).

Map 21: CHC treatment uptake in greater Hobart by SA3, 2016



Map 22: CHC treatment uptake in rest of TAS by SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Table 9: CHC prevalence and treatment uptake in TAS by SA3, 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Tasmania	528,674	5,515	1.04%	937	17.0%
	Brighton	23,908	249	1.04%	41	16.5%
	Burnie - Ulverstone	56,036	580	1.03%	92	15.9%
	Central Highlands (Tas.)	3,217	23	0.71%	-	-
	Devonport	43,984	411	0.93%	82	20.0%
	Hobart - North East	53,978	1,135	2.10%	133	11.7%
	Hobart - North West	57,964	694	1.20%	136	19.6%
	Hobart - South and West	33,540	183	0.54%	47	25.7%
	Hobart Inner	51,583	507	0.98%	104	20.5%
	Huon - Bruny Island	21,429	244	1.14%	48	19.6%
	Launceston	86,495	607	0.70%	100	16.5%
	Meander Valley - West Tamar	20,659	164	0.80%	33	20.1%
	North East	40,193	368	0.91%	86	23.4%
	Sorell - Dodges Ferry	16,806	137	0.82%	40	29.2%
	South East Coast	5,679	50	0.88%	-	-
	West Coast	13,202	146	1.11%	16	11.0%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

VICTORIA

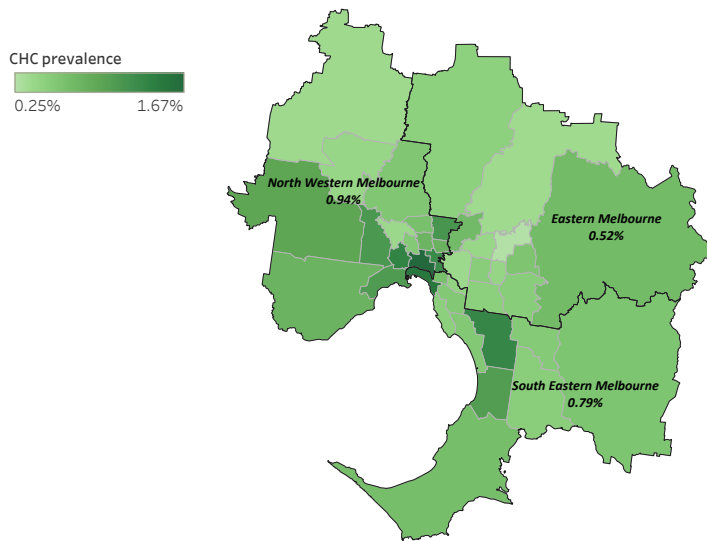
PREVALENCE

Victorian PHNs located in non-metropolitan areas had a substantially higher estimated prevalence than metropolitan PHNs, with the highest prevalence recorded in Gippsland (1.01%) and Murray (VIC) (0.98%), while most metropolitan areas were well below the national average, including Eastern Melbourne (0.52%) and South Eastern Melbourne (0.79%).

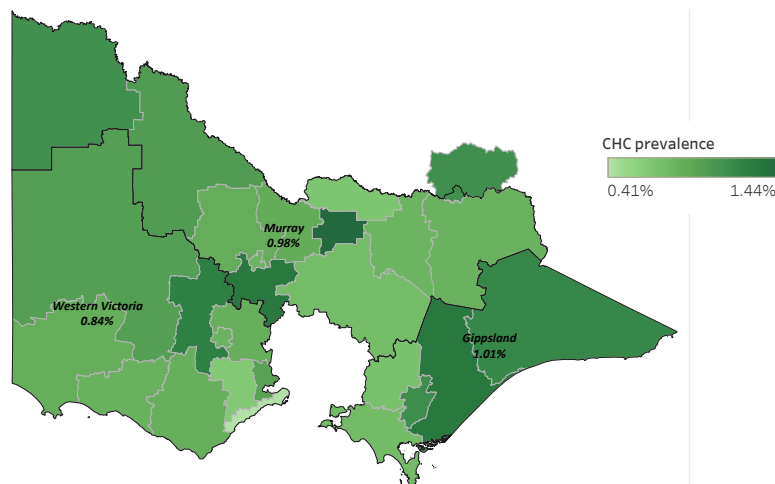
North Western Melbourne was the only Victorian PHN with prevalence estimates higher than the national average (0.94%). However within this PHN there were a number of SA3s that fell well below the national prevalence, and a number that were substantially higher. The lowest SA3s were Macedon Ranges (0.37%), Keilor (0.38%), and Sunbury (0.41%). The highest prevalence was observed in Melbourne City (1.67%), Maribyrnong (1.37%) and Yarra (1.29%).

The SA3s within Eastern Melbourne and South Eastern Melbourne PHN generally had low prevalence, aligning with the low prevalence at the PHN level. In Eastern Melbourne the prevalence ranged from 0.25% in Manningham – East to 0.74% in Banyule. In South Eastern Melbourne there were some SA3s with higher prevalence, such as Port Phillip with 1.51% and Dandenong with 1.34%.

Map 23: CHC prevalence in greater Melbourne by PHN and SA3, 2016



Map 24: CHC prevalence in rest of VIC by PHN and SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN.

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

In Gippsland PHN, the highest prevalence estimates were in the SA3s of Wellington (1.32%), Gippsland East (1.18%), and Latrobe Valley (1.15%). The highest prevalence SA3 in Murray (VIC) was in Shepparton with 1.44%, followed by Heathcote-Castlemaine-Kyneton (1.31%).

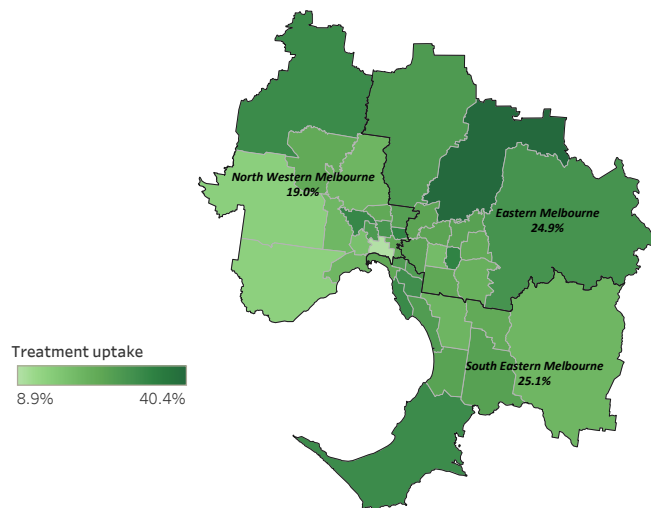
Western Victoria, which had the lowest estimated hepatitis C prevalence of non-metropolitan Victorian PHNs (0.84%), had the highest SA3 prevalence in Maryborough-Pyrenees with 1.25%, with the remaining SA3s ranging from between 0.41% (Surf Coast-Bellarine Peninsula) to 0.99% (Grampians).

DIAGNOSIS

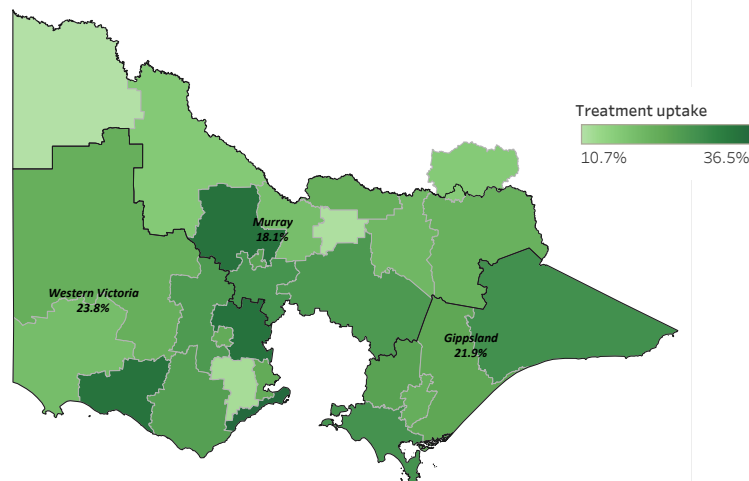
In Victoria, the notification rate was below the national average in all but two PHNs: Murray (VIC) (54.9) and Gippsland (51.7). Metropolitan PHNs had consistently lower rates, with the highest in North Western Melbourne (45.4), followed by South Eastern Melbourne (33.9), and Eastern Melbourne (22.1). Eastern Melbourne had the second lowest rate of hepatitis C notifications of any PHN in Australia.

In North Western Melbourne the highest notification rate was in Melbourne City, with 110.5 per 100,000, substantially higher than the second highest rate in Melton-Baccus Marsh (64.3). The lowest rate of hepatitis C notifications was in Macedon Ranges (13.4). The SA3s within Eastern Melbourne and South Eastern Melbourne generally had lower rates of notification. In Eastern Melbourne, rates ranged from 10.7 (Manningham – West) to 33.7 (Maroondah). Dandenong had the highest rate in South Eastern Melbourne (63.3), closely followed by Port Phillip (62.8).

Map 25: CHC treatment uptake in greater Melbourne by PHN and SA3, 2016



Map 26: CHC treatment uptake in rest of VIC by PHN and SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Despite having higher estimated prevalence, the notification rates in non-metropolitan SA3s were not substantially higher than their metropolitan counterparts. In Gippsland the highest rate was observed in Wellington (73.0), Gippsland East (61.7), and Latrobe Valley (57.2). Similar patterns were reported for rates in SA3s in Murray (VIC), with the highest in Heathcote-Castlemaine-Kyneton (95.3) and Shepparton (89.0).

Western Victoria, which had an overall lower notification rate than the other non-metropolitan PHNs, also had a smaller level of variation between SA3s. The highest rate was observed in Geelong (60.0), closely followed by Grampians (59.0), and the lowest in Surf Coast-Bellarine Peninsula (15.4).

TREATMENT

Treatment uptake in VIC was among the highest in Australia, with four of Victoria's PHNs among the top six in the country, located in both metropolitan and regional areas. Access to treatment varied within these PHNs, and was lower in inner Melbourne and in some regional centres.

Within metropolitan PHNs, uptake was higher in Eastern Melbourne (24.9%) and South Eastern Melbourne (25.1%) than in North Western Melbourne (19.0%). In Eastern Melbourne, uptake of treatment was relatively similar in most of the constituent SA3s at around 25-30%, however was notably higher in Nillumbik-Kinglake (40.4%), as well as in Whitehorse-East (34.0%). Hepatitis C treatment uptake was lower than the PHN average in Whitehorse-West (19.4%) and Knox (22.3%).

Treatment uptake did not fluctuate as widely within South Eastern Melbourne PHN, varying between the highest level in Bayside (32.3%) and the lowest in Cardinia (20.6%). It was above the PHN average in Frankston, Casey-South, Glen Eira, Mornington Peninsula, Stonnington - East and Stonnington - West.

Within North Western Melbourne PHN, treatment uptake exceeded 20% in the majority of SA3s, with the highest occurring in Darebin - South (33.6%), Keilor (32.9%) and Macedon Ranges (31.9%). Uptake was lowered overall by a small number of SA3s with a high population of people living with CHC, most notably Melbourne City (8.9%) and Melton-Bacchus Marsh (14.5%). Uptake was also lower in the south-western regions of Wyndham (14.1%).

Treatment uptake within Gippsland (21.9% overall) was highly stable across the region (range 22-28.5%). In Western Victoria uptake did fluctuate regionally, highest in Surf Coast-Bellarine Peninsula (36.5%), Creswick-Daylesford-Ballan (34.8%), and Warrnambool (34.5%).

In most areas within the Murray PHN estimated treatment uptake was between 15-25%, however it was almost double the PHN average of 18.1% in Loddon-Elmore (34.8%) and also higher in Bendigo (24.7%) and Upper Goulburn Valley (26.5%). Treatment was lowest in the regions of Shepparton (11.3%) and Mildura (10.7%).

Table 10: CHC prevalence and treatment uptake in VIC by PHN and SA3, 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Eastern Melbourne	1,522,751	7,855	0.52%	1,954	24.9%
	Banyule	122,136	900	0.74%	227	25.2%
	Boroondara	181,618	676	0.37%	174	25.7%
	Knox	171,238	902	0.53%	201	22.3%
	Manningham - East	29,530	73	0.25%	19	26.0%
	Manningham - West	93,725	365	0.39%	92	25.2%
	Maroondah	100,866	628	0.62%	149	23.7%
	Monash	183,989	916	0.50%	223	24.4%
	Nillumbik - Kinglake	58,106	208	0.36%	84	40.4%
	Whitehorse - East	63,117	265	0.42%	90	34.0%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Whitehorse - West	117,488	612	0.52%	119	19.4%
	Whittlesea - Wallan	242,710	1,180	0.49%	330	28.0%
	Yarra Ranges	158,229	1,139	0.72%	338	29.7%
	North Western Melbourne	1,659,844	15,631	0.94%	2,971	19.0%
	Brimbank	134,338	1,525	1.14%	313	20.5%
	Brunswick - Coburg	87,167	701	0.80%	206	29.4%
	Darebin - North	87,494	1,018	1.16%	270	26.5%
	Darebin - South	56,893	470	0.83%	158	33.6%
	Essendon	72,334	413	0.57%	116	28.1%
	Hobsons Bay	90,436	989	1.09%	203	20.5%
	Keilor	62,570	237	0.38%	78	32.9%
	Macedon Ranges	29,951	110	0.37%	35	31.9%
	Maribyrnong	74,708	1,021	1.37%	187	18.3%
	Melbourne City	142,970	2,386	1.67%	212	8.9%
	Melton - Bacchus Marsh	209,800	2,011	0.96%	292	14.5%
	Moreland - North	78,127	523	0.67%	125	23.9%
	Sunbury	40,568	164	0.41%	39	23.7%
	Tullamarine - Broadmeadows	169,559	1,030	0.61%	214	20.8%
	Wyndham	234,899	1,902	0.81%	269	14.1%
	Yarra	88,030	1,139	1.29%	272	23.9%
	South Eastern Melbourne	1,474,885	11,598	0.79%	2,916	25.1%
	Bayside	101,315	502	0.50%	162	32.3%
	Cardinia	96,858	598	0.62%	123	20.6%
	Casey - North	107,057	600	0.56%	142	23.6%
	Casey - South	212,967	1,091	0.51%	285	26.1%
	Dandenong	189,532	2,537	1.34%	528	20.8%
	Frankston	124,455	1,336	1.07%	343	25.7%
	Glen Eira	141,561	820	0.58%	255	31.1%
	Kingston	121,320	710	0.59%	194	27.3%
	Mornington Peninsula	166,092	1,151	0.69%	367	31.9%
	Port Phillip	108,239	1,637	1.51%	396	24.2%
	Stonnington - East	35,501	160	0.45%	44	27.5%
	Stonnington - West	69,987	468	0.67%	129	27.6%
	Gippsland	284,189	2,872	1.01%	630	21.9%
	Baw Baw	48,100	338	0.70%	83	24.6%
	Gippsland - East	47,035	557	1.18%	159	28.5%
	Gippsland - South West	66,475	500	0.75%	140	28.0%
	Latrobe Valley	78,739	902	1.15%	198	22.0%
	Wellington	43,841	578	1.32%	136	23.5%

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Murray (VIC)	621,149	6,083	0.98%	1,101	18.1%
	Albury (NSW)	64,967	733	1.13%	120	16.4%
	Bendigo	106,652	863	0.81%	213	24.7%
	Campaspe	38,491	336	0.87%	63	18.8%
	Heathcote - Castlemaine - Kyneton	44,058	578	1.31%	160	27.7%
	Loddon - Elmore	8,953	78	0.87%	27	34.8%
	Mildura	55,882	623	1.12%	67	10.7%
	Moira	31,818	215	0.67%	47	21.9%
	Murray River - Swan Hill	38,822	393	1.01%	65	16.6%
	Shepparton	66,290	954	1.44%	108	11.3%
	Upper Goulburn Valley	56,022	416	0.74%	110	26.5%
	Wangaratta - Benalla	47,952	388	0.81%	78	20.1%
	Wodonga - Alpine	72,804	600	0.82%	128	21.3%
	Western Victoria	640,753	5,387	0.84%	1,280	23.8%
	Ballarat	120,870	984	0.81%	222	22.6%
	Barwon - West	17,976	116	0.65%	14	12.0%
	Colac - Corangamite	37,833	322	0.85%	81	25.2%
	Creswick - Daylesford - Ballan	23,779	201	0.84%	70	34.8%
	Geelong	192,404	1,849	0.96%	420	22.7%
	Glenelg - Southern Grampians	36,822	317	0.86%	60	18.9%
	Grampians	61,042	605	0.99%	132	21.8%
	Maryborough - Pyrenees	19,239	240	1.25%	63	26.3%
	Surf Coast - Bellarine Peninsula	77,761	315	0.41%	115	36.5%
	Warrnambool	53,028	443	0.84%	153	34.5%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

WESTERN AUSTRALIA

PREVALENCE

In WA, 60% of the population who live with hepatitis C reside in two PHNs with above-average estimated prevalence of hepatitis C; Country WA (1.08%) and Perth South (0.97%). The prevalence for Perth North was 0.81%.

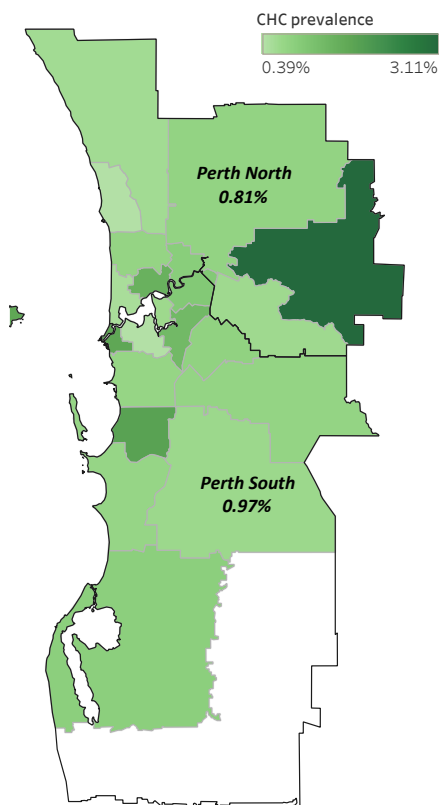
Prevalence varied by SA3 within Perth South, with the highest in Kwinana (1.85%), Fremantle (1.73%) and Canning (1.34%). Meanwhile a number of SA3s were below the average prevalence for the PHN and state, ranging from 0.40% in Melville to 0.87% in Mandurah. Perth North had two SA3s over the PHN and state prevalence; Mundaring (3.11%) and Perth City (1.53%), however the remaining SA3s were relatively similar.

Estimated hepatitis C prevalence was around the national average for all SA3s in Country WA except for West Pilbara (0.87%) and Augusta-Margaret River-Busselton (0.89%). The highest prevalence was reported in Gascoyne with 1.65%, followed by Kimberley (1.53%), Esperance (1.47%), Goldfields (1.37%) and Mid West (1.20%).

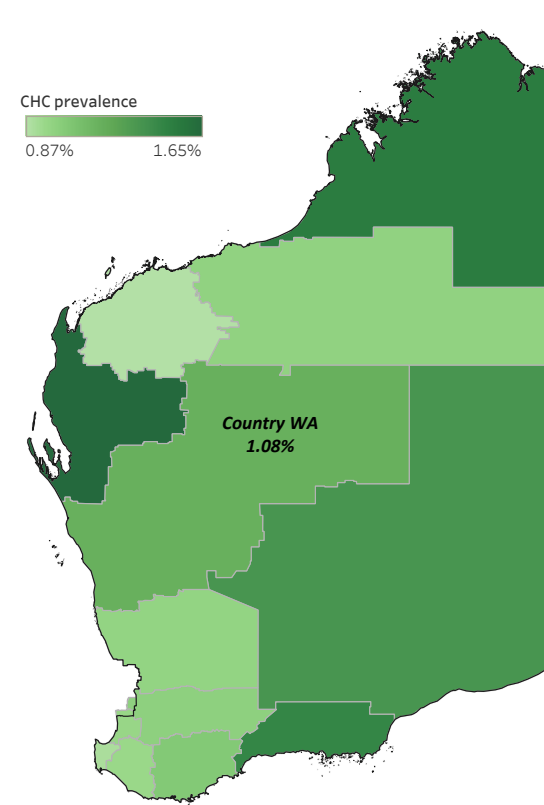
DIAGNOSIS

WA clearly illustrated the difference in notification rates between metropolitan and non-metropolitan PHNs, with notification rates in metropolitan PHNs below the national average, while the non-metropolitan PHN rate was above. Country WA had a substantially higher notification rate (53.0) than the WA metropolitan PHN counterparts in Perth South (45.0) and Perth North (37.8). There were further differences in

Map 27: CHC prevalence in greater Perth by PHN and SA3, 2016



Map 28: CHC prevalence in rest of WA by PHN and SA3, 2016



These maps represent geographic variation in the proportion of the population living with CHC according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN.

Data source: Estimates of CHC prevalence based on published national estimates and notifications distribution.

notification at the SA3 level. Within Country WA, the rate varied from a high of 76.8 per 100,000 in Wheat Belt-South to 32.1 in Augusta-Margaret River-Busselton. Eight of the 13 SA3s in Country WA had rates over the state notification rate.

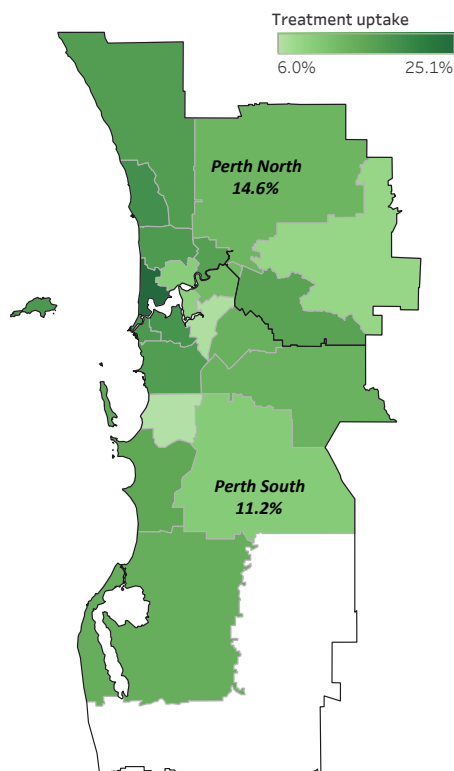
There were similar levels of variation within the SA3s of Perth South and Perth North PHNs. Mundaring in Perth North had the highest notification rate with 160.1 per 100,000 and the highest in Perth South was Kwinana at 121.2. There was little variation from the PHN notification rate for the other SA3s within these PHNs, with Perth South having a wider range (11.3–81.5) than Perth North (14.3–76.3).

TREATMENT

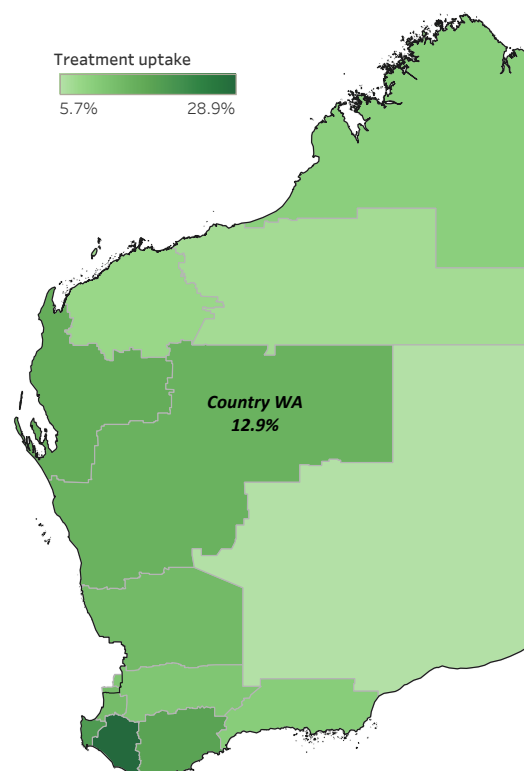
Treatment uptake did not vary widely between PHNs in WA, and all ranked in the lowest 10 for uptake in Australia. Uptake was highest in Perth North (14.6%), and levels varied considerably within the PHN, highest in Cottesloe-Claremont (25.1%) and Joondalup (19.2%), while almost half the PHN average in Mundaring (8.2%) and low in Perth City (9.8%). Within Perth South, where the overall estimated treatment uptake was 11.2%, uptake was highest in Melville (18.5%), Fremantle (17.8%) and Cockburn (17.1%). Uptake was only half the PHN average in Kwinana (6.0%) and Canning (6.4%).

In Country WA, treatment uptake was estimated to be highest in the southernmost regions of Manjimup (28.9%), Albany (18.0%) and Augusta-Margaret River-Busselton (19.7%), and lowest in those most remote (Goldfields, 5.7%, Pilbara, 7.1%, and Kimberley, 9.9%).

Map 29: CHC treatment uptake in greater Perth by PHN and SA3, 2016



Map 30: CHC treatment uptake in rest of WA by PHN and SA3, 2016



These maps represent geographic variation in the proportion of people living with CHC who have received treatment according to SA3. PHN outlines and names are denoted in black. White areas on maps represent SA3 regions outside the boundary of the PHN, or those with data suppressed due to low numbers (number treated <6).

Data source: Department of Human Services Medicare and PBS statistics. Estimates of CHC prevalence based on published national estimates and notifications distribution.

Table 11: CHC prevalence and treatment uptake in WA by PHN and SA3, 2016

Primary Health Network	SA3	Total population	People living with CHC	CHC prevalence (%)	People treated, Mar 2016 - Feb 2017	Treatment uptake (%)
	Perth North	1,049,819	8,460	0.81%	1,232	14.6%
	Bayswater - Bassendean	83,161	756	0.91%	125	16.5%
	Cottesloe - Claremont	62,041	315	0.51%	79	25.1%
	Joondalup	150,717	594	0.39%	114	19.2%
	Kalamunda	53,444	324	0.61%	52	16.0%
	Mundaring	25,604	797	3.11%	65	8.2%
	Perth City	123,926	1,890	1.53%	185	9.8%
	Stirling	205,639	1,523	0.74%	266	17.5%
	Swan	150,062	1,148	0.77%	152	13.2%
	Wanneroo	195,225	1,121	0.57%	191	17.0%
	Perth South	980,768	9,532	0.97%	1,067	11.2%
	Armadale	82,701	623	0.75%	86	12.2%
	Belmont - Victoria Park	73,453	749	1.02%	95	13.8%
	Canning	146,995	1,966	1.34%	126	12.7%
	Cockburn	121,606	877	0.72%	150	6.4%
	Fremantle	31,456	546	1.73%	97	17.81%
	Gosnells	79,073	632	0.80%	88	17.8%
	Kwinana	40,425	747	1.85%	45	13.9%
	Mandurah	100,492	872	0.87%	125	6.0%
	Melville	95,501	384	0.40%	71	14.3%
	Rockingham	129,951	931	0.72%	142	18.5%
	Serpentine - Jarrahdale	27,919	178	0.64%	18	15.2%
	South Perth	43,665	272	0.62%	25	10.1%
	Country WA	534,085	5,759	1.08%	743	12.9%
	Albany	61,556	644	1.05%	116	18.0%
	Augusta - Margaret River - Busselton	52,918	473	0.89%	93	19.7%
	Bunbury	106,807	1,018	0.95%	135	13.3%
	East Pilbara	25,776	253	0.98%	18	7.1%
	Esperance	16,582	244	1.47%	25	10.2%
	Gascoyne	9,811	162	1.65%	26	16.0%
	Goldfields	39,543	543	1.37%	31	5.7%
	Kimberley	35,697	548	1.53%	54	9.9%
	Manjimup	23,495	221	0.94%	64	28.9%
	Mid West	56,044	671	1.20%	101	15.0%
	West Pilbara	35,835	310	0.87%	25	8.1%
	Wheat Belt - North	54,245	527	0.97%	72	13.7%
	Wheat Belt - South	20,831	208	1.00%	24	11.6%

Data source: Estimation of CHC prevalence based on national prevalence and distribution of notifications data. Totals may not add up due to individuals without an area of residence recorded, and due to discordance between SA3 and PHN boundaries. SA3s suppressed where total population <2,000 individuals.

SECTION 3: DATA SOURCES AND METHODOLOGY

SUMMARY OF DATA SOURCES

Indicator	Estimation method	Source	Geographic basis
Prevalence	Calculated using national prevalence data assigned according to the proportion of notified cases	Published national prevalence data and National Notifiable Diseases Surveillance System data	Where a person who tested positive was living when they were tested
Diagnosis	Notifications for hepatitis C from laboratories and clinicians to health departments	National Notifiable Diseases Surveillance System data	Where a person who tested positive was living when they were tested
Treatment	Number of scripts dispensed for antiviral medications indicated for CHC	Pharmaceutical Benefits Scheme data	Where a person was living when they were prescribed treatment
Monitoring	Number of people provided viral load, genotype, and viral detection tests	Medicare Benefits Schedule data	Where a person was living when they were provided with the test
Workforce	Number of currently practising registered practitioners	Australian Health Practitioner Regulation Agency	The location of a practitioner's main job in medicine during the previous week

*Where a person was living refers to the postcode of residence as recorded in administrative data.

COMMON DATA TERMS

	Definition
Provider type	The registered practitioner category of a treating doctor. This is broadly grouped as GP, specialist, or other (which includes nurse practitioners and trainee medical practitioners) in treatment data.
Primary Health Network	A geographic area derived as part of the national health reform agenda. Population size ranges between 60,000-1.7 million residents.
Statistical Area 3 (SA3)	A geographic area defined by the Australian Bureau of Statistics. Population size usually ranges between 30,000 and 130,000 residents.
Hepatitis C treatment	Any direct-acting antiviral (DAA) treatment indicated for hepatitis C therapy listed during the period examined in this report (March 2016-May 2017): daclatasvir+/-sofosbuvir, grazoprevir/elbasvir +/- ribavirin, sofosbuvir+/-ledipasvir, sofosbuvir+ribavirin, and paritaprevir/ritonavir/ombitasvir/dasabuvir +/- ribavirin.
Hepatitis C notification	A positive test result for hepatitis C (hepatitis C antibody OR hepatitis C RNA) that has been notified to state and territory health authorities. Notification by laboratories which make a positive diagnosis, is a legal requirement in Australia.
Relevant specialist	In workforce data, the calculation of the number of relevant per area includes those specialists registered in the following areas: gastroenterology and hepatology; infectious diseases; addiction medicine; general medicine; and sexual health medicine.

DETAILED METHODOLOGY

HEPATITIS C PREVALENCE

SOURCE: National Notifiable Diseases Surveillance System (NNDSS), Australian Department of Health and published estimates of national prevalence

DETAILS: Estimates of the number of people living with CHC and the population prevalence were derived by applying published national prevalence estimates (1) to each geographic area according to the proportional distribution of diagnosed cases reported to the NNDSS. These estimates were generated for both SA3 and PHN geographical areas. Notably, notifications include all positive diagnoses of hepatitis C virus infection (defined as a positive HCV antibody OR positive HCV RNA result), and are likely to include people who do not currently have chronic infection but have previously been infected. For more detail on notifications, see below.

Estimates were based on diagnosed cases which occurred during the period 2007–2016, however sensitivity analyses were conducted to assess the impact of different years of source data (the periods 1997–2016 and 2016 only), and the ten-year period was then selected as the most representative (see supplementary).

These NNDSS data are based on the residential postcode of the diagnosed individual, assigned to each PHN and SA3 using concordances published by the Australian Bureau of Statistics (6-8) and the Department of Health (9), respectively.

HEPATITIS C NOTIFICATIONS

SOURCE: National Notifiable Diseases Surveillance System (NNDSS), Australian Department of Health
Estimated Resident Population (ERP) data, Australian Bureau of Statistics

DETAILS: Notification data was provided according to postcode of residence at time of diagnosis, year of diagnosis, age group, and sex. Data were assigned to each PHN and SA3 using the postcode of residence published concordances. Notification rates were generated by dividing the total number of notifications by the ERP. ERP estimates were available by state and territory and by SA2, which were assigned to SA3 and PHN boundaries using the concordances described above.

All positive diagnoses of hepatitis C (defined as a positive hepatitis C antibody OR hepatitis C RNA test result) are legally required to be reported to jurisdictional departments of health by the diagnosing laboratory, and are collated and published by the NNDSS. Notifications are de-duplicated by jurisdictions and aim to only record one positive diagnosis per individual. Use of these data was approved by the Department of Health and the Communicable Diseases Network of Australia.

WORKFORCE

SOURCE: Workforce Survey data, Australian Health Practitioner Regulation Agency (AHPRA)

DETAILS: AHPRA collects data regarding all registered medical professionals in Australia, including characteristics such as their primary specialty, hours of clinical work per week, and geographic location. We used data extracted from the online Health Workforce Dataset (10) to generate data regarding the number of practitioners according to specialty and PHN of primary workplace. Data were extracted for general practitioners, as well as for physicians specialising in gastroenterology and hepatology; infectious diseases; addiction medicine; sexual health medicine; and general medicine; these were grouped together as 'relevant specialists'. These specialties were chosen as those with potential to prescribe medication for viral hepatitis, as described in other treatment data sources (11). Prevalence data were used to generate estimates of the number of specialists per 1,000 people living with chronic hepatitis C.

ASSESSMENT AND TREATMENT

MONITORING

SOURCE: Medicare Benefits Schedule and Pharmaceutical Benefits Scheme records, Australian Department of Human Services

DETAILS: These sources include all services provided through Australia's national subsidised healthcare system, Medicare. Data were provided according to PHN and SA3, derived from Medicare data using the postcode of residence for the individual at the time of the prescription dispensing or service provision. Because of this, data may have counted an individual more than once during a given time period if they changed their postcode of residence.

All time periods are based on date of service, which represents the date the patient was supplied with their medication by a pharmacy. Age was calculated as of the date of service, which meant a patient could be part of two age categories during a given time period. Provider type was determined according to a practitioner's registered speciality type as recorded by Medicare, broadly grouped as GP, specialist, or other (which includes nurse practitioners and trainee medical practitioners).

These data do not include services provided outside of Medicare, such as those paid for by individual patients, pharmaceutical company compassionate access programs, clinical trials, or those subsidised by State Government services. These gaps are likely to lead to some underestimation of the total proportion of individuals treated in a given area, particularly in the time period prior to PBS listing of treatments.

The number of patients receiving a test or treatment was suppressed by the Department of Human Services if it was below 6 for the given period, indicated in tables using an asterisk.

TREATMENT

Treatment data for CHC represent the number of individuals prescribed any drug listed on the PBS (4) for the treatment of CHC: daclatasvir+/-sofosbuvir, grazoprevir/elbasvir +/- ribavirin, sofosbuvir+/-ledipasvir, sofosbuvir+ribavirin, and paritaprevir/ritonavir/ombitasvir/dasabuvir +/- ribavirin. Treatment uptake was derived by dividing the number of people who received treatment during the period by the total estimated population living with CHC in a given geographic area (see prevalence section).

ASSESSMENT

Data were obtained regarding testing services used to assess hepatitis C infection, including hepatitis C viral load, genotype, and qualitative viral detection (MBS items 69488, 69489, 69491, 69492, 69445, 69451, 69499 and 69500). These data were assessed according to the registered speciality of the requesting provider (GP, specialist, or other).

CORRECTIONAL FACILITY REGIONAL DATA

As the number of notifications in imprisoned individuals is estimated to be significant, data were extracted from the 2011 Census to assess the proportion of the population in each SA3 whose place of residence was listed as a correctional facility or detention centre. Those with a proportion greater than 1% (more than 10 times the national average of 0.1%) are indicated in tables and text.

DATA SUPPRESSIONS

To protect the privacy of individuals recorded in the data published in this report, and to ensure accuracy of calculations, suppression was applied when low numbers were recorded for each data source. This standard was <6 for Medicare data (as applied by the data custodian), and <5 for notifications and estimated prevalence. Data for the entire SA3 was suppressed if the total population of the SA3 was less than 2000 individuals.

REFERENCES

1. The Kirby Institute. HIV, viral hepatitis and sexually transmissible infections in Australia: Annual Surveillance Report 2017. Sydney: The Kirby Institute, The University of New South Wales, 2017.
2. The World Health Organisation. Global Health Sector Strategy on Viral Hepatitis 2016–2021: Towards ending viral hepatitis. Geneva, Switzerland: World Health Organisation, 2016.
3. The Kirby Institute. Monitoring hepatitis C treatment uptake in Australia. February 2017. Report No.: 6.
4. Australian Government Department of Health. Schedule of Pharmaceutical Benefits 2016 [5/Sep/2016]. Available from: <http://www.pbs.gov.au/info/browse/publications>.
5. Australian Government Department of Health. Medicare Benefits Schedule: Australian Government, Department of Health and Ageing; 2016 [5/Sep/2016]. Available from: <http://www.health.gov.au/internet/mbsonline/publishing.nsf/Content/downloads>.
6. Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS): Volume 1, July 2016. Report No. 1270.0.55.001
7. Australian Bureau of Statistics. Estimated Resident Population (Dataset) ABS.Stat: Commonwealth of Australia; 2016 [cited 2016 August]. Available from: <http://stat.data.abs.gov.au/>.
8. Australian Bureau of Statistics. Estimated Resident Population by Region, 1991-2015 [5/Sep/2016]. Available from: <http://stat.abs.gov.au/>.
9. Australian Government Department of Health. PHN Concordances 2016. Available from: <http://www.health.gov.au/internet/main/publishing.nsf/Content/PHN-Concordances>.
10. Australian Government Department of Health. National Health Workforce Dataset 2017. Available from: <http://hwd.health.gov.au>
11. The Kirby Institute. Monitoring hepatitis C treatment uptake in Australia. 2016 September. Report No.: 5.



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