

AUSTRALIAN HIV OBSERVATIONAL DATABASE

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HIV-infected young people in Australia: data from the Australian HIV Observational Database (AHOD)

HIV infection in adolescents or young adults in Australia has not been well characterized. Using data from AHOD, Dr Carly Hughes and colleagues compare key demographic characteristics such as mode of exposure, presence of coinfections, and HIV treatment response as determined by CD4 count and HIV viral load of adolescents/young adults to those over 25 years of age. The authors describe the need to further characterize the population of young adults who are newly diagnosed with HIV, given the complexity adolescence and young adulthood places on the general management of chronic disease. Among the 2180 of AHOD patients diagnosed after 1997, 223 (10.2%) were aged less than 25 years of age at diagnosis (young adults). There were proportionally twice as many females in the young adult group compared to the older group (21% versus 10%). The median age at diagnosis for the younger group was 22 years and 37 years in the older group. At the time of HIV diagnosis the younger group presented with significantly higher CD4 counts; median 460 vs 400 [cells/mm³, P=0.006] yet lower HIV viral load (VL) at diagnosis but this difference was lost at the time of treatment initiation. At the most recent visit, the proportion of younger adults with an undetectable VL (<50 copies) was similar to the older group (91% vs 94%). However, ART treatment interruption was significantly more likely in the younger cohort (5% per year compared to 4% in the older group) and there was significantly higher loss to follow-up in the younger group compared to older group (incidence rate 8.0 per 100PY vs. 4.3, P<0.001). The key outcome comparisons are presented in Table 1.

Table 1: Comparison of outcomes by age group

	Under 25 years at diagnosis	25 years or older at diagnosis	P-value
Total patients	223	1957	
Mortality			
Deaths, n(%)	2 (0.9%)	66 (3.4%)	
Incidence rate per 100 PY, median (IQR)	0.22 (0.05-0.87)	0.57 (0.45-0.72)	0.176
LTFU to AHOD			
LTFU, n(%)	74 (33.2)	503 (25.7)	<0.001
Incidence rate per 100 PY, median (IQR)	8.01 (6.37-10.05)	4.32 (3.96-4.72)	
Treatment switch			
Switches, n	167	2006	
Incidence rate per 100 PY, median (IQR)	14.75 (12.68-17.07)	14.74 (14.11-15.39)	0.984
Treatment interruption			
Interruptions, n	60	540	
Incidence rate per 100 PY, median (IQR)	5.30 (4.12-6.72)	3.97 (3.67-4.31)	
Length of treatment interruption (days)			
Median (IQR)	409 (125-1084)	228 (70-789)	0.046
CD4 testing, median (IQR)			
Total visits	9 (4-15)	12 (5-24)	0.074
Rate per PY	2.45 (2.35-2.55)	2.54 (2.51-2.57)	
VL testing, median (IQR)			
Total visits	9 (4-17)	13 (6-26)	0.001
Rate per PY	2.48 (2.39-2.59)	2.66 (2.63-2.69)	

Results from this study highlight the challenges associated with managing young adults with newly diagnosed HIV and the need for additional methods to engage younger adults in accessing quality care. Directions for future research may include ongoing longitudinal studies of the AHOD Cohort. Complete details can be found in source article.¹

1. Hughes C, Puhr R, Ojaimi S, Petoumenos K, Bartlett AW, Templeton DJ, et al. Human immunodeficiency virus-infected young people in Australia: data from the Australian HIV Observational Database. *Internal Medicine Journal*. 2018; 48:1447-56.

Table 1: All AHOD demographics¹ (Total – 4631)

	Number	(%)		Number	(%)
Sex			CD4 (cells/μl)¹		
Male	4194	(91)	<200	422	(11)
Female	424	(9)	200-299	429	(11)
Transgender	10	0	300-499	1211	(30)
			500+	1943	(49)
Age (years)¹			Missing	626	
<30	514	(11)	Mean [SD]	530	[359]
30-39	1614	(35)			
40-49	1458	(31)	HIV viral load (copies/ml)¹		
50+	1021	(22)	\leq 400 ⁴	2691	(65)
Mean [SD]	41.8	[11]	401-10 000	640	(15)
			>10 000	815	(20)
Aboriginal/Torres Strait islander			Missing	485	
Yes	87	(2)	Median [LQ – UQ] ³	138	[49, 4000]
No	2976	(64)			
Missing	1568	(34)	Prior AIDS defining illness¹		
			Yes	757	(16)
Exposure category			No	3874	(84)
Male homosexual contact	3193	(69)			
Male homosexual contact and IDU	152	(3)	Hepatitis C ever		
Injecting drug user (IDU)	95	(2)	Yes	422	(11)
Heterosexual contact	632	(14)	No	3439	(89)
Receipt of blood/blood products	32	(1)	No test	750	
Other	362	(8)			
Missing	164	(4)	Hepatitis B ever		
			Yes	189	(5)
Estimated year of HIV infection²			No	3568	(95)
<1990	113	(2)	No test	874	
1990-1999	609	(13)			
2000-2009	414	(9)	Total patients under active follow up in last 12 months (N=2324)⁴		
2010-2017	163	(4)			
Missing	3332	(72)	Recent CD4 (cells/μl)⁵		
			< 200	136	(8)
Patient care setting			200-299	74	(4)
General Practitioner	1531	(33)	300-499	296	(16)
Hospital Tertiary Centre	996	(22)	500+	1297	(72)
Sexual Health Clinic	2104	(45)	Missing	503	
			Mean [SD]	713	[313]
Region of birth					
Australia and New Zealand	2421	(52)	Recent HIV viral load⁵		
Asia and Oceania	389	(8)	\leq 50	1873	95
Britain and Ireland	169	(4)	51-400	73	4
Europe	125	(3)	401-10 000	12	1
Africa and Middle East	159	(3)	>10 000	11	1
North America	41	(1)	Missing	337	
South and Central America	65	(1)	Median [LQ – UQ] ³	20	[19-40]
Missing	1250	(27)			

1. Age & prior AIDS defining illness at time of cohort enrolment. CD4 count & HIV viral load closest to and within 3 months of cohort enrolment date. 2. Year of HIV infection = mid date between date of first positive and last negative test (coded as not reported if either first positive or last negative date are missing). 3. LQ = Lower quartile UQ = Upper quartile. 4. Patients who had the most recent visit between 1 April 2018 and 31 March 2019 and have not died. NB one site (178 patients) did not provide data for 2018 so is censored to 31 March 2018. 5. Most recent CD4 count & HIV viral load between 1 April 2018 and 31 March 2019.

Table 2: Follow up status by calendar year¹

Year	Entered study	Deaths	Lost to Follow up
2000	859	25	39
2001	226	29	61
2002	167	23	61
2003	194	22	53
2004	91	19	73
2005	102	26	59
2006	120	28	53
2007	98	26	81
2008	89	22	97
2009	310	16	72
2010	244	25	84
2011	206	21	76
2012	279	17	104
2013	135	14	95
2014	169	26	125
2015	79	13	136
2016	153	15	148
2017	194	20	199
2018	60	14	106
Total	3715	387	1616

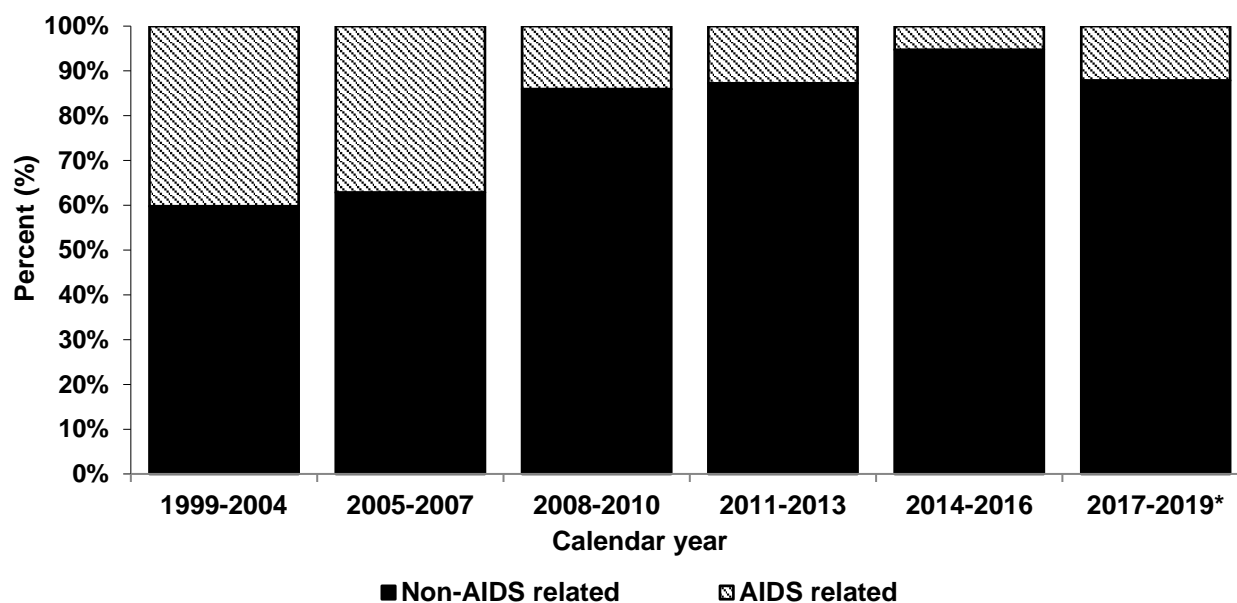
Complete follow-up (percentage of patients)²: 64 %

Loss to follow-up (per 100 person years): 3.44 (95% CI: 3.26-3.63)

Mortality (per 100 person years): 1.02 (95% CI: 0.94-1.14)

1. 4 sites (309 patients) were censored 31 March 2006, 31 March 2008, 31 March 2013, and 31 March 2015 respectively, and one site (178 patients) were censored 31 March 2018. 2. Patients who have died or any patients seen at clinic site within the last 12 months (1 April 2018 – 31 March 2019) are considered to have complete follow-up.

Figure 1: Proportion of AIDS and non-AIDS related deaths in AHOD since cohort inception by year grouping



* 1 January 2017 to 31 March 2019.

Table 3: Total number of deaths in AHOD since cohort inception, by AIDS or non-AIDS related death classification and year grouping

	1999-2004	2005-2007	2008-2010	2011-2013	2014-2016	2017-2019 ²	All years
Non-AIDS related	73	52	46	32	30	19	260
AIDS related	45	20	8	5	3	2	87
Unknown	3	5	6	11	8	1	32
No CoDe Form ²	0	1	2	4	6	16	33
Total deaths	121	78	62	52	47	38	412

1. Preliminary AHOD data as of September 2019, note that new deaths may have subsequently been reported from AHOD sites.

2. 1 January 2017 to 31 March 2019. 3. Coding of Death classification (CoDe)

Table 4: Summary of deaths reported in the last 5-year period¹

Coding of Death Classification ²	Number
Cancer	17
AIDS (ongoing active disease)	4
MI or other ischemic heart disease	13
Suicide	2
Chronic viral hepatitis (progression of / complication to)	2
Other Causes	16
Unknown (autopsy inconclusive, died overseas, etc)	9
Missing information ³	22

1. 1 January 2014 to 31 December 2018, preliminary AHOD data as of September 2019, note that new deaths may have subsequently been reported from AHOD sites. 2. Coding of Death classification (CoDe) 3. Still awaiting CoDe forms, note that subsequent to publishing CoDe may have been received from AHOD sites.

Table 5: Trends in antiretroviral treatment^{1,2}

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Patients under active follow up ¹	(n=2066)	(n=2437)	(n=2340)	(n=2437)	(n=2620)	(n=2634)	(n=2668)	(n=2581)	(n=2582)	(n=2612)	(n=2455)
Treatment	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Never treatment	63 (3)	51 (2)	62 (3)	64 (3)	63 (2)	52 (2)	44 (2)	31 (1)	24 (1)	29 (1)	19 (1)
Ever treatment	n=2003	n=2184	n=2340	n=2437	n=2620	n=2634	n=2668	n=2581	n=2582	n=2612	n=2455
Currently ³	1785 (86)	1928 (88)	2095 (90)	2201 (90)	2430 (93)	2484 (94)	2538 (95)	2480 (96)	2505 (97)	2539 (97)	2406 (98)
Previously, not currently	218 (11)	205 (9)	183 (8)	172 (7)	127 (5)	98 (4)	86 (3)	70 (3)	53 (2)	44 (2)	30 (1)
Number of drugs ever⁴											
≤3	522 (33)	644 (37)	728 (39)	791 (40)	859 (40)	848 (39)	830 (38)	716 (34)	669 (32)	589 (28)	506 (26)
4-6	824 (51)	809 (47)	842 (45)	866 (44)	961 (45)	993 (46)	1022 (47)	1007 (48)	984 (48)	1025 (49)	968 (49)
7-9	80 (5)	80 (5)	74 (4)	76 (4)	75 (4)	74 (3)	75 (3)	86 (4)	94 (5)	117 (6)	112 (6)
10+	179 (11)	204 (12)	219 (12)	229 (12)	238 (11)	248 (11)	262 (12)	285 (14)	316 (15)	379 (18)	374 (19)
Number of drug classes ever^{4,5}											
1	95 (5)	103 (5)	112 (5)	116 (5)	107 (4)	81 (3)	67 (3)	53 (2)	46 (2)	62 (2)	77 (3)
2	971 (53)	1070 (54)	1145 (54)	1211 (54)	1382 (56)	1416 (56)	1385 (54)	1199 (48)	1154 (46)	1106 (44)	983 (41)
3	650 (35)	616 (31)	616 (29)	619 (28)	657 (27)	660 (26)	722 (28)	813 (32)	837 (33)	869 (34)	853 (36)
4	102 (6)	146 (7)	209 (10)	231 (10)	261 (11)	286 (11)	319 (12)	369 (15)	410 (16)	427 (17)	412 (17)
5	28 (2)	45 (2)	52 (2)	58 (3)	61 (2)	68 (3)	73 (3)	76 (3)	73 (3)	67 (3)	63 (3)

1. Treatment status for all patients under active follow during the calendar year. Table includes prospective data only (i.e. records prior to AHOD enrolment are excluded).2. Ritonavir is recorded separately unless recorded as part of a combination drug, regardless of whether it is a low dose (boosted PI).3. Currently on treatment is defined as receiving treatment at some point during the calendar year. 4. Denominator is the number of patients who have ever received treatment.5. Broad class ARV groupings are: nucleos(t)ide reverse transcriptase inhibitors; non-nucleoside reverse transcriptase inhibitors; protease inhibitors; integrase inhibitors; entry inhibitors;

Table 6: Trends in combination antiretroviral treatment^{1,2}

	2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018	
Combination³	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
1 st combination	247	(13)	363	(18)	378	(18)	441	(20)	548	(22)	531	(21)	496	(20)	428	(17)	399	(16)	335	(13)	284	(12)
2 nd combination	354	(19)	344	(18)	415	(20)	439	(20)	525	(22)	552	(22)	579	(23)	530	(22)	514	(21)	517	(21)	495	(21)
3 rd combination	287	(16)	278	(14)	316	(15)	323	(15)	343	(14)	372	(15)	394	(16)	411	(17)	425	(17)	457	(18)	433	(18)
≥4 th combination	947	(52)	980	(50)	1006	(48)	1005	(46)	1024	(42)	1024	(41)	1054	(42)	1096	(44)	1144	(46)	1201	(48)	1154	(49)

1. Includes patients who commenced their first combination ART after 1 January 1996 for at least 14 days. The denominator includes all AHOD patients that received combination antiretroviral treatment in any calendar year (i.e. HIV positive), who commenced their first combination ART after 1 January 1996 for at least 14 days. Includes prospective and retrospective data. 2. Ritonavir is recorded separately unless recorded as part of a combination drug, regardless of whether it is a low dose (boosted PI). 3. Combinations include 3 or more antiretroviral drugs, does not include mono/dual therapy. Regimens with interruptions of less than 7 days were considered as continuous treatment.

Figure 2: Trends in combination antiretroviral treatment (as above)

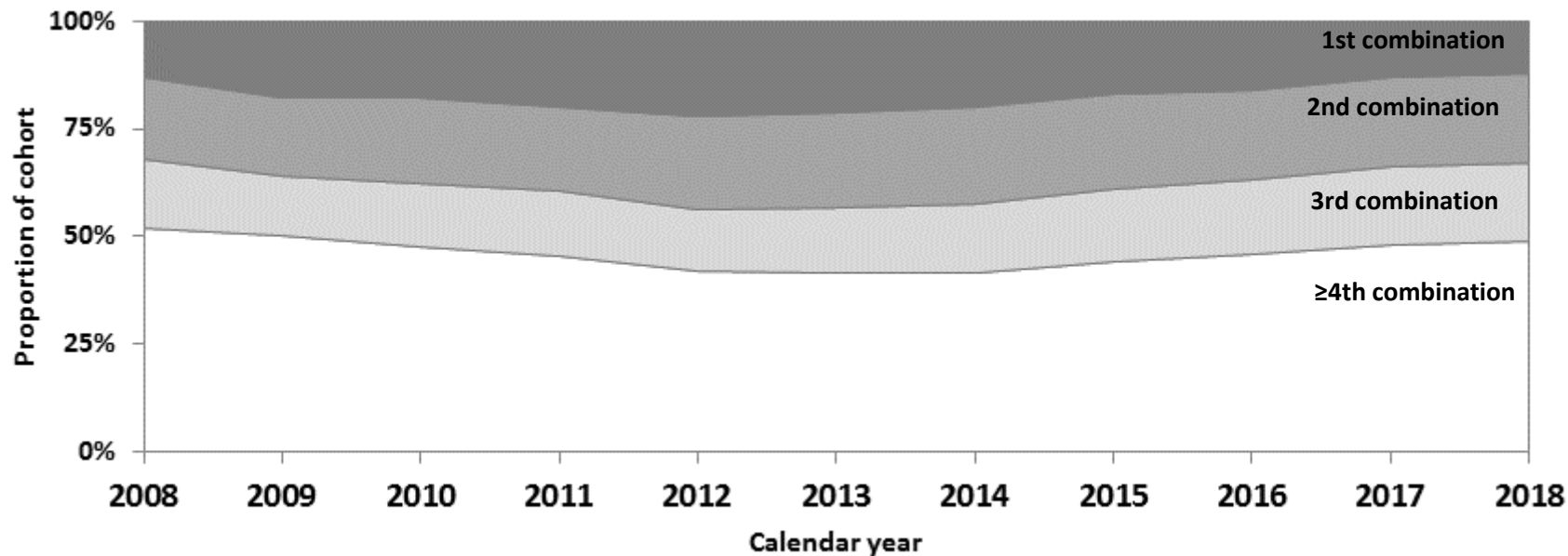


Table 7: Immunological and virological trends¹

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018 ²
Viral load (copies/ml)											
Total N (with measure)	2435	2422	2403	2582	2616	2619	2572	2469	2411	2273	2097
Off Treatment³											
No. with a viral load count ⁴	443	397	323	296	238	180	148	89	74	49	47
Median	8327	6400	6000	4036	2618	856	844	43	40	40	40
IQR	587-31540	450-32145	74-33900	50-29442	40-24209	39-20453	39-23659	39-7799	20-801	20-40	19-40
On Treatment⁵											
No. with a viral load count ⁴	1992	2025	2080	2286	2378	2439	2424	2380	2337	2224	2050
Median	49	49	49	40	36.5	20	20	20	20	20	20
IQR	40-50	40-50	40-50	34-49	19-49	19-40	19-40	19-40	19-40	19-40	19-40
<hr/>											
CD4 count (cells/μl)											
Total N (with measure)	2364	2346	2338	2460	2495	2493	2495	2483	2438	2273	2006
Off Treatment³											
No. with a CD4 count ⁶	449	391	328	295	235	171	144	94	73	46	41
Median	488	505	504.5	528	561	620	635	650	640	690	630
IQR	380-668	395-680	392-680	410-700	455-760	485-840	489-800	525-770	480-830	470-880	326-848
On Treatment⁵											
No. with a CD4 count ⁶	1915	1955	2010	2165	2260	2322	2351	2389	2365	2227	1965
Median	530	540	552	575	590	610	630	648	668.5	674	670
IQR	378-740	380-730	400-739	424-770	430-780	445-792	460-820	469-850	485-867	500-877	480-884

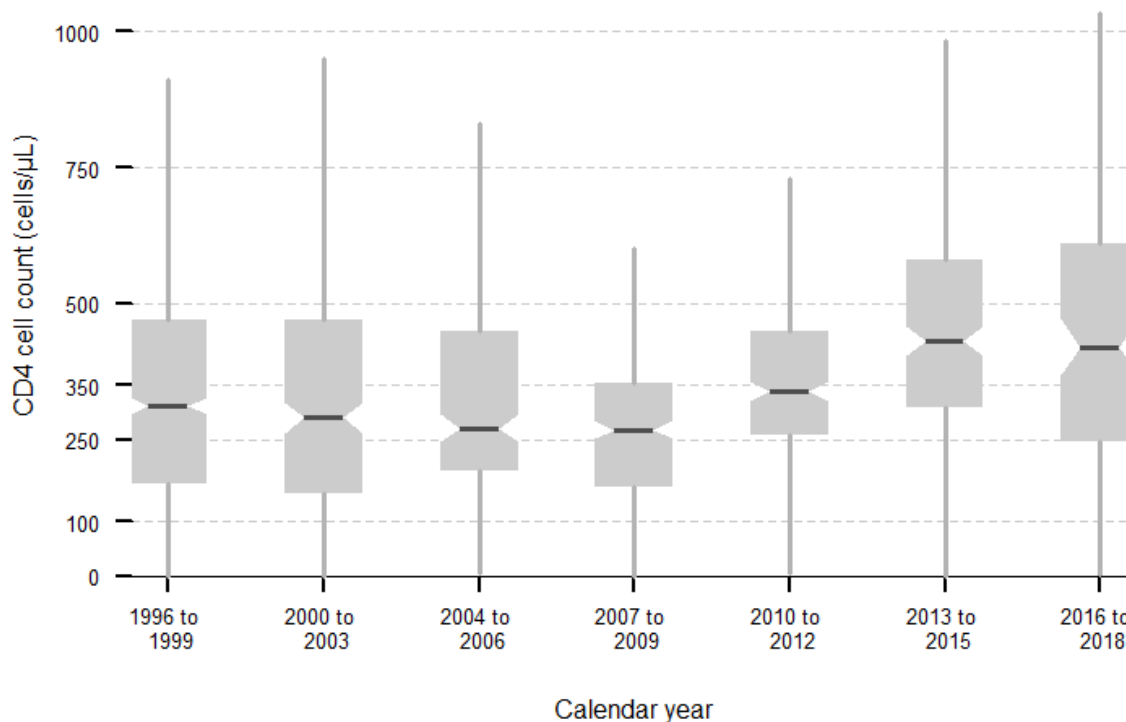
1. Includes retrospective and prospective data. Off treatment if never on a regimen of duration greater than 14 days for given calendar year. Viral load taken as median value during given calendar year. Undetectable assay level taken as ≤ 50 copies/ml. 2. One site (187 patients) were censored 31 March 2018. 3. Patients who have not received treatment during the calendar year. 4. Includes patients with a viral load measured during the calendar year. 5. Patients who received treatment during the calendar year. 6. Includes patients with a CD4 count measured during the calendar year

Table 8: CD4 cell count at antiretroviral therapy initiation by calendar year¹

	1996-99	2000-03	2004-06	2007-09	2010-12	2013-15	2016-18 ⁴
Number of participants initiating ART¹							
N=	1184	359	235	314	294	272	120
CD4 cell count (copies/μL)^{2,3}							
Mean	327	301	325	272	355	440	431
Median	309	272	264	260	340	423	410
IQR	161-460	135-420	190-432	160-350	255-405	302-571	244-588

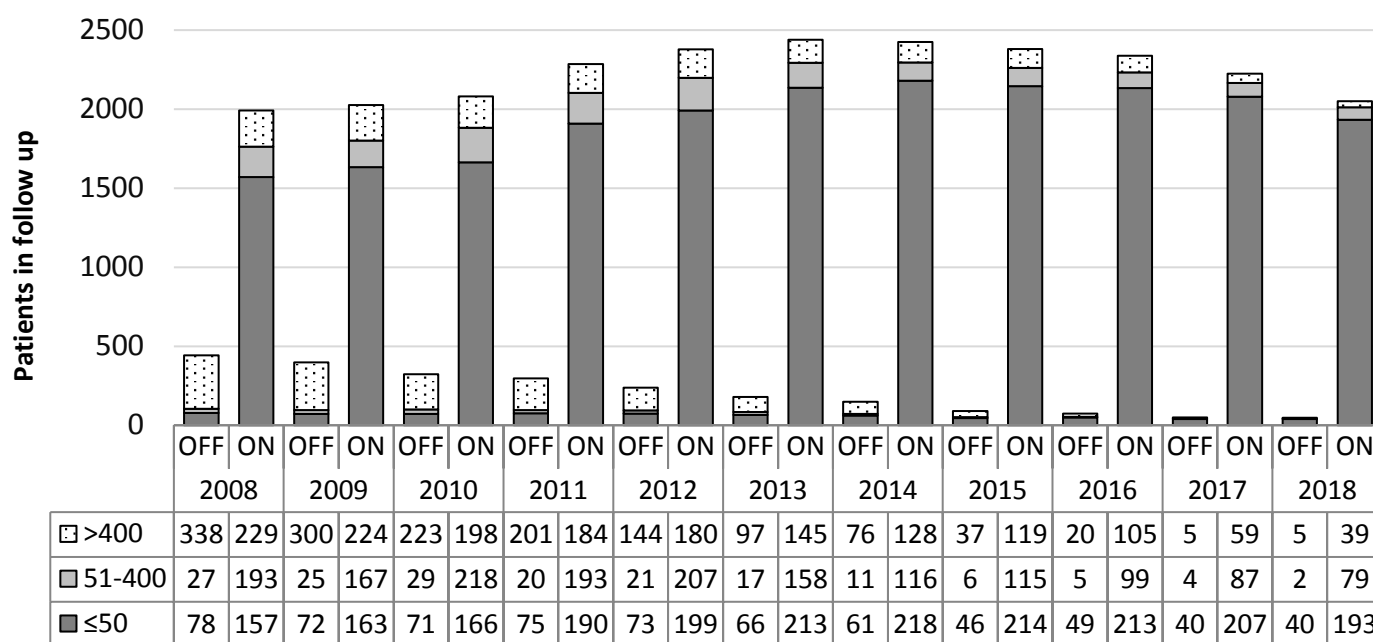
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART>14 days. Includes both retrospective and prospective data. ATRAS sub study participants were excluded from analysis. 2. CD4 cell count selected from the observation closest to ART start date within a timeframe window of 12 months prior to ART start date and one-month post ART start date. 3. Patients were excluded from the analysis if an undetectable viral load was recorded prior to initiating ART or was missing a viral load measurement prior to initiating ART. 4. Includes data reported from 1 January 2016 to 31 March 2018.

Figure 3: Empirical CD4 cell count distribution (boxplot) at antiretroviral therapy initiation by year of ART initiation¹⁻³ (median CD4 indicated by horizontal grey bar)



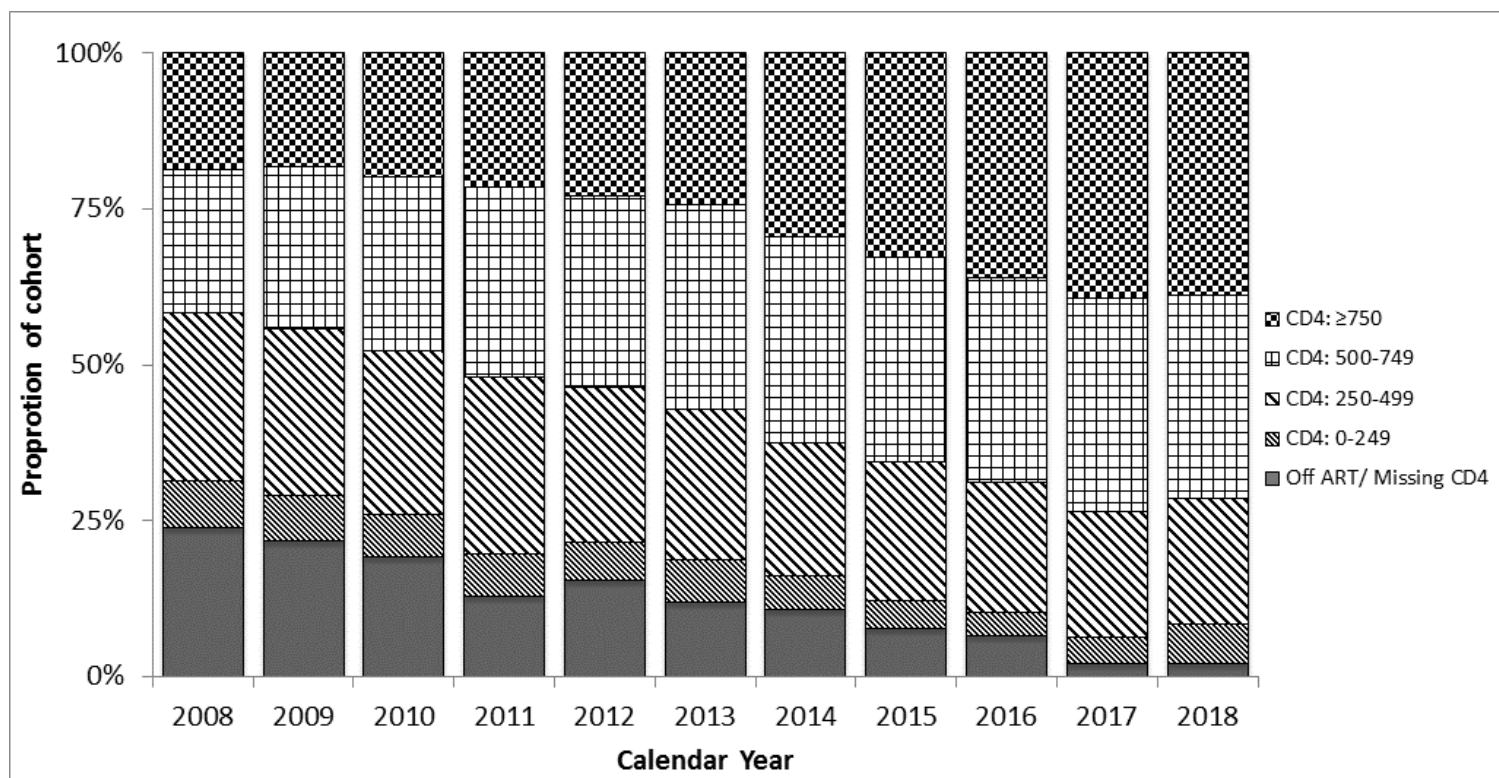
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART>14 days. Includes both retrospective and prospective data. ATRAS sub study participants excluded from analysis. 2. CD4 cell count selected from the observation closest to ART start date within a timeframe window of 12 months prior to ART start date and 7 days post ART start date. 3. Patients were excluded from the analysis if an undetectable viral load was recorded prior to initiating ART or was missing a viral load measurement prior to initiating ART. 4. '2016 to 2018' includes data reported from 1 January 2016 to 31 March 2018.

Figure 4: Patients with an undetectable viral load, by treatment status (off /on treatment) and year¹



1. Off treatment if never on a regimen of duration greater than 14 days for given calendar year. Viral load taken as median value during regimen of longest duration for given calendar year.

Figure 5: CD4 cell counts (cells/ μ l) in patients receiving treatment by calendar year¹⁻³



1. Includes patients with a prospective CD4 measure during the relevant calendar year. 2. For patients on treatment, analysis based on the initial treatment intent, not on treatment administered (ITT), i.e. no adjustments are made for off-treatment following ART initiation. 3. Patients off treatment include those who have enrolled and have not initiated combination antiretroviral therapy.

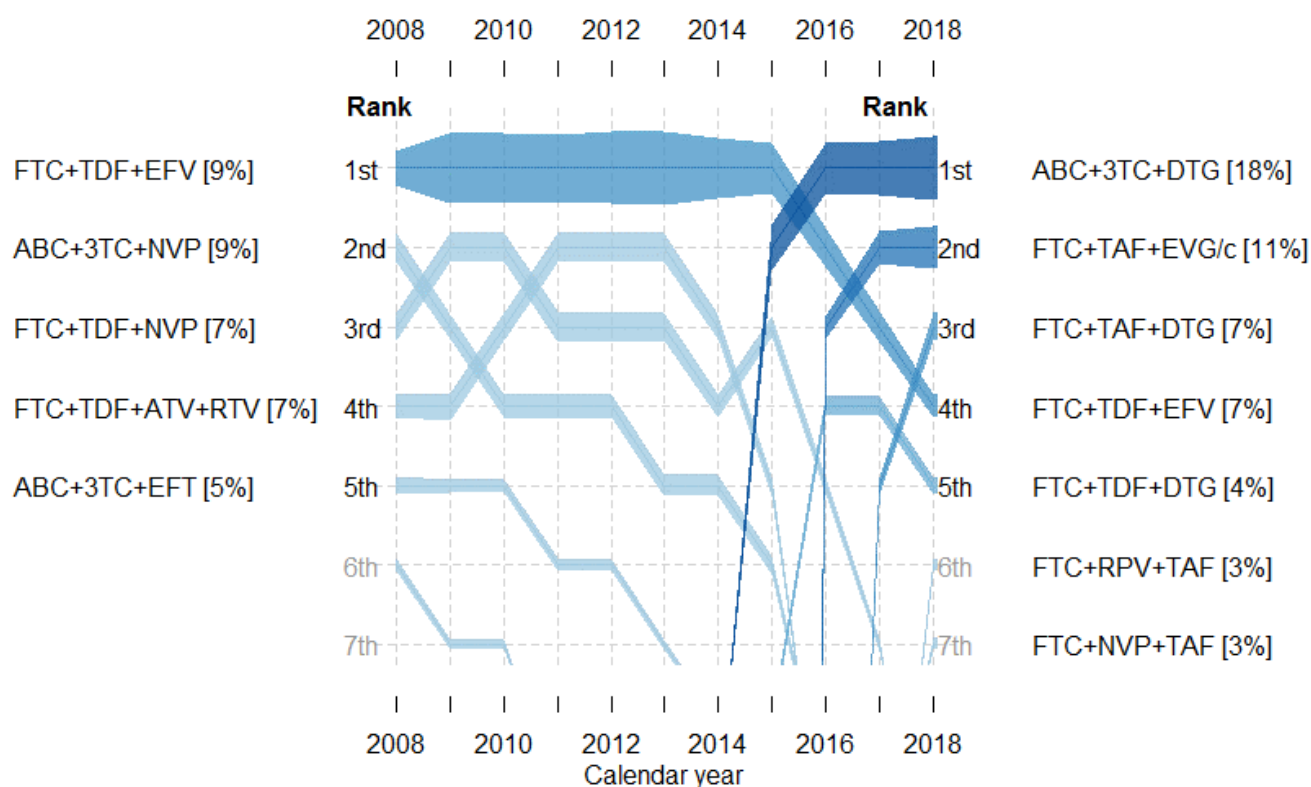
Table 9: Top ten treatment combinations among the AHOD cohort¹: January-December 2018

In 2018, there were a total of 374 unique antiretroviral treatment (ART) combinations (12 of which contain trial drugs) among the 2444 AHOD patients on combination ART. A total of 2594 combination regimens were recorded among these patients throughout 2018. The top ten most common ART combinations are described below.

ART combinations	Number of regimens recorded during 2018
abacavir+lamivudine+dolutegravir	462
emtricitabine+TAF+elvitegravir+cobicistat	298
emtricitabine+TAF+dolutegravir	193
emtricitabine+tenofovir+efavirenz	174
emtricitabine+tenofovir+dolutegravir	115
emtricitabine+rilpivirine+TAF	85
emtricitabine+nevirapine+TAF	84
abacavir+lamivudine+nervirapine	78
emtricitabine+tenofovir+rilpivirine	59
emtricitabine+tenofovir+raltegravir	49

1. Includes retrospective and prospective data. Combinations include 3 or more antiretroviral drugs. Fixed dose combinations are separated into individual component antiretroviral drugs.

Figure 6: Top five treatment combinations among the AHOD cohort¹ ranked by proportion² of total ART regimens recorded in years 2008-2018



1. Includes retrospective and prospective data. Combinations include 3 or more antiretroviral drugs. Fixed dose combinations are separated into individual component antiretroviral drugs. 2. Proportion defined as frequency of ART line divided by total number of ART regimens recorded. For example, 2018 Rank 1 proportion calculated by 462/2594=17.8%. Thickness of line over time is proportional to calculated percentage.

Table 10: Current use of individual antiretroviral treatments¹

	2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Nucleoside analogue reverse transcriptase inhibitors (RTI)																						
Abacavir	347	(15)	251	(11)	244	(10)	226	(9)	196	(7)	182	(7)	175	(6)	160	(6)	127	(5)	99	(4)	65	(3)
Combivir ²	265	(11)	228	(10)	214	(8)	176	(7)	146	(5)	118	(4)	98	(4)	84	(3)	69	(3)	57	(2)	38	(2)
Descovy ³	1	(0)	2	(0)	3	(0)	3	(0)	3	(0)	3	(0)	3	(0)	4	(0)	55	(2)	360	(14)	422	(17)
Didanosine	93	(4)	61	(3)	49	(2)	32	(1)	26	(1)	19	(1)	17	(1)	13	(0)	7	(0)	3	(0)	2	(0)
Emtricitabine	121	(5)	150	(6)	196	(8)	225	(9)	237	(9)	243	(9)	176	(6)	168	(6)	180	(7)	205	(8)	214	(9)
Kivexa ⁴	465	(20)	455	(19)	434	(17)	462	(18)	482	(18)	477	(17)	508	(18)	499	(18)	315	(12)	238	(9)	187	(8)
Lamivudine	493	(21)	362	(15)	337	(13)	308	(12)	270	(10)	243	(9)	239	(9)	223	(8)	203	(7)	165	(6)	132	(5)
Stavudine	71	(3)	55	(2)	42	(2)	28	(1)	25	(1)	20	(1)	16	(1)	10	(0)	9	(0)	4	(0)	3	(0)
Tenofovir	472	(20)	457	(19)	459	(18)	450	(17)	427	(16)	408	(15)	319	(12)	278	(10)	262	(10)	254	(10)	196	(8)
Tenofovir (TAF)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	1	(0)	1	(0)	19	(1)	66	(3)	71	(3)
Trizivir ⁵	63	(3)	50	(2)	40	(2)	36	(1)	23	(1)	20	(1)	18	(1)	15	(1)	12	(0)	9	(0)	7	(0)
Truvada ⁶	697	(29)	898	(38)	940	(37)	805	(31)	882	(32)	916	(33)	907	(33)	838	(30)	773	(28)	602	(23)	286	(12)
Zalcitabine	3	(0)	2	(0)	2	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)
Zidovudine	96	(4)	58	(2)	48	(2)	38	(1)	32	(1)	30	(1)	26	(1)	23	(1)	18	(1)	11	(0)	5	(0)
Non-nucleoside analogue RTI																						
Delavirdine	3	(0)	2	(0)	2	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Efavirenz	566	(24)	574	(24)	532	(21)	341	(13)	346	(13)	293	(11)	228	(8)	190	(7)	141	(5)	93	(4)	64	(3)
Nevirapine	668	(28)	666	(28)	639	(25)	611	(23)	603	(22)	559	(20)	528	(19)	472	(17)	398	(15)	338	(13)	268	(11)
Etravirine	52	(2)	85	(4)	105	(4)	108	(4)	114	(4)	118	(4)	120	(4)	124	(4)	113	(4)	96	(4)	81	(3)
Rilpivirine	0	(0)	2	(0)	3	(0)	4	(0)	13	(0)	28	(1)	37	(1)	45	(2)	52	(2)	65	(2)	64	(3)
Entry Inhibitor																						
Enfuvritide	43	(2)	28	(1)	16	(1)	8	(0)	6	(0)	5	(0)	3	(0)	0	(0)	1	(0)	1	(0)	0	(0)
Fostemsavir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	2	(0)	2	(0)	1	(0)
Maraviroc	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)

1. All treatment records of ≥2 weeks of treatment in any calendar year were included in this analysis. The denominator includes all patients that could have been on antiretroviral therapy (i.e. HIV positive) in any calendar year. The proportion of patients on each drug in any calendar year does not add up to 100% across all ART drug groups in each calendar year as patients on more than one ARV during a calendar year period will be counted in all of the relevant ART groups. Includes retrospective and prospective data.

2. Lamivudine & zidovudine. 3. Tenofovir (TAF) & emtricitabine. 4. Abacavir & lamivudine. 5. Abacavir, lamivudine & zidovudine. 6. Tenofovir & emtricitabine.

Table 10 continued: Current use of individual antiretroviral treatments¹

	2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Protease Inhibitor																						
Amprenavir	24	(1)	22	(1)	21	(1)	19	(1)	18	(1)	16	(1)	15	(1)	11	(0)	7	(0)	7	(0)	4	(0)
Atazanavir	545	(23)	562	(24)	590	(23)	590	(23)	585	(21)	555	(20)	497	(18)	408	(15)	308	(11)	210	(8)	141	(6)
Darunavir	123	(5)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Evotaz ⁷	123	(5)	172	(7)	209	(8)	252	(10)	293	(11)	309	(11)	347	(13)	354	(13)	348	(13)	315	(12)	235	(10)
Fosamprenavir	35	(1)	29	(1)	20	(1)	17	(1)	14	(1)	12	(0)	11	(0)	8	(0)	6	(0)	5	(0)	3	(0)
Indinavir	22	(1)	13	(1)	9	(0)	7	(0)	7	(0)	6	(0)	4	(0)	4	(0)	4	(0)	3	(0)	2	(0)
Kaletra ⁸	354	(15)	333	(14)	330	(13)	294	(11)	251	(9)	213	(8)	178	(6)	130	(5)	82	(3)	60	(2)	30	(1)
Nelfinavir	7	(0)	6	(0)	5	(0)	4	(0)	4	(0)	4	(0)	4	(0)	3	(0)	3	(0)	3	(0)	3	(0)
Prezcobix ⁹	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	19	(1)	73	(3)	75	(3)
Ritonavir	655	(28)	667	(28)	720	(28)	748	(29)	787	(29)	760	(27)	744	(27)	671	(24)	569	(21)	428	(16)	277	(11)
Saquinavir	44	(2)	29	(1)	22	(1)	20	(1)	17	(1)	14	(1)	12	(0)	10	(0)	7	(0)	4	(0)	2	(0)
Integrase Inhibitors																						
Bictegravir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	2	(0)	4	(0)
Dolutegravir	13	(1)	14	(1)	14	(1)	16	(1)	22	(1)	24	(1)	226	(8)	414	(15)	404	(15)	531	(20)	570	(23)
Elvitegravir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	2	(0)	3	(0)
Raltegravir	185	(8)	306	(13)	448	(18)	515	(20)	613	(22)	677	(24)	704	(25)	607	(22)	490	(18)	399	(15)	295	(12)
Cabotegravir	0	(0)	0	(0)	1	(0)	1	(0)	1	(0)	16	(1)	20	(1)	27	(1)	59	(2)	72	(3)	68	(3)
Class Combinations																						
Atripla ¹⁰	8	(0)	21	(1)	298	(12)	399	(15)	441	(16)	498	(18)	472	(17)	418	(15)	338	(12)	262	(10)	174	(7)
Eviplera ¹¹	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	4	(0)	77	(3)	132	(5)	140	(5)	41	(2)	12	(0)
Stribild ¹²	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	3	(0)	319	(12)	474	(17)	500	(19)	477	(19)
Triumeq ¹³	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	2	(0)	5	(0)	236	(9)	350	(13)	373	(15)
Genvoya ¹⁴	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	2	(0)	5	(0)	236	(9)	350	(13)	373	(15)
Odefsey ¹⁵	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	73	(3)	94	(4)
Biktarvy ¹⁶	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	1	(0)	4	(0)
Juluca ¹⁷	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)

7. Atazanavir & cobicistat. 8. Lopinavir & ritonavir. 9. Darunavir & cobicistat. 10. Tenofovir, emtricitabine & efavirenz. 11. Tenofovir, emtricitabine & rilpivirine. 12. Tenofovir, emtricitabine, elvitegravir & cobicistat. 13. Abacavir, lamivudine, dolutegravir. 14. Tenofovir (TAF), emtricitabine, elvitegravir & cobicistat. 15. Rilpivirine, emtricitabine & Tenofovir (TAF). 16. Bictegravir, Emtricitabine, FTC & Tenofovir (TAF). 17. Dolutegravir & Rilpivirine.

MONITORING DISPENSED ANTIRETROVIRALS VIA THE S100 PROGRAM

Table 11 reports the number of people dispensed antiretroviral (ARV) treatment through the Australian Government's Highly Specialised (HSD) (s100) program. Data up to and including 2013 were based on data reported in the Public Health Dispensed National Patient report. The number of patients who were dispensed antiretroviral drugs per state per financial year quarter were analysed together with data on ARV use from the AHOD sample.

For the time period 2009 – 2013, to estimate the number of patients receiving ART, we combined data on the proportion of patients receiving certain mutually exclusive ARVs in AHOD with data from the s100 program on the total number of people receiving the same ARVs. For example, lamivudine and emtricitabine are a common component of combination ART regimens in Australia but should not be prescribed in combination. We calculated the proportion of all treated patients in AHOD who received lamivudine or emtricitabine as part of an ART regimen by year and state. We also estimated the total number of patients dispensed lamivudine or emtricitabine for HIV infection each year through the s100 program by calculating the average number of patients prescribed each drug from the corresponding four financial year quarters. An estimate of the total number of people receiving any ART was then obtained by dividing the total number of patients receiving lamivudine or emtricitabine through the s100 program by the proportion of treated patients in AHOD receiving the same ARV drugs.

Note: Prior to 2009, the HSD Report provided prescribed patient numbers by each antiretroviral agent. However, after noting some inconsistencies with their methodology, they have since ceased providing these numbers. For years 2009-2010, instead we (The Kirby Institute) evaluated patient numbers by using a combination of total packs dispensed and an average “packs-per-patient” adjustment ratio. The packs-per-patient adjustment figure was calculated from 2008 data, where total packs dispensed, and patient numbers were available. However, due to the relatively recent diversification of pack sizes, newer dosing schedules and the introduction of antiretroviral agents that were absent in 2008, we are uncertain as to how our packs-per-patient adjustment ratio has changed over time. Therefore, we caution our estimates for 2011- 2013 data for Table 11.

From 2014 onwards, we report the number of people receiving ART based on a 10% sample of the Pharmaceutical Benefits Scheme (PBS) data, including s100 drugs. Data on dispensed prescriptions for a PBS 10% sample is updated every quarter and supplied to several approved users or clients including Prospecation which provides a dashboard interface (PharmDash) for querying the PBS 10% sample [1, 2]. The 10% sample of the PBS is a randomised patient level, de-identified PBS script claims data set from 2006-present. Currently the data set has 170 million script claims and 3 million patients. It includes all PBS listed drugs with HIV indications. The presented figures are annual totals of unique patients in December each year. This represents total number of patients obtaining at least one prescription for the indicated drug anytime during a year. This methodology is preferable due to increased accuracy of the source data and the removal of assumptions and extrapolations previously required. This may also explain the considerable increase in estimated number of patients receiving ART from 2013 to 2014.

[1] <http://www.pbs.gov.au/info/industry/useful-resources/sources/>, 22 September 2015.

[2] <http://www.prospecation.com.au/>, 22 September 2015.

Table 11: Number of people dispensed antiretroviral treatment through the Highly Specialised Drugs (s100) program by year and antiretroviral agent

Antiretroviral agent	Year of prescription ^{1, 2}						
	2012 ³	2013 ³	2014 ⁴	2015 ⁴	2016 ⁴	2017 ⁴	2018 ⁴
Nucleoside analogue reverse transcriptase inhibitors							
Abacavir	425	400	460	440	330	240	260
Didanosine	84	60	130	80	≤30	≤30	-
Emtricitabine	157	60	90	120	110	100	90
Lamivudine	609	540	650	710	610	570	500
Stavudine	36	20	50	40	≤30	≤30	10
Zidovudine	70	60	70	60	≤30	≤30	-
Lamivudine & Zidovudine	461	400	420	370	300	270	160
Abacavir & Lamivudine	2041	2500	3470	3350	1710	1270	780
Abacavir, Lamivudine & Zidovudine	103	100	100	60	40	≤30	30
Tenofovir	2039	2480	770	660	590	470	350
Tenofovir & Emtricitabine	4404	4340	6150	5890	5380	3090	1480
TAF & Emtricitabine	-	-	-	-	420	3730	4870
Non-nucleoside analogue reverse transcriptase inhibitors							
Efavirenz	738	700	830	670	420	370	240
Nevirapine	2376	2260	2780	2550	2140	1770	1360
Etravirine	454	520	580	540	510	440	390
Rilpivirine	18	40	140	240	260	250	280
Protease inhibitors							
Atazanavir	2582	2380	2790	2190	1660	1090	650
Darunavir	1131	1140	1800	1980	2000	1530	1270
Fosamprenavir	111	80	120	100	60	40	-
Indinavir	18	20	≤30	≤30	≤30	≤30	10
Lopinavir & Ritonavir	1341	960	1030	690	380	210	120
Ritonavir	2652	3180	4010	3740	3170	2110	1300
Saquinavir	72	40	≤30	≤30	≤30	≤30	-
Tipranavir	11	<5	≤30	≤30	≤30	-	-
Darunavir & Cobicistat	-	-	-	-	130	660	810
Atazanavir & Cobicistat	-	-	-	-	100	230	270
Entry inhibitors							
Enfuvirtide	13	20	-	-	-	-	-
Maraviroc	122	160	310	250	290	270	260
Integrase inhibitor							
Raltegravir	2250	2740	3900	3200	2610	2270	1930
Dolutegravir	-	-	1910	2990	2380	3060	3880
Combination Class Agents							
Tenofovir, Emtricitabine & Efavirenz	2786	3100	3710	3250	2620	1860	1200
Tenofovir, Emtricitabine & Rilpivirine	217	1040	2250	2550	2300	1860	530
Tenofovir, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	880	1690	1800	380
TAF, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	-	-	2820	4700
Abacavir, Lamivudine & Dolutegravir	-	-	-	2840	4690	5550	5680
Bictegravir, Emtricitabine, FTC & Tenofovir (TAF)	-	-	-	-	-	140	840
Dolutegravir & Rilpivirine.	-	-	10	80	160	190	220
Total patients	128,004	137,004	17,500	18,720	19,940	21,060	22,000
Total cost⁵ (\$'000s)	210,005	229,000	230,872	250,688	260,811	294,935	282,337

1. For 2012 and 2013 the number of people dispensed each antiretroviral drug during a calendar year was estimated by calculating the average of the total number of people dispensed each drug during the corresponding financial year quarters. Number of person years 2012 estimated from the HSD Program Public Hospital Dispensed National Pack Number Report because of changes to S100 data collection methodology. Number of person years for 2013 estimated from the PBS item reports on services and benefits. 2. Dashes (-) indicate that data were not available. 3. Total patients calculated as (Lamivudine + Combivir (Lamivudine & Zidovudine)+Trizivir (Abacavir, Lamivudine & Zidovudine)+Kivexa (Abacavir & Lamivudine)+Emtricitabine +Truvada(Tenofovir & Emtricitabine) + Atripla(Tenofovir & Emtricitabine & Efavirenz) + Exiplera(Tenofovir & Emtricitabine & Rilpivirine))/the proportion of patients in the Australian HIV Observational Database receiving any of the previously mentioned drugs in each year. Estimates of total patients are rounded to nearest 100 patients. 4. PharmDash <http://www.prospection.com.au/>, 14 August 2018]. 5. Public Hospital Expenditure until 2013, PBS + patient contributions thereafter, calculation were adapted by PharmDash in 2017.

Sources: PharmDash, Highly Specialised Drugs (S100) Program

A full list of AHOD publications is available online:

<https://kirby.unsw.edu.au/project/ahod>

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***All data in this report are provisional
and subject to future revision***