

AUSTRALIAN HIV OBSERVATIONAL DATABASE ANNUAL REPORT 2016

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How do outcomes compare between women and men living with HIV in Australia? An observational study

Background: Gender differences vary across geographical settings and are poorly reported in the literature. The aim of this study published in *Sexual Health* [1] was to evaluate demographics and clinical characteristics of participants from the Australian HIV Observational Database (AHOD), and to explore any differences between females and males in the rate of new clinical outcomes, as well as initial immunological and virological response to antiretroviral therapy.

Methods: Time to a new clinical end-point, all-cause mortality and/or AIDS illness was analysed using standard survival methods. Univariate and covariate adjusted Cox proportional hazard models were used to evaluate the time to plasma viral load suppression in all patients that initiated antiretroviral therapy (ART) and time to switching from a first-line ART to a second-line ART regimen.

Results: Of 3,495 patients enrolled in AHOD at the time of the study with at least one follow-up visit, 210 (6%) were female (**Table 1**). Most patients initiated ART between 1999 and 2004 and protease-inhibitor anchored regimens were the most common first line regimen (42% of females and 41% males). No statistically significant differences were found in CD4 cell counts at initiation and response.

The hazard of all-cause mortality, new AIDS illness and a composite end-point were not found to be significantly different between females and males (**Table 2**). Incident rates of all-cause mortality were similar between females and males; 1.14 (0.61, 1.95) vs 1.28 (1.12, 1.45) per 100 person years, further emphasized by comparable Kaplan-Meier cumulative incidence curves (**Figure 1**). Virological response to ART was similar for females and males when measured as time to viral suppression and/or time to virological failure.

Conclusion: This study supports current Australian HIV clinical care as providing equivalent standards of care for male and female HIV-positive patients. In line with Australian epidemiology, the proportion of women in AHOD was low. However, we are currently addressing this by targeting the recruitment of women.

Table 1. Patient characteristics by sex.

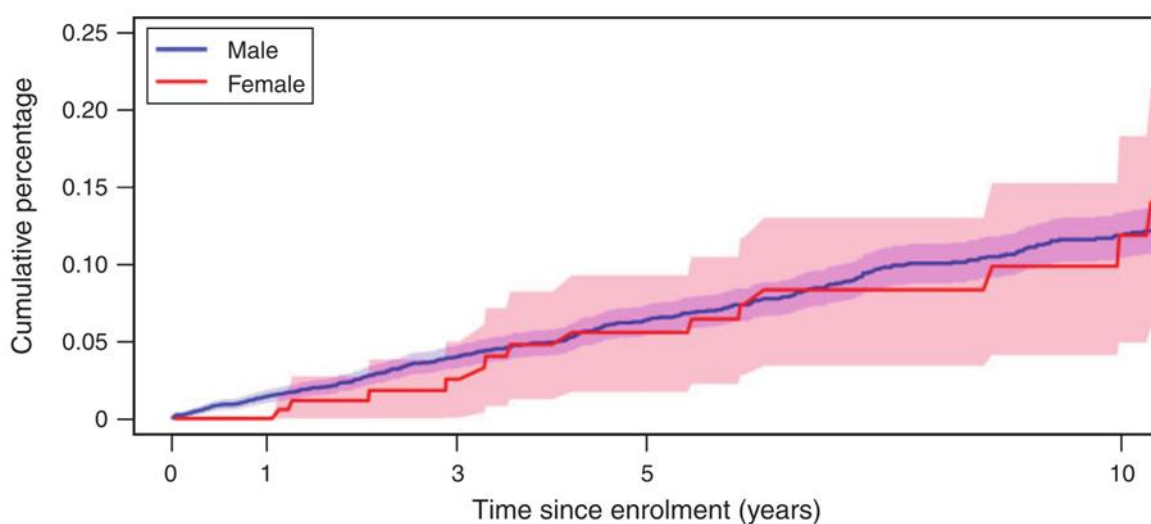
		Female	Male	P-value
Number of patients		210	3,285	
Age at enrolment (years)	Mean	36.4	40.7	<0.0001
	Median (IQR)	34.1 (30.0-42.8)	39.5 (33.3-46.9)	
Patient care setting, n (%)	General practice	53 (25)	1,240 (38)	0.001
	Hospital	53 (25)	733 (22)	
	Sexual health clinic	104 (50)	1,312 (40)	
Year of ART start, n (%)	1996-2004	127 (60)	2,216 (67)	0.11
	2005-2011	53 (25)	675 (21)	
	ART naïve	30 (15)	394 (12)	
CD4 cell count at ART initiation	Mean	337	345	0.72
	Median (IQR)	285 (190-420)	310 (170-475)	
Plasma viral load at ART initiation	Mean	75,757	147,152	0.006
	Median (IQR)	4,295 (400-60,511)	14,665 (500-100,000)	

Table 2. Clinical end-point univariate- and covariate-adjusted Cox proportional hazard ratios.

End-point	Hazard ratio (female vs male)	95% confidence interval	P-value
All-cause mortality			
Univariable	0.89	0.51-1.55	0.67
Multivariable*	0.98	0.56-1.75	0.97
AIDS illness			
Univariable	0.76	0.39-1.48	0.42
Multivariable*	0.75	0.38-1.48	0.41
All-cause mortality and AIDS illness (combined)			
Univariable	0.70	0.43-1.14	0.16
Multivariable*	0.74	0.45-1.21	0.23

* Adjusted for age at cohort enrolment, injecting drug use (IDU) HIV exposure, hepatitisCvirus (HCV), hepatitisBvirus (HBV), recent CD4 cell count, recent HIV viral load $\geq 100\ 000$ copies mL⁻¹, year of cohort enrolment, number antiretroviral therapy (ART) modifications and clinical care setting.

Figure 1. Cumulative incidence of all-cause mortality comparing females and males participating in the Australian HIV Observational Database (AHOD).



<i>Number at risk</i>					
Male	3130	2850	2139	1829	935
Female	191	177	132	112	44

[1] Giles ML, Zapata MC, Wright ST, Petoumenos K, Grotowski M, Broom J, Law MG, O'Connor CC. **How do outcomes compare between women and men living with HIV in Australia? An observational study.** *Sexual Health*. 2016. doi: 10.1071/SH15124. [Epub ahead of print]

Table 1: All AHOD demographics¹ (Total – 4 270)

	Number	(%)		Number	(%)
Sex			CD4 (cells/μl)¹		
Male	3916	(92)	<200	426	(11)
Female	345	(8)	200-299	415	(11)
Transgender	9	(0)	300-499	1172	(31)
			500+	1769	(47)
Age (years)¹			Missing	488	
<30	456	(11)	Mean [SD]	512	[285]
30-39	1502	(35)			
40-49	1364	(32)	HIV viral load (copies/ml)¹		
50+	948	(22)	≤400	2286	(62)
Mean [SD]	42	[11]	401-10 000	626	(17)
			>10 000	798	(22)
Aboriginal/Torres Strait islander²			Missing	560	
Yes	67	(2)	Median [LQ – UQ] ⁴	400	[400-6617]
No	2743	(64)			
Missing	1460	(34)	Prior AIDS defining illness¹		
			Yes	701	(16)
Exposure category			No	3569	(84)
Male homosexual contact	3083	(72)			
Male homosexual contact and IDU	146	(3)	Hepatitis C ever		
Injecting drug user (IDU)	104	(2)	Yes	436	(11)
Heterosexual contact	744	(17)	No	3357	(89)
Receipt of blood/blood products	28	(1)	No test	477	
Other	94	(2)			
Missing	71	(2)	Hepatitis B ever		
			Yes	177	(5)
Estimated year of HIV infection³			No	3369	(95)
<1990	114	(3)	No test	724	
1990-1999	613	(14)			
2000-2009	398	(9)	Total patients under active follow up in last 12 months (N=2 430)⁵		
2010-2014	94	(2)			
Missing	3051	(71)	Recent CD4 (cells/μl)⁶		
			< 200	63	(3)
Patient care setting			200-299	92	(5)
General Practitioner	1441	(34)	300-499	443	(21)
Hospital Tertiary Centre	902	(21)	500+	1559	(71)
Sexual Health Clinic	1927	(45)	Missing	274	
			Mean [SD]	688	[308]
Region of birth					
Australia and New Zealand	2354	(55)	Recent HIV viral load		
Asia and Oceania	334	(8)	≤400	1998	(97)
Britain and Ireland	156	(4)	401-10 000	31	(1)
Europe	114	(3)	>10 000	44	(2)
Africa and Middle East	139	(3)	Missing	358	
North America	44	(1)	Median [LQ – UQ] ⁴	20	[19-40]
South and Central America	55	(1)			
Missing	1061	(25)			

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. Data not available for 8 of 31 sites.

3. 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).

4. LQ = Lower quartile UQ = Upper quartile.

5. Patients who had the most recent visit between 1 April 2015 and 31 March 2016 and have not died.

6. Most recent CD4 count & HIV viral load between 1 April 2015 and 31 March 2016.

Table 2: Follow up status by calendar year¹

Year	Entered study	Deaths	Lost to Follow up
1999 ²	815	6	37
2000	859	24	46
2001	247	29	62
2002	164	23	62
2003	195	22	55
2004	84	19	75
2005	98	26	61
2006	120	28	56
2007	98	26	83
2008	88	22	104
2009	308	16	70
2010	239	25	91
2011	203	21	82
2012	278	18	118
2013	130	14	131
2014	165	20	171
2015	77	12	78
2016 ²	102	3	0
Total	4270	354	1382

Complete follow-up (percentage of patients)⁴: 68 %

Loss to follow-up (per 100 person years): 3.94 (95% CI: 3.73-4.16)

Mortality (per 100 person years): 1.09 (95% CI: 0.98-1.21)

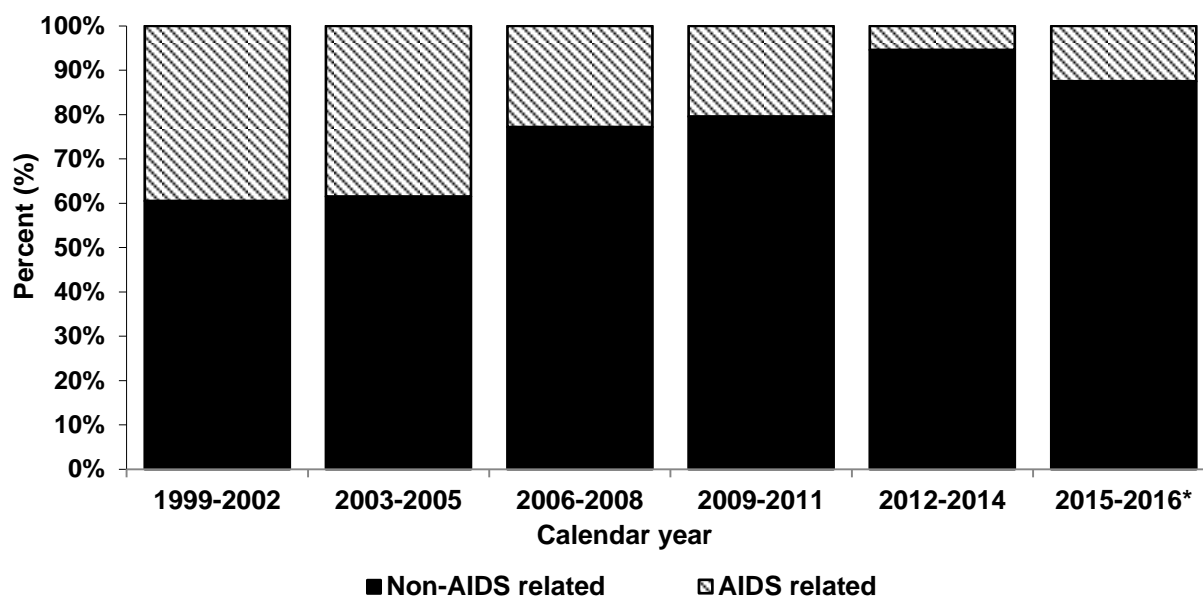
1. 4 sites (309 patients) were censored 31 March 2008, 31 March 2013, 31 March 2006 and 31 March 2015 respectively.

2. 1 July – 31 December 1999.

3. 1 January – 31 March 2016.

4. Patients who have died or any patients seen at clinic site within the last 12 months (1 April 2015 – 31 March 2016) 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 2015 to 31 March 2016.

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

	1999-2002	2003-2005	2006-2008	2009-2011	2012-2014	2015-2016 ¹	All years
Non-AIDS related	49	40	54	35	35	7	220
AIDS related	32	25	16	9	2	1	85
Unknown	2	2	4	7	16	5	36
Missing Coding of Death	0	0	2	10	7	6	25
Total deaths	83	67	76	61	60	19	366

1. 1 January 2015 to 31 March 2016.

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

Coding of Death Classification ²	Number
Cancer	28
AIDS (ongoing active disease)	6
Suicide	3
Chronic viral hepatitis (progression of / complication to)	2
MI or other ischemic heart disease	4
Chronic obstructive lung disease	4
Heart or vascular	1
Other Causes	8
Unknown (autopsy inconclusive, died overseas, etc)	18
Missing information ³	16

1. 1 January 2010 to 31 December 2015.

2. Coding of Death classification (CoDe) – [<http://www.cphiv.dk/code/tabid/55/default.aspx>].

3. Still awaiting forms

Table 5: Trends in antiretroviral treatment¹

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Patients under active follow up ¹	(n=2002)	(n=2035)	(n=2047)	(n=2023)	(n=2132)	(n=2285)	(n=2372)	(n=2547)	(n=2541)	(n=2537)	(n=2408)
Treatment	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<i>Never treatment</i>	73 (4)	72 (4)	71 (3)	69 (3)	57 (3)	69 (3)	71 (3)	86 (3)	72 (3)	57 (2)	43 (2)
<i>Ever treatment</i>	n=1929	n=1963	n=1976	n=1954	n=2075	n=2216	n=2301	n=2461	n=2469	n=2480	n=2365
Currently ²	1647 (82)	1726 (85)	1736 (85)	1765 (87)	1905 (89)	2069 (91)	2162 (91)	2375 (93)	2407 (95)	2433 (96)	2332 (97)
Previously, not currently	282 (14)	237 (12)	240 (12)	189 (9)	170 (8)	147 (6)	139 (6)	86 (3)	62 (2)	47 (2)	33 (1)
Number of drugs ever³											
≤3	573 (30)	515 (26)	482 (24)	445 (23)	546 (26)	625 (28)	679 (30)	733 (30)	722 (29)	698 (28)	593 (25)
4-6	780 (40)	759 (39)	774 (39)	754 (39)	760 (37)	802 (36)	836 (36)	926 (38)	960 (39)	982 (40)	949 (40)
7-9	422 (22)	494 (25)	506 (26)	509 (26)	492 (24)	493 (22)	489 (21)	497 (20)	484 (20)	487 (20)	504 (21)
10+	154 (8)	195 (10)	214 (11)	246 (13)	277 (13)	296 (13)	297 (13)	305 (12)	303 (12)	313 (13)	319 (13)
Number of drug classes ever^{3,4}											
1	68 (4)	58 (3)	47 (3)	43 (2)	39 (2)	51 (2)	49 (2)	40 (2)	24 (1)	15 (1)	14 (1)
2	947 (53)	980 (54)	968 (53)	946 (52)	1047 (54)	1111 (53)	1173 (53)	1331 (55)	1353 (56)	1313 (53)	1117 (47)
3	717 (40)	728 (40)	725 (40)	703 (38)	669 (34)	673 (32)	668 (30)	702 (29)	695 (29)	738 (30)	800 (34)
4	46 (3)	54 (3)	65 (4)	104 (6)	150 (8)	216 (10)	244 (11)	271 (11)	296 (12)	323 (13)	356 (15)
5		3 (0)	15 (1)	30 (2)	47 (2)	54 (3)	60 (3)	63 (3)	68 (3)	70 (3)	69 (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. Currently on treatment is defined as receiving treatment at some point during the calendar year.

3. Denominator is the number of patients who have ever received treatment.

4. 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 treatment¹

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Combination²	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
1 st combination	306 (17)	270 (15)	246 (13)	235 (13)	352 (18)	362 (17)	418 (19)	516 (22)	506 (21)	463 (19)	392 (17)
2 nd combination	315 (18)	317 (17)	337 (18)	334 (18)	332 (17)	404 (19)	420 (19)	490 (21)	527 (22)	553 (23)	514 (22)
3 rd combination	302 (17)	300 (16)	291 (16)	287 (16)	266 (14)	305 (15)	315 (15)	341 (14)	375 (15)	378 (15)	382 (16)
≥4 th combination	857 (48)	932 (51)	951 (52)	961 (53)	992 (51)	1022 (49)	1017 (47)	1027 (43)	1015 (42)	1048 (43)	1056 (45)

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. 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)

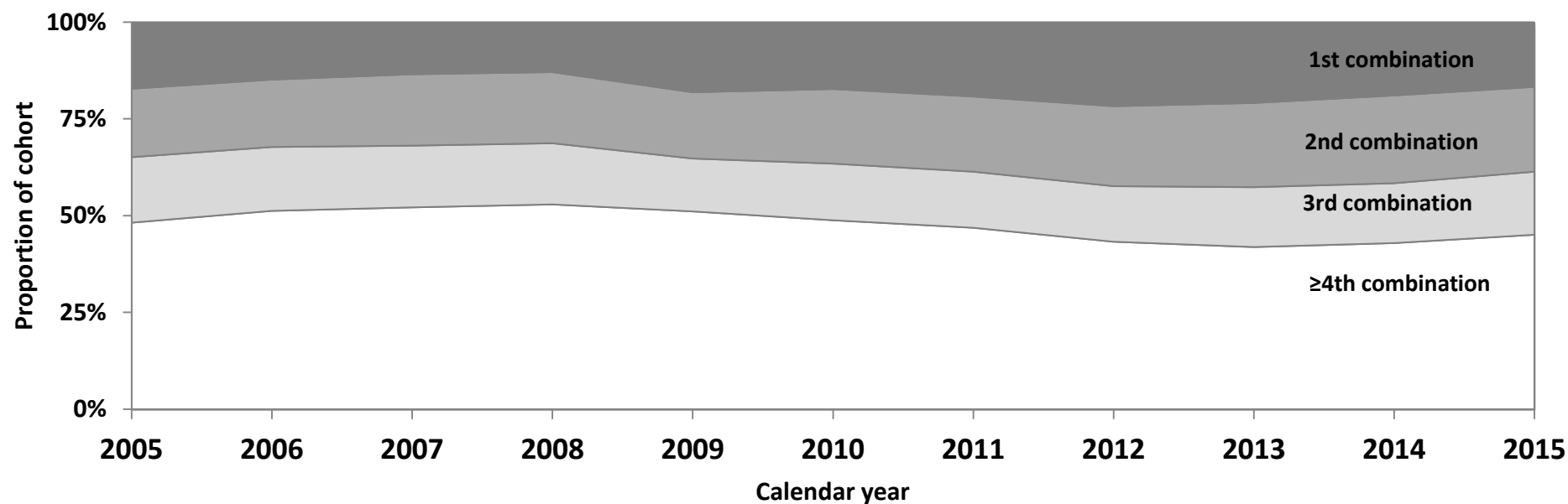


Table 7: Immunological and virological trends¹

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Viral load (copies/ml)											
Total N (with measure)	2244	2257	2313	2360	2299	2253	2359	2400	2366	2241	2135
Off Treatment²											
No. with a viral load count ⁴	492	427	415	371	316	254	233	175	134	103	94
Median	19127.5	14600	13486	11900	11490	8251	5250	6000	4634.8	2038	556
IQR	4140-64100	3600-48050	3223-40738	2277-38000	2034-36575	500-33900	520-40096	170-31548	47-27800	39-30500	20-17189
On Treatment³											
No. with a viral load count ⁴	1752	1830	1898	1989	1983	1999	2126	2225	2232	2138	2074
Median	50	50	49	49	49	49	40	36	20	20	20
IQR	49-399	49-79.5	43.5-50	40-50	40-50	40-50	34-49	20-49	19-40	19-40	19-40
CD4 count (cells/μl)											
Total N (with measure)	2217	2213	2274	2323	2291	2277	2399	2427	2425	2290	2172
Off Treatment²											
No. with a CD4 count ⁵	497	430	417	376	325	267	241	185	140	106	63
Median	494	504.75	500	490	505	490	505	560	596.5	620	628
IQR	370-640	380-655	401-631.5	390-651	397-664	395-640	392-660	461-730	456.5-769.5	460-760	432-750
On Treatment³											
No. with a CD4 count ⁵	1720	1783	1857	1947	1966	2010	2158	2242	2285	2184	2109
Median	483	500	522.5	530	540	551.75	571.75	581.25	608	635.25	650
IQR	320-690	340-710	360-720	374-740	380-735	397.5-739	420-767	425-779	440-792	460-825	474-850

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. Patients who have not received treatment during the calendar year.

3. Patients who have received any treatment during the calendar year.

4. Includes patients with a viral load measured during the relevant calendar year.

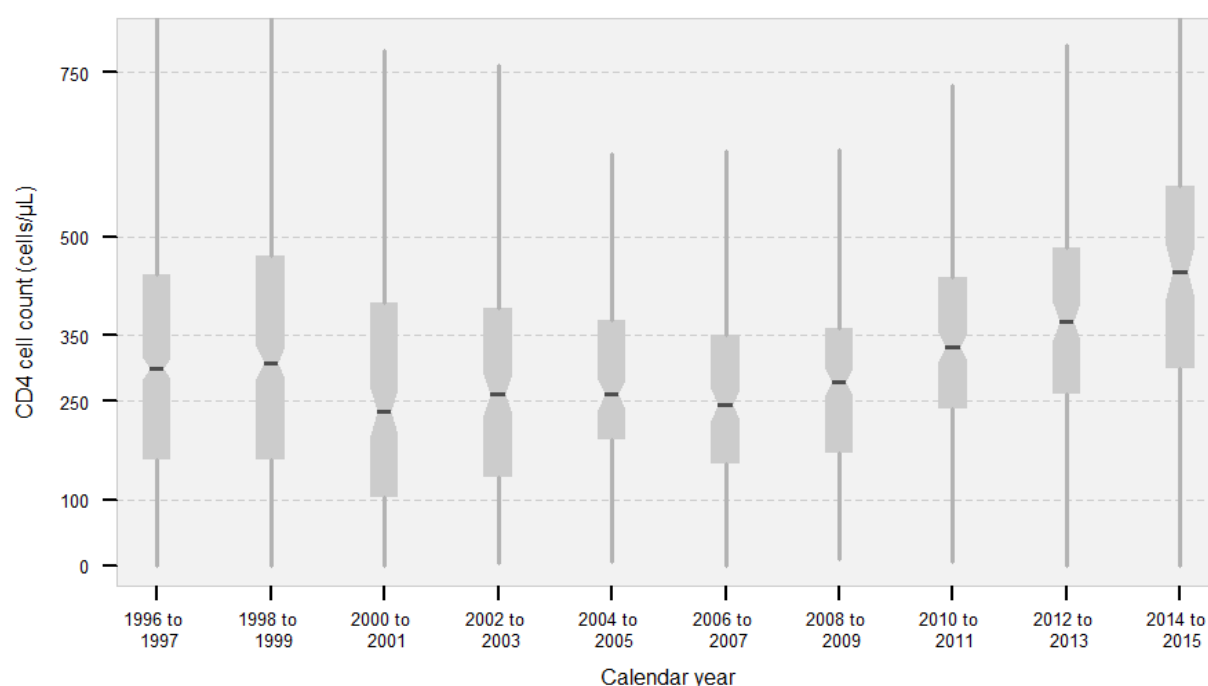
5. Includes patients with a CD4 count measured during the relevant calendar year.

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

	1996 to 1997	1998 to 1999	2000 to 2001	2002 to 2003	2004 to 2005	2006 to 2007	2008 to 2009	2010 to 2011	2012 to 2013	2014 to 2016 ⁴
Number of participants initiating ART¹										
N=	783	373	173	165	141	161	210	211	152	114
CD4 cell count (copies/μl)^{2,3}										
Mean	321	344	284	305	327	271	285	345	374	450
Median	300	308	234	260	260	244	279	332	370	446
IQR	160-443	160-470	104-400	135-392	192-372	154-350	170-360	230-440	260-482	300-576

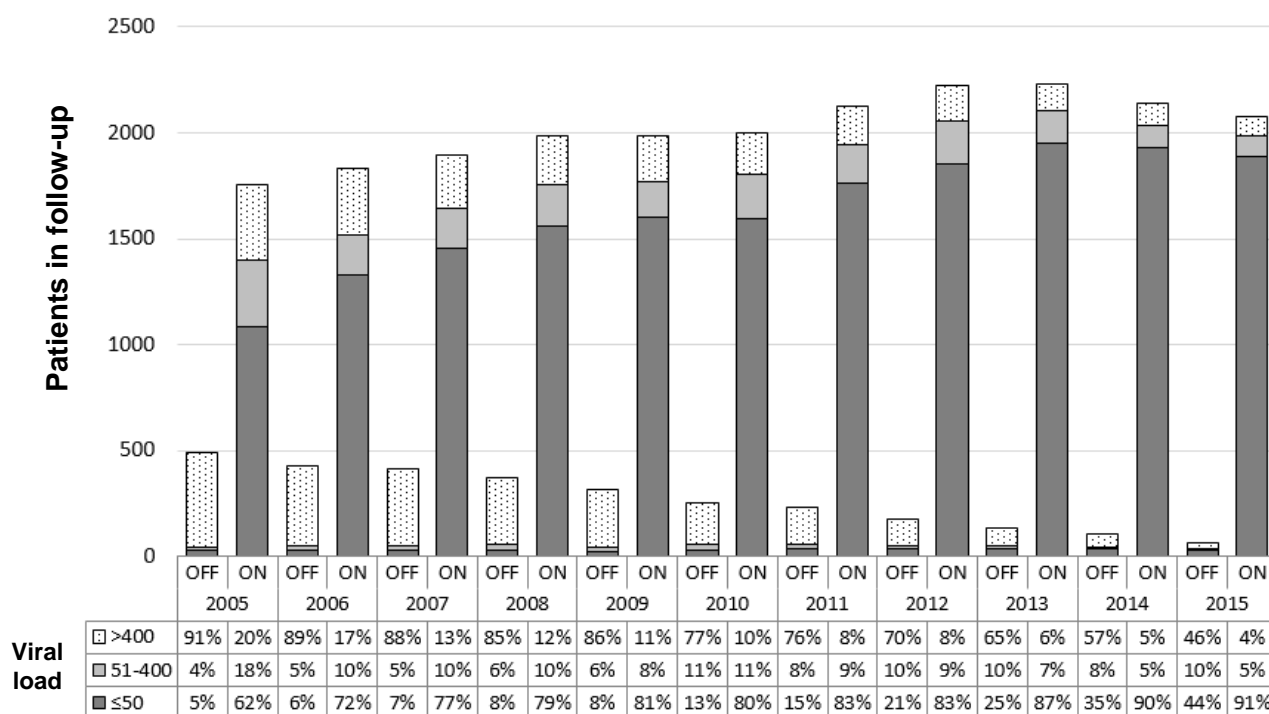
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART > 14 days. Includes retrospective and prospective data. ATRAS sub study participants were excluded from analysis.
2. CD4 cell count selected from the observation closest to ART start date within a timeframe window of 12 months prior to ART start date and 1 month post ART start date.
3. A patient was 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 2014 to 31 March 2016.

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)



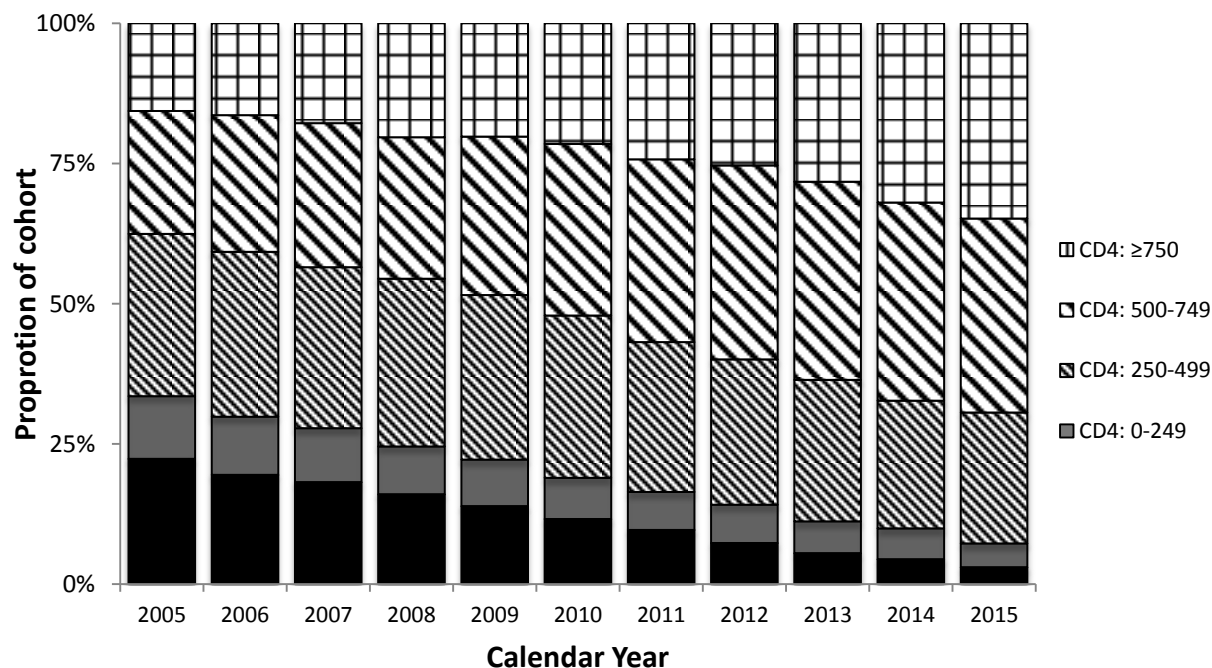
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART > 14 days. Includes retrospective and prospective data. ATRAS sub study participants excluded from analysis.
2. CD4 cell count selected from the observation closest to ART start date within a timeframe window of 12 months prior to ART start date and 7 days post ART start date.
3. A patient was 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.

Figure 4: Proportion of 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.
- * In the "off-treatment" group (n=61 in 2015), there are patients where their viral load time series is strongly indicative of the patient receiving therapy, defined as 2 or more recent records where pVL <50 copies/ml. Data validation is ongoing with sites.

Figure 5: CD4 cell counts (cells/μl) 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.

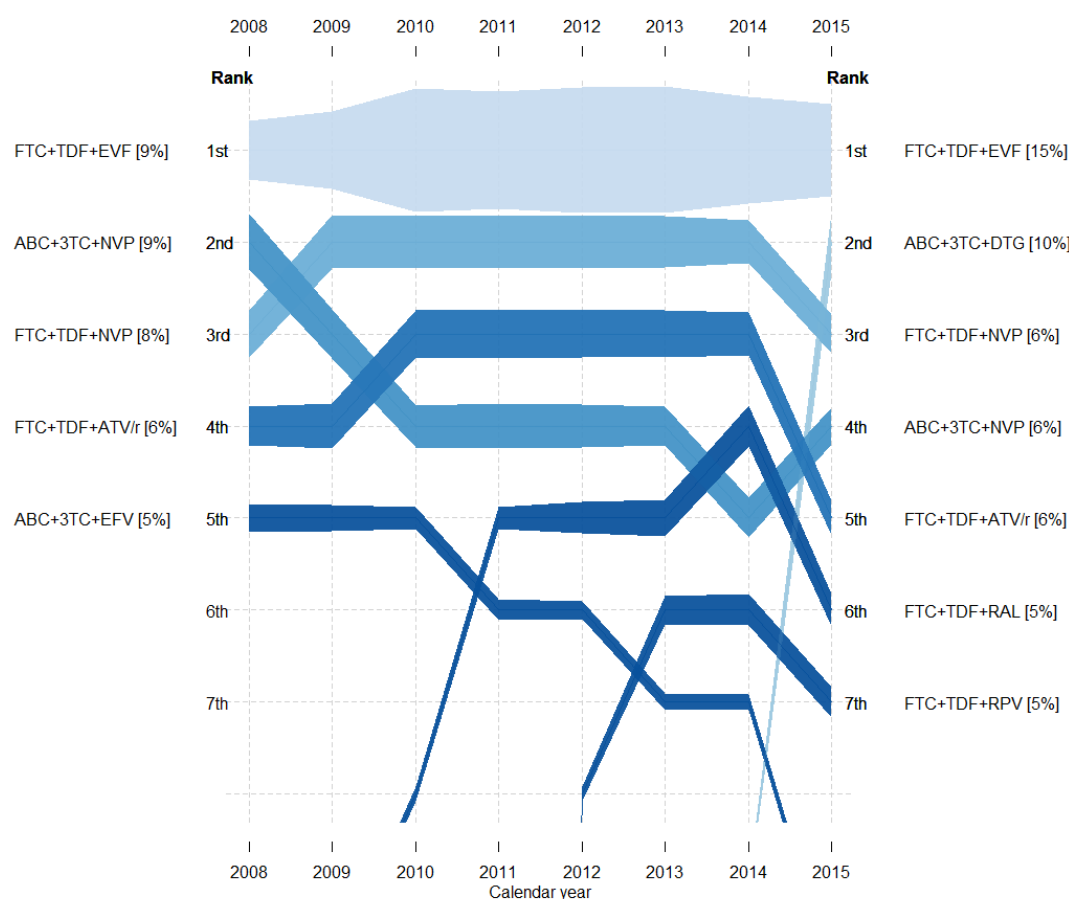
Table 9: Top ten treatment combinations among the AHOD cohort¹: January-December 2015

In 2015, there were a total of 397 unique antiretroviral treatment (ART) combinations among the 2352 AHOD patients on combination ART. A total of 2844 combination regimens were recorded among these patients throughout 2015. The top ten most common ART combinations are described below.

ART combinations	Number of regimens recorded during 2015
emtricitabine+tenofovir+efavirenz	417
abacavir+lamivudine+dolutegravir	274
emtricitabine+tenofovir+nevirapine	175
abacavir+lamivudine+nevirapine	165
emtricitabine+tenofovir+atazanavir+ritonavir	160
emtricitabine+tenofovir+raltegravir	144
emtricitabine+tenofovir+rilpivirine	139
emtricitabine+tenofovir+dolutegravir	107
emtricitabine+tenofovir+Elvitegravir+Cobicistat	98
abacavir+lamivudine+efavirenz	66

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 2008-2015



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, 2015 Rank 1 proportion calculated by 417/2844=14.66%. Thickness of line over time is proportional to calculated percentage.

Table 10: Current use of individual antiretroviral treatments¹

	2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Nucleoside analogue reverse transcriptase inhibitors (RTI)																						
Abacavir	532	(24)	486	(21)	406	(18)	388	(16)	288	(12)	272	(11)	251	(10)	219	(8)	197	(7)	201	(8)	201	(8)
Combivir ²	450	(20)	398	(17)	312	(13)	258	(11)	224	(9)	206	(8)	169	(7)	140	(5)	109	(4)	90	(4)	76	(3)
Didanosine	281	(13)	205	(9)	135	(6)	94	(4)	63	(3)	53	(2)	34	(1)	29	(1)	21	(1)	18	(1)	13	(1)
Emtricitabine	39	(2)	100	(4)	86	(4)	129	(5)	164	(7)	206	(8)	228	(9)	231	(9)	246	(9)	191	(7)	191	(8)
Kivexa ³	72	(3)	265	(12)	370	(16)	408	(17)	402	(17)	378	(15)	408	(16)	429	(16)	422	(16)	438	(17)	424	(17)
Lamivudine	1007	(45)	950	(42)	665	(29)	570	(24)	439	(18)	403	(16)	373	(15)	333	(13)	299	(11)	299	(12)	297	(12)
Stavudine	203	(9)	145	(6)	88	(4)	69	(3)	51	(2)	39	(2)	24	(1)	22	(1)	14	(1)	11	(0)	6	(0)
Tenofovir	743	(33)	775	(34)	541	(23)	509	(21)	488	(20)	491	(20)	466	(18)	433	(16)	419	(16)	339	(13)	299	(12)
Trizivir ⁴	150	(7)	123	(5)	86	(4)	69	(3)	56	(2)	44	(2)	40	(2)	27	(1)	21	(1)	19	(1)	15	(1)
Truvada ⁵	17	(1)	364	(16)	538	(23)	711	(30)	903	(38)	941	(38)	797	(31)	864	(33)	872	(33)	837	(33)	739	(30)
Zalcitabine	7	(0)	5	(0)	3	(0)	3	(0)	2	(0)	2	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)
Zidovudine	219	(10)	177	(8)	135	(6)	105	(4)	65	(3)	54	(2)	41	(2)	36	(1)	34	(1)	26	(1)	21	(1)
Non-nucleoside analogue RTI																						
Delavirdine	13	(1)	11	(0)	9	(0)	3	(0)	2	(0)	2	(0)	13	(1)	-	-	-	-	-	-	-	-
Efavirenz	474	(21)	508	(22)	551	(24)	567	(24)	576	(24)	534	(21)	345	(13)	350	(13)	299	(11)	230	(9)	194	(8)
Nevirapine	658	(29)	639	(28)	654	(28)	678	(29)	668	(28)	640	(26)	610	(24)	607	(23)	557	(21)	514	(20)	453	(18)
Etravirine	-	-	2	(0)	24	(1)	53	(2)	85	(4)	104	(4)	111	(4)	118	(4)	121	(5)	121	(5)	122	(5)
Rilpivirine	-	-	-	-	-	-	-	-	2	(0)	3	(0)	6	(0)	19	(1)	36	(1)	43	(2)	41	(2)
Entry Inhibitor																						
Enfuvirtide	63	(3)	69	(3)	62	(3)	45	(2)	28	(1)	17	(1)	9	(0)	7	(0)	6	(0)	4	(0)	1	(0)
Maraviroc	8	(0)	7	(0)	8	(0)	15	(1)	22	(1)	29	(1)	33	(1)	42	(2)	49	(2)	50	(2)	46	(2)

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. Comibivir – Lamivudine & Zidovudine. 3. Kivexa – abacavir & lamivudine. 4. Trizivir - abacavir & lamivudine & zidovudine. 5. Truvada – tenofovir & emtricitabine.

Table 10 continued: Current use of individual antiretroviral treatments¹

	2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Protease Inhibitor																						
Amprenavir	446	(20)	30	(1)	28	(1)	27	(1)	27	(1)	24	(1)	20	(1)	18	(1)	15	(1)	13	(1)	9	(0)
Atazanavir	388	(17)	445	(20)	486	(21)	540	(23)	554	(23)	571	(23)	567	(22)	556	(21)	511	(19)	456	(18)	373	(15)
Darunavir	14	(1)	42	(2)	74	(3)	120	(5)	165	(7)	199	(8)	231	(9)	269	(10)	279	(11)	301	(12)	299	(12)
Fosamprenavir	31	(1)	36	(2)	32	(1)	30	(1)	24	(1)	17	(1)	15	(1)	13	(0)	11	(0)	10	(0)	7	(0)
Indinavir	72	(3)	48	(2)	33	(1)	21	(1)	11	(0)	7	(0)	4	(0)	4	(0)	4	(0)	1	(0)	1	(0)
Kaletra ⁶	446	(20)	413	(18)	389	(17)	363	(15)	340	(14)	328	(13)	288	(11)	249	(9)	201	(8)	164	(6)	115	(5)
Nelfinavir	72	(3)	47	(2)	35	(2)	9	(0)	8	(0)	7	(0)	6	(0)	6	(0)	5	(0)	4	(0)	3	(0)
Ritonavir	601	(27)	671	(29)	693	(30)	739	(31)	743	(31)	783	(31)	802	(31)	829	(31)	780	(30)	733	(29)	646	(26)
Saquinavir	128	(6)	109	(5)	90	(4)	70	(3)	44	(2)	35	(1)	32	(1)	27	(1)	23	(1)	18	(1)	13	(1)
Integrase Inhibitors																						
Raltegravir	3	(0)	10	(0)	64	(3)	184	(8)	308	(13)	450	(18)	515	(20)	604	(23)	650	(25)	659	(26)	556	(23)
Dolutegravir	-	-	-	-	-	-	-	-	-	-	-	-	2	(0)	7	(0)	10	(0)	183	(7)	319	(13)
Elvitegravir	-	-	-	-	-	-	-	-	1	(0)	1	(0)	1	(0)	4	(0)	19	(1)	21	(1)	23	(1)
Class Combinations																						
Atripla ⁷	1	(0)	2	(0)	5	(0)	6	(0)	17	(1)	291	(12)	392	(15)	431	(16)	465	(18)	422	(16)	362	(15)
Eviplera ⁸	-	-	-	-	-	-	-	-	-	-	-	-	3	(0)	57	(2)	119	(5)	135	(5)	131	(5)
Stribild ⁹	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	(0)	3	(0)	62	(2)	104	(4)
Triumeq ¹⁰	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	(0)	224	(9)
Genvoya ¹¹	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	(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 treatment (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 ARV drug groups in each calendar year as patients on more than one ART during a calendar year period will be counted in all of the relevant ART groups. Includes retrospective and prospective data. 6. Kaletra – lopinavir & ritonavir.

7. Atripla – tenofovir & emtricitabine & efavirenz.

8. Eviplera - tenofovir & emtricitabine & rilipivirine.

9. Stribild - tenofovir & emtricitabine & elvitegravir & cobicistat.

10. Triumeq – abacavir & lamivudine & dolutegravir

11. Genvoya – tenofovir alafenamide & emtricitabine & elvitegravir & cobicistat

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 a number of approved users or clients including Prospecction 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.prospecction.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}					
	2010	2011	2012	2013	2014 ³	2015 ³
Nucleoside analogue reverse transcriptase inhibitors						
Abacavir	492	473	425	400	460	440
Didanosine	163	117	84	60	130	80
Emtricitabine	211	146	157	60	90	120
Lamivudine	822	718	609	540	650	710
Stavudine	77	48	36	20	≤60	≤60
Zidovudine	128	98	70	60	70	60
Lamivudine & Zidovudine	719	602	461	400	420	370
Abacavir & Lamivudine	2220	2179	2041	2500	3460	3350
Abacavir, Lamivudine & Zidovudine	163	133	103	100	100	≤60
Tenofovir	1586	1967	2039	2480	760	650
Tenofovir & Emtricitabine	4772	4510	4404	4340	6150	5890
Non-nucleoside analogue reverse transcriptase inhibitors						
Delavirdine	6	-	-	-	-	-
Efavirenz	2003	973	738	700	830	670
Nevirapine	2809	2728	2376	2260	2770	2550
Etravirine	403	456	454	520	580	540
Rilpivirine	-	-	18	40	140	240
Protease inhibitors						
Atazanavir	2879	2906	2582	2380	2790	2190
Darunavir	887	1058	1131	1140	1800	1980
Fosamprenavir	181	148	111	80	120	100
Indinavir	31	21	18	20	≤60	≤60
Lopinavir & ritonavir	1734	1581	1341	960	1030	690
Ritonavir	3181	3098	2652	3180	4010	3740
Saquinavir	121	95	72	40	≤60	≤60
Tipranavir	20	15	11	<5	≤60	≤60
Entry inhibitors						
Enfuvirtide	37	22	13	20	-	-
Maraviroc	55	118	122	160	310	250
Integrase inhibitor						
Raltegravir	1250	1848	2250	2740	3900	3200
Dolutegravir	-	-	-	-	1910	2990
Combination Class Agents						
Tenofovir, Emtricitabine & Efavirenz	2013	2873	2786	3100	3710	3250
Tenofovir, Emtricitabine & Rilpivirine	-	-	217	1040	2250	2550
Tenofovir, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	-	880	1690
TAF, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	-	-	-
Abacavir, Lamivudine & Dolutegravir	-	-	-	-	-	2840
Total patients	12,400⁴	12,700⁴	12,800⁴	13,700⁴	17,480	18,710
Total cost⁵ (\$'000s)	181,508	200,165	210,005	229,000	230,930	250,710

1. For 2010 to 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 for July - December 2009 to December 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. PharmDash [<http://www.prospection.com.au/>, 2 August 2016]

4. 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.

5. Public Hospital Expenditure until 2013, PBS + patient contributions thereafter.

Sources: PharmDash, Highly Specialised Drugs (S100) Program

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*All data in this report are provisional
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