

AUSTRALIAN HIV OBSERVATIONAL DATABASE ANNUAL REPORT 2017

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The impact of changes in HIV management guidelines on time to treatment initiation in Australia

Background: The question of when to initiate HIV antiretroviral therapy has only been definitively answered recently. Guidelines now strongly recommend immediately starting treatment for all HIV-positive individuals. The aim of this short report published in *HIV Medicine* [1] was to assess the impact of changes in treatment guidelines on clinical practice.

Methods: We examined newly diagnosed HIV patients participating in the Australian HIV Observational Database (AHOD) over three recent time periods before and after two changes to National guidelines and the Pharmaceutical Benefits Scheme (PBS).

Results: From December 2012 to April 2016, 135 patients, from 14 AHOD treatment sites, were diagnosed with HIV. Of these, 62 were diagnosed between December 2012 and March 2014, 53 between April 2014 and July 2015, and 20 from August 2015 to April 2016. These patients did not differ significantly in terms of age, sex, and CD4 count and HIV viral load at diagnosis across the three periods (**Table 1**). However, a significant reduction in median time to commencing treatment over the three time periods was observed, decreasing from 84 days (interquartile range (IQR) 31-397 days) for patients diagnosed between December 2012 and March 2014 to 60 days (IQR 28-156 days) for patients diagnosed between April 2014 and July 2015 and down to as little as 19 days (IQR 6-27) for those diagnosed in the most recent period (**Figure 1**).

Conclusion: Our results further highlight the benefit of guidelines in HIV patient care as early diagnosis and treatment are essential to achieve the national goal of elimination of transmission of HIV by 2020.

Figure 1. Time to HIV treatment initiation in the Australian HIV Observational Database (AHOD).

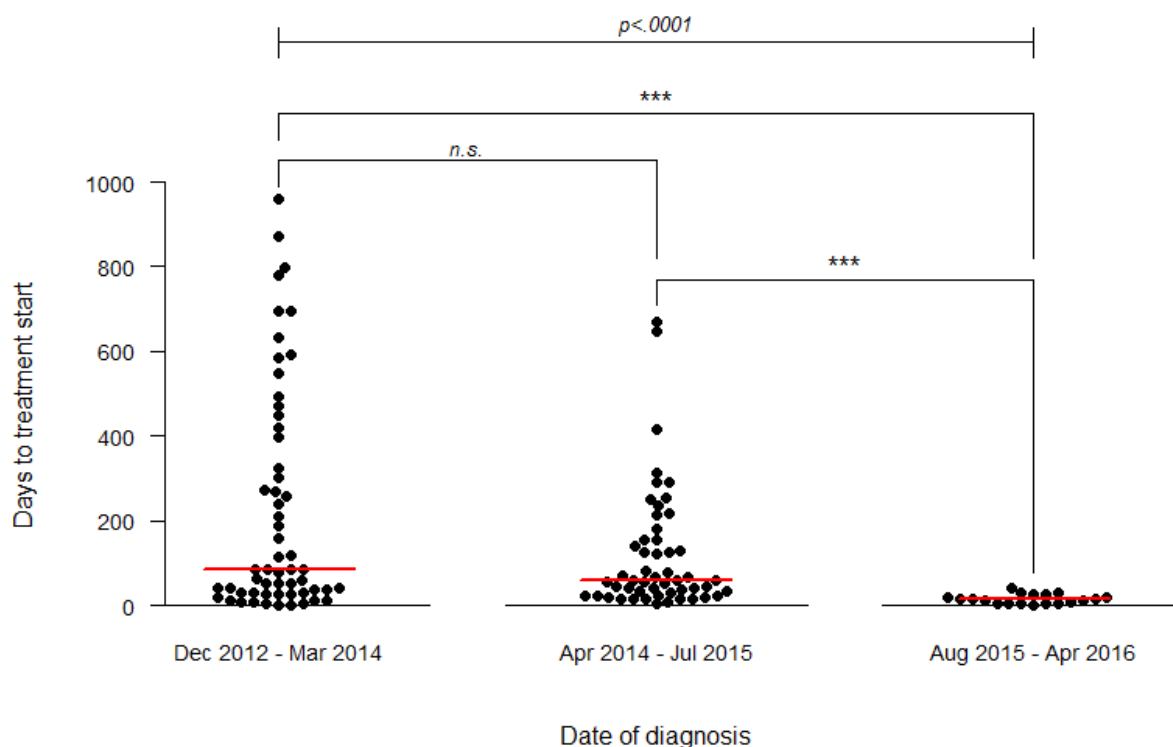


Table 1. Patient characteristics and time to treatment initiation [1].

	Dec 2012 – Mar 2014	Diagnosis Apr 2014 – July 2015	Aug 2015 – Apr 2016	P value
n	62	53	20	
male n (%)	55 (88.7%)	47 (88.7%)	18 (90.0%)	1.00
age (years) median (range)	36 (17-74)	33 (19-71)	35 (20-67)	0.84
CD4 at diagnosis [°] (cells/mm ³) n median (IQR)	45 400 (252-560)	43 442 (250-587)	20 514 (278-637)	0.57
VL at diagnosis [°] (log ₁₀ (copies/ml)) n median (IQR)	46 4.8 (4.3-5.5)	40 4.7 (3.4-5.1)	20 4.7 (4.6-5.3)	0.29
CD4 at treatment start [†] (cells/mm ³) n median (IQR)	39 370 (195-510)	36 429 (279-563)	18 505 (273-624)	0.24
VL at treatment start [†] (log ₁₀ (copies/ml)) n median (IQR)	34 4.7 (4.0-5.1)	31 4.7 (3.9-5.1)	17 4.8 (4.6-5.3)	0.40
never started treatment n (%)	5* (8.0%)	1* (1.9%)	1 (5.0%)	0.31
time to treatment start (days) n median (IQR)	57 84 (31-397)	52 60 (28-156)	19 15 (6-27)	<0.001

* lost to follow-up before starting treatment

[°] closest measurement to diagnosis within 28 days

[†] closest measurement within 28 days before and 14 after treatment start

Abbreviations: IQR, interquartile range; VL, viral load

[1] Puhr R, Petoumenos K, Youds D, Law MG, Templeton DJ; Australian HIV Observational Database (AHOD) study group. **The impact of changes in HIV management guidelines on time to treatment initiation in Australia.** *HIV Med.* 2017 Oct; 18(9):701-703. doi: 10.1111/hiv.12504.

Table 1: All AHOD demographics¹ (Total – 4,466)

	Number	(%)		Number	(%)
Sex			CD4 (cells/μl)¹		
Male	4059	(91)	<200	526	(12)
Female	399	(9)	200-299	470	(11)
Transgender	8	(0)	300-499	1244	(29)
			500+	2007	(47)
Age (years)¹			Missing	219	
<30	481	(11)	Mean [SD]	510	[354]
30-39	1566	(35)			
40-49	1414	(32)	HIV viral load (copies/ml)¹		
50+	992	(22)	≤400 ⁴	2659	(64)
Mean [SD]	42	[11]	401-10 000	647	(15)
			>10 000	872	(21)
Aboriginal/Torres Strait islander²			Missing	288	
Yes	56	(1)	Median [LQ – UQ] ⁵	200	[49-4900]
No	2871	(64)			
Missing	1539	(34)	Prior AIDS defining illness¹		
			Yes	729	(16)
Exposure category			No	3736	(84)
Male homosexual contact	3192	(71)			
Male homosexual contact and IDU	148	(3)	Hepatitis C ever		
Injecting drug user (IDU)	105	(2)	Yes	448	(11)
Heterosexual contact	807	(18)	No	3510	(89)
Receipt of blood/blood products	32	(1)	No test	508	
Other	98	(2)			
Missing	84	(2)	Hepatitis B ever		
			Yes	186	(5)
Estimated year of HIV infection³			No	3525	(95)
<1990	114	(3)	No test	755	
1990-1999	615	(14)			
2000-2009	407	(9)	Total patients under active follow up in last 12 months (N=2 502)⁶		
2010-2014	141	(2)			
Missing	3189	(71)	Recent CD4 (cells/μl)⁷		
			< 200	67	(3)
Patient care setting			200-299	72	(3)
General Practitioner	1492	(33)	300-499	434	(19)
Hospital Tertiary Centre	951	(21)	500+	1657	(74)
Sexual Health Clinic	2023	(45)	Missing	272	
			Mean [SD]	714	[311]
Region of birth			Recent HIV viral load⁷		
Australia and New Zealand	2420	(54)	≤50	2028	(95)
Asia and Oceania	366	(8)	51-400	64	(3)
Britain and Ireland	163	(4)	401-10 000	28	(1)
Europe	125	(3)	>10 000	25	(1)
Africa and Middle East	147	(3)	Missing	357	
North America	44	(1)	Median [LQ – UQ] ⁵	20	[19-40]
South and Central America	62	(1)			
Missing	1139	(26)			

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. 1860 (45%) patients ≤50 copies/ml. Detection limit for early AHOD patients was 200/400 copies/ml with 11 and 439 patients with undetectable viral load at enrolment respectively.

5. LQ = Lower quartile UQ = Upper quartile.

6. Patients who had the most recent visit between 1 April 2016 and 31 March 2017 and have not died.

7. Most recent CD4 count & HIV viral load between 1 April 2016 and 31 March 2017.

Table 2: Follow up status by calendar year¹

Year	Entered study	Deaths	Lost to Follow up
1999 ²	815	6	34
2000	859	25	42
2001	246	29	62
2002	164	23	61
2003	193	22	54
2004	84	19	73
2005	96	26	59
2006	118	28	56
2007	98	26	83
2008	88	22	96
2009	307	16	68
2010	241	25	90
2011	203	21	77
2012	280	18	111
2013	131	14	115
2014	168	24	128
2015	79	12	167
2016	151	8	85
2017 ³	145	5	0
Total	4466	369	1461

Complete follow-up (percentage of patients)⁴: 67 %

Loss to follow-up (per 100 person years): 3.93 (95% CI: 3.72-4.14)

Mortality (per 100 person years): 1.05 (95% CI: 0.95-1.16)

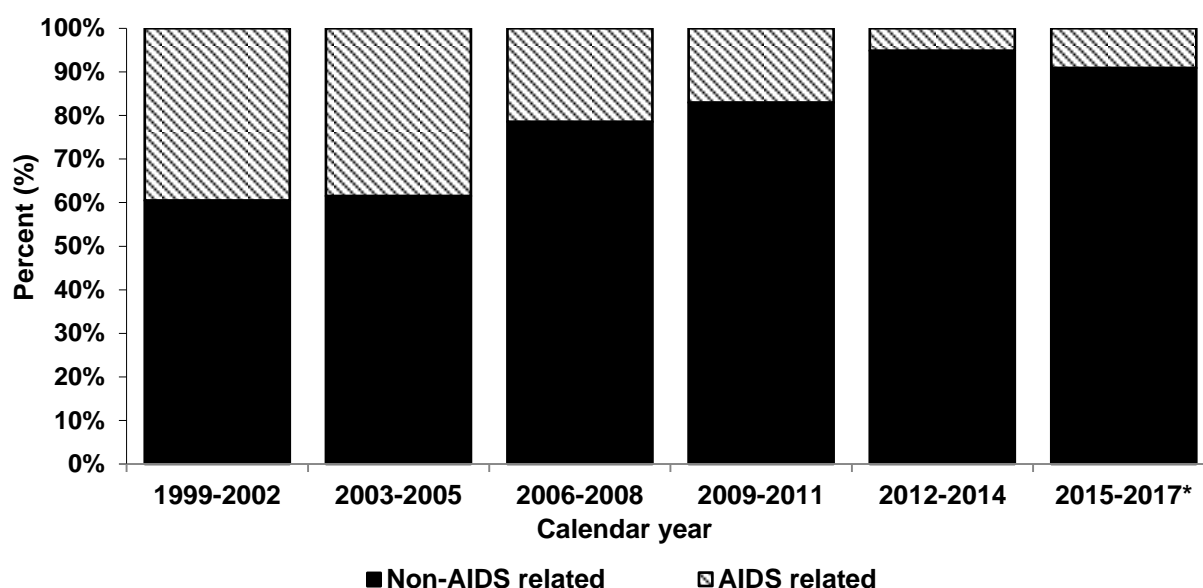
1. 4 sites (309 patients) were censored 31 March 2008, 31 March 2013, 31 March 2006 and 31 March 2015 respectively.

2. 1 July – 31 December 1999.

3. 1 January – 31 March 2017.

4. Patients who have died or any patients seen at clinic site within the last 12 months (1 April 2016 – 31 March 2017) 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 2017.

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	2015-2017 ¹	All years
Non-AIDS related	49	40	55	39	37	10	230
AIDS related	32	25	15	8	2	1	83
Unknown	2	2	4	11	11	2	32
No Code Form	0	0	2	6	6	10	24
Total deaths	83	67	76	64	56	23	369

1. 1 January 2015 to 31 March 2017.

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
MI or other ischemic heart disease	5
Other heart or vascular disease	4
Suicide	3
Chronic viral hepatitis (progression of / complication to)	3
Renal failure	1
Other Causes	9
Unknown (autopsy inconclusive, died overseas, etc)	19
Missing information ³	19

1. 1 January 2011 to 31 December 2016.

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

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Patients under active follow up ¹	(n=2040)	(n=2054)	(n=2033)	(n=2149)	(n=2306)	(n=2394)	(n=2576)	(n=2578)	(n=2593)	(n=2495)	(n=2446)
Treatment	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<i>Never treatment</i>	71 (3)	70 (3)	67 (3)	57 (3)	69 (3)	68 (3)	82 (3)	75 (3)	66 (3)	50 (2)	39 (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	1729 (85)	1741 (85)	1773 (87)	1917 (89)	2083 (90)	2181 (91)	2397 (93)	2431 (94)	2468 (95)	2395 (96)	2373 (97)
Previously, not currently	240 (12)	243 (12)	193 (9)	175 (8)	154 (7)	145 (6)	97 (4)	72 (3)	59 (2)	50 (2)	34 (1)
Number of drugs ever³											
≤3	515 (26)	486 (24)	453 (23)	552 (26)	634 (28)	685 (29)	742 (30)	726 (29)	708 (28)	616 (25)	592 (25)
4-6	762 (39)	775 (39)	754 (38)	765 (37)	806 (36)	847 (36)	941 (38)	979 (39)	1002 (40)	977 (40)	927 (39)
7-9	497 (25)	509 (26)	512 (26)	495 (24)	497 (22)	493 (21)	501 (20)	487 (19)	492 (19)	515 (21)	543 (23)
10+	195 (10)	214 (11)	247 (13)	280 (13)	300 (13)	301 (13)	310 (12)	311 (12)	325 (13)	337 (14)	345 (14)
Number of drug classes ever^{3,4}											
1	57 (3)	46 (3)	43 (2)	41 (2)	53 (2)	49 (2)	39 (2)	24 (1)	15 (1)	14 (1)	17 (1)
2	980 (54)	970 (53)	950 (52)	1051 (53)	1115 (53)	1184 (53)	1343 (55)	1360 (55)	1323 (53)	1142 (47)	1091 (46)
3	733 (40)	730 (40)	708 (39)	677 (34)	683 (32)	679 (31)	717 (29)	712 (29)	763 (31)	834 (34)	837 (35)
4	54 (3)	65 (4)	104 (6)	151 (8)	216 (10)	242 (11)	268 (11)	294 (12)	320 (13)	362 (15)	375 (16)
5		15 (1)	30 (2)	47 (2)	55 (3)	62 (3)	66 (3)	72 (3)	77 (3)	77 (3)	70 (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

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Combination²	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
1 st combination	273 (15)	251 (14)	242 (13)	361 (18)	368 (17)	432 (20)	531 (22)	513 (21)	474 (19)	407 (17)	370 (15)
2 nd combination	323 (18)	346 (19)	343 (19)	338 (17)	416 (20)	436 (20)	506 (21)	533 (22)	560 (23)	528 (22)	508 (21)
3 rd combination	300 (16)	293 (16)	291 (16)	276 (14)	309 (15)	320 (14)	350 (14)	372 (15)	382 (15)	393 (16)	410 (17)
≥4 th combination	931 (51)	949 (52)	959 (52)	993 (50)	1028 (48)	1024 (46)	1041 (43)	1036 (42)	1070 (43)	1095 (45)	1101 (46)

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)

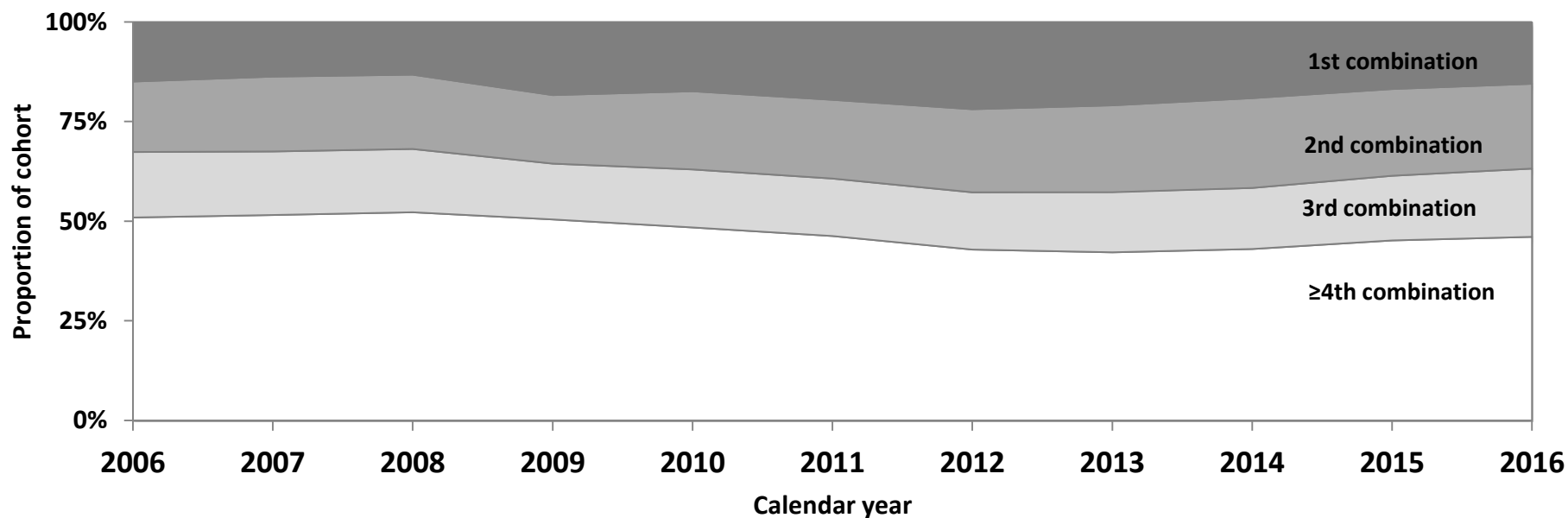


Table 7: Immunological and virological trends¹

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Viral load (copies/ml)											
Total N (with measure)	2289	2347	2413	2361	2355	2505	2563	2558	2472	2387	2245
Off Treatment²											
No. with a viral load count ⁴	438	430	388	341	276	255	199	153	124	76	70
Median	14252	13439	11220	10500	7835	5090	5852	3404	2315	148	40
IQR	3325-47900	2890-40500	1914-36650	1950-34900	428-34575	313-35689	104-30098	40-23450	37-28500	20-14937	19-2351
On Treatment³											
No. with a viral load count ⁴	1851	1917	2025	2020	2079	2250	2364	2405	2348	2311	2175
Median	50	49.5	49	49	49	40	39	20	20	20	20
IQR	49-70	44-50	40-50	40-50	40-50	30-49	20-49	19-40	19-40	19-40	19-40
CD4 count (cells/μl)											
Total N (with measure)	2284	2353	2411	2397	2384	2522	2576	2573	2462	2425	2323
Off Treatment²											
No. with a CD4 count ⁵	450	440	403	357	298	271	216	164	129	89	73
Median	505	499	486	501	498	510	560	605	630	618	560
IQR	376-650	392-632	388-651	390-660	395-655	393-670	460-737	451-800	467-790	420-750	430-755
On Treatment³											
No. with a CD4 count ⁵	1834	1913	2008	2040	2086	2251	2360	2409	2333	2336	2250
Median	503.5	523	530	540	552	573	585	605	630	650	670
IQR	341-710	360-720	374-740	380-735	398-736	420-768	428-779	440-790	460-820	470-850	486-870

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.

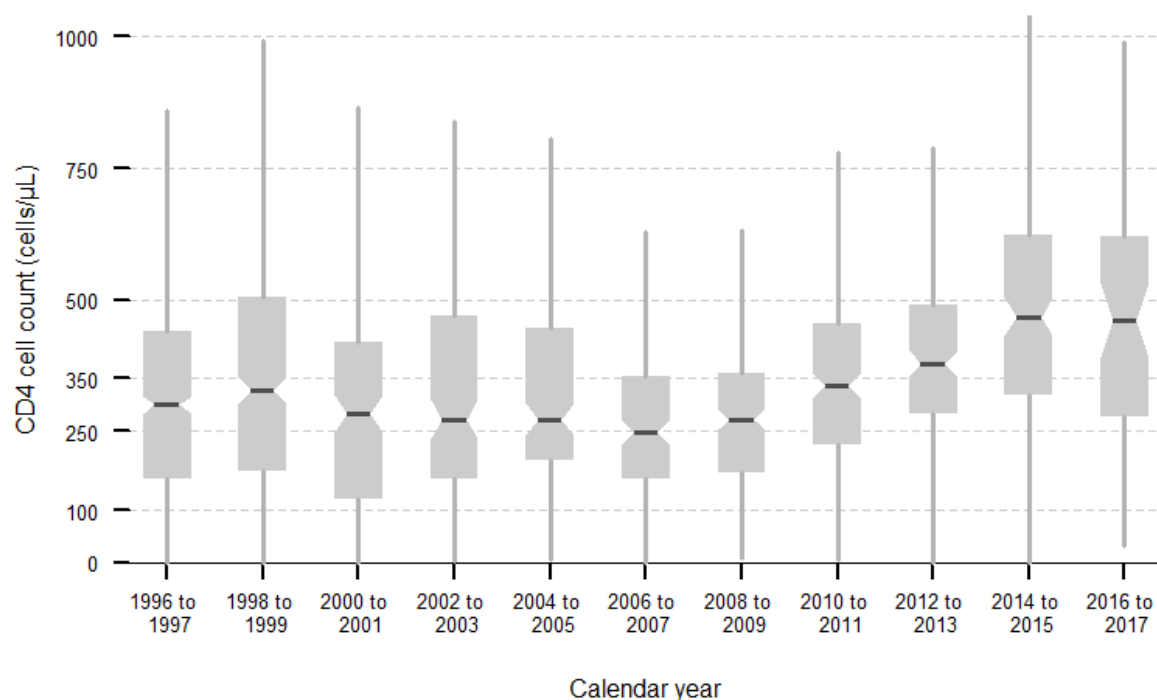
5. Includes patients with a CD4 count measured during the relevant calendar year.

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

	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 2015	2016 to 2017 ⁴
Number of participants initiating ART¹										
N=	402	186	177	159	177	224	226	180	170	59
CD4 cell count (copies/μl)^{2,3}										
Mean	367	354	341	354	279	282	350	389	482	472
Median	328	283	272	273	248	273	337	379	468	460
IQR	174-504	120-420	160-470	192-450	160-355	170-360	223-456	282-490	320-624	273-628

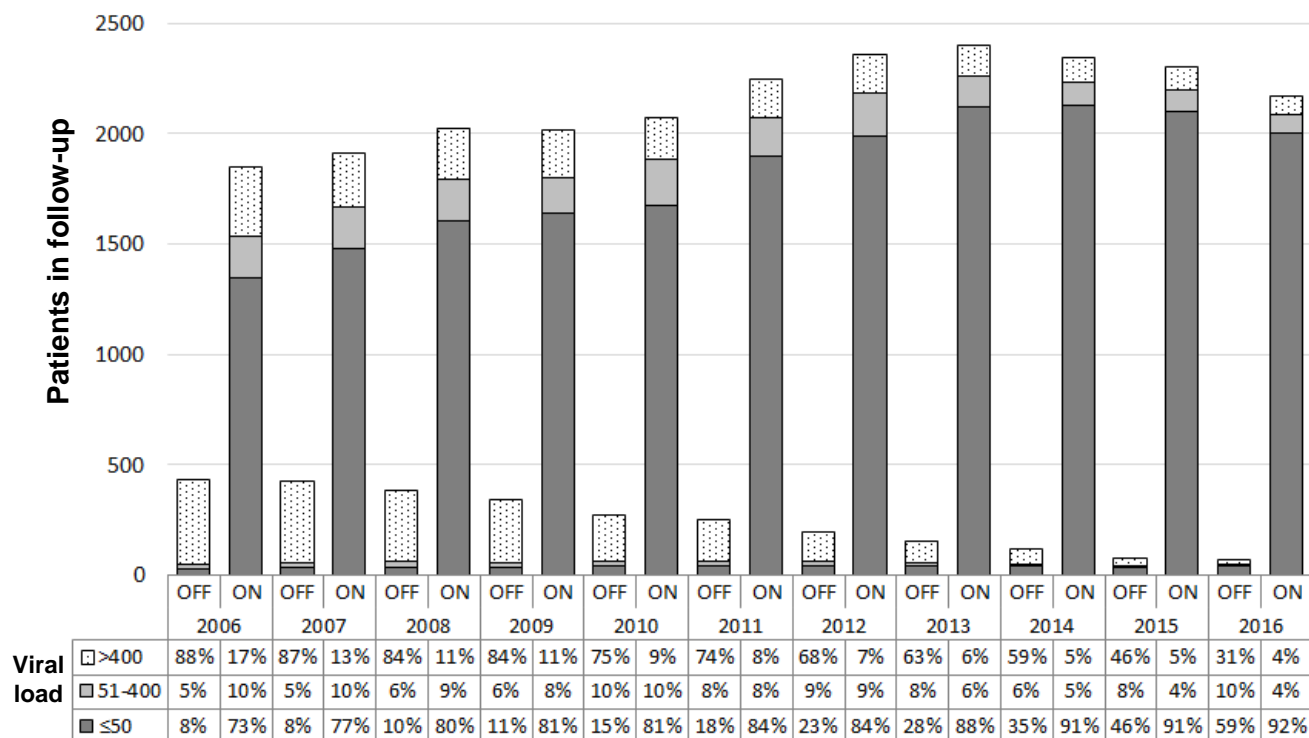
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART>14 days. Includes retrospective and prospective data. ATRAS sub study participants were excluded from analysis.
2. CD4 cell count selected from the observation closest to ART start date within a timeframe window 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 2016 to 31 March 2017.

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)



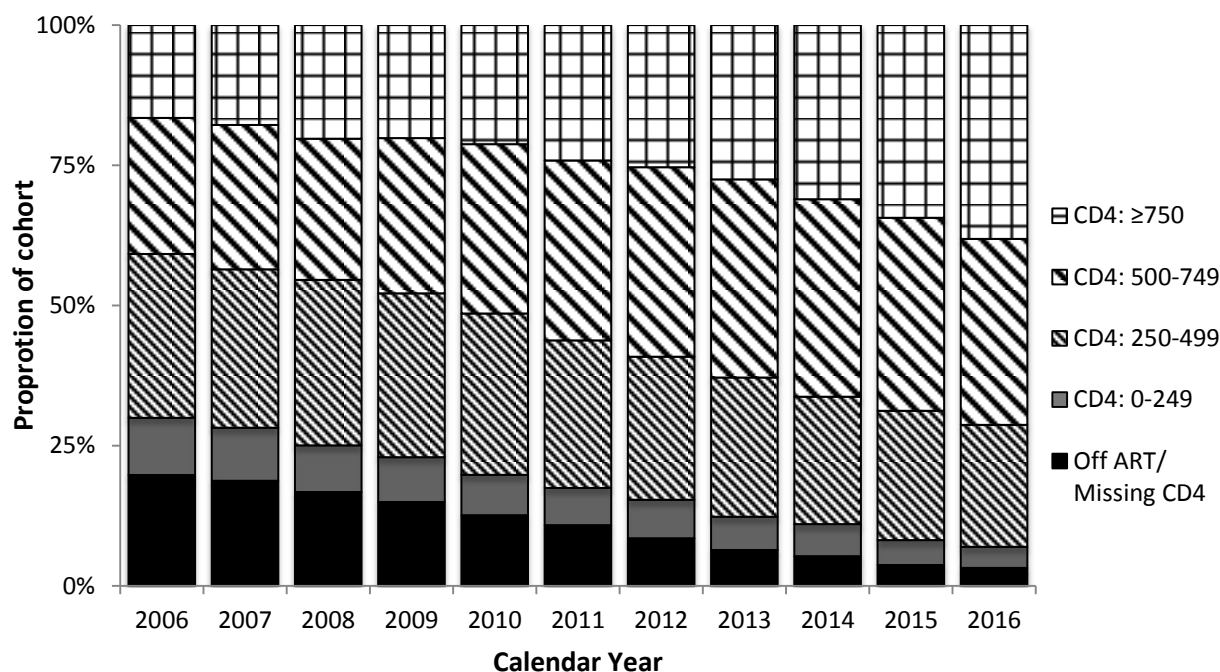
1. First ART defined as a combination of 3 or more antiretroviral agents and a duration of ART>14 days. Includes retrospective and prospective data. ATRAS sub study participants excluded from analysis.
2. CD4 cell count selected from the observation closest to ART start date within a timeframe window 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.
4. '2016 to 2017' includes data reported from 1 January 2016 to 31 March 2017.

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.

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.

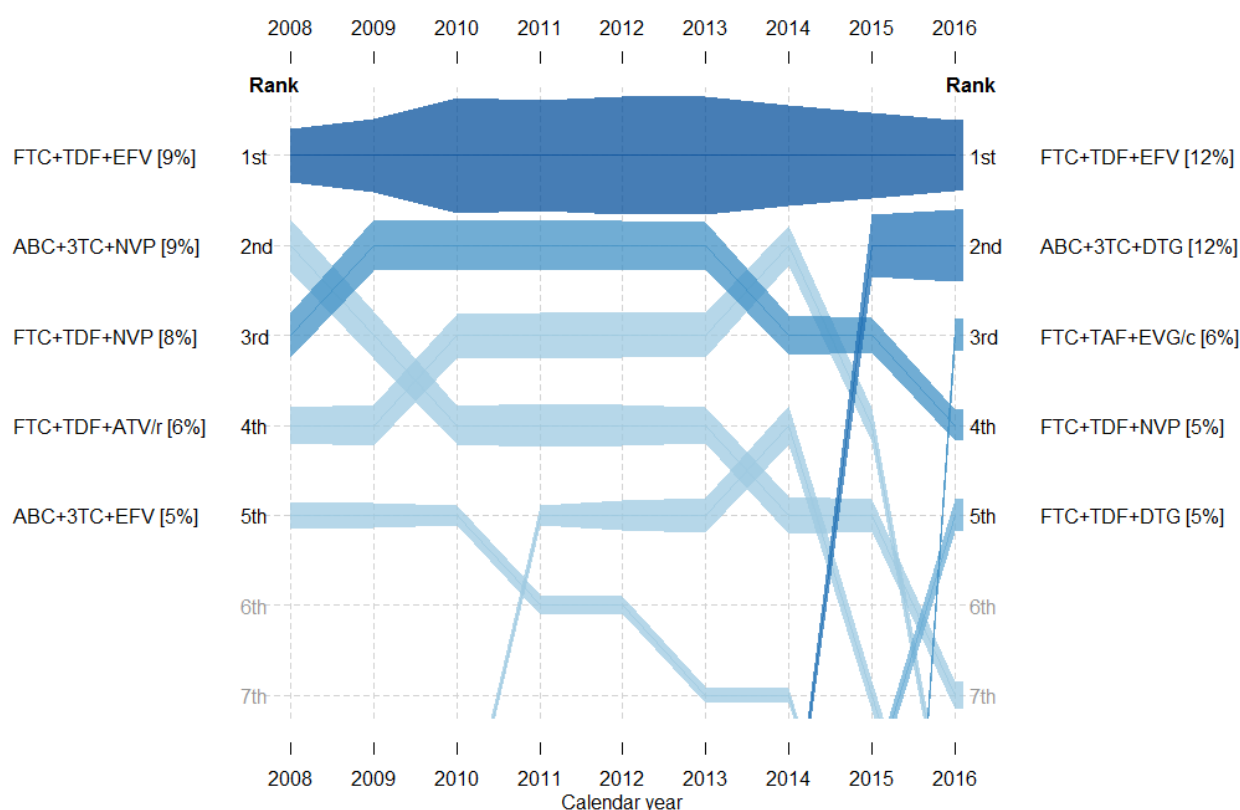
Table 9: Top ten treatment combinations among the AHOD cohort¹: January-December 2016

In 2016, there were a total of 430 unique antiretroviral treatment (ART) combinations (13 of which contain trial drugs) among the 2406 AHOD patients on combination ART. A total of 2925 combination regimens were recorded among these patients throughout 2016. The top ten most common ART combinations are described below.

ART combinations	Number of regimens recorded during 2016
emtricitabine+tenofovir+efavirenz	355
abacavir+lamivudine+dolutegravir	354
emtricitabine+TAF+elvitegravir+cobicistat	161
emtricitabine+tenofovir+nevirapine	158
emtricitabine+tenofovir+dolutegravir	155
emtricitabine+tenofovir+rilpivirine	140
abacavir+lamivudine+nevirapine	133
emtricitabine+tenofovir+elvitegravir+cobicistat	133
emtricitabine+tenofovir+atazanavir+ritonavir	124
emtricitabine+tenofovir+raltegravir	124

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 2008-2016



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, 2016 Rank 1 proportion calculated by 355/2925=12.14%. Thickness of line over time is proportional to calculated percentage.

Table 10: Current use of individual antiretroviral treatments¹

	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Nucleoside analogue reverse transcriptase inhibitors (RTI)																						
Abacavir	485	(22)	405	(18)	387	(17)	286	(12)	271	(11)	249	(10)	219	(9)	199	(8)	205	(8)	217	(8)	194	(8)
Combivir ²	404	(18)	315	(14)	259	(11)	225	(9)	210	(9)	171	(7)	142	(6)	114	(4)	94	(4)	79	(3)	65	(3)
Descovy ³	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	35	(1)
Didanosine	206	(9)	136	(6)	94	(4)	63	(3)	53	(2)	34	(1)	29	(1)	21	(1)	18	(1)	14	(1)	8	(0)
Emtricitabine	100	(4)	86	(4)	130	(6)	163	(7)	205	(9)	224	(9)	230	(9)	248	(9)	197	(7)	200	(8)	209	(9)
Kivexa ⁴	266	(12)	372	(16)	418	(18)	414	(17)	393	(16)	424	(17)	445	(17)	440	(17)	463	(18)	455	(18)	299	(12)
Lamivudine	952	(42)	667	(29)	570	(25)	436	(18)	401	(17)	371	(15)	333	(13)	299	(11)	302	(11)	308	(12)	291	(12)
Stavudine	147	(7)	91	(4)	71	(3)	54	(2)	42	(2)	28	(1)	26	(1)	19	(1)	15	(1)	10	(0)	9	(0)
Tenofovir	778	(35)	545	(24)	515	(22)	496	(21)	499	(21)	471	(19)	444	(17)	433	(16)	355	(13)	319	(12)	298	(12)
Tenofovir (TAF)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	1	(0)	1	(0)	17	(1)
Trizivir ⁵	122	(5)	85	(4)	68	(3)	55	(2)	43	(2)	39	(2)	26	(1)	21	(1)	19	(1)	15	(1)	11	(0)
Truvada ⁶	367	(16)	543	(24)	717	(31)	911	(38)	950	(40)	813	(33)	884	(35)	901	(34)	874	(33)	791	(31)	703	(29)
Zalcitabine	5	(0)	3	(0)	3	(0)	2	(0)	2	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)	1	(0)
Zidovudine	177	(8)	136	(6)	106	(5)	66	(3)	56	(2)	43	(2)	37	(1)	35	(1)	28	(1)	25	(1)	22	(1)
Non-nucleoside analogue RTI																						
Delavirdine	11	(0)	9	(0)	3	(0)	2	(0)	2	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
Efavirenz	510	(23)	551	(24)	568	(24)	580	(24)	539	(23)	346	(14)	355	(14)	306	(12)	241	(9)	201	(8)	151	(6)
Nevirapine	642	(29)	655	(29)	682	(29)	677	(29)	652	(27)	623	(25)	621	(24)	572	(22)	532	(20)	474	(19)	393	(16)
Etravirine	2	(0)	24	(1)	53	(2)	85	(4)	104	(4)	110	(4)	117	(5)	120	(5)	120	(5)	122	(5)	108	(4)
Rilpivirine	0	(0)	0	(0)	0	(0)	2	(0)	3	(0)	6	(0)	19	(1)	36	(1)	42	(2)	44	(2)	46	(2)
Entry Inhibitor																						
Enfuvirtide	69	(3)	62	(3)	45	(2)	28	(1)	17	(1)	9	(0)	7	(0)	6	(0)	4	(0)	1	(0)	1	(0)
Fostemsavir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	2	(0)
Maraviroc	7	(0)	8	(0)	15	(1)	23	(1)	31	(1)	35	(1)	44	(2)	52	(2)	56	(2)	54	(2)	51	(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. 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

	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Protease Inhibitor																						
Amprenavir	281	(13)	29	(1)	28	(1)	28	(1)	26	(1)	22	(1)	20	(1)	17	(1)	14	(1)	10	(0)	6	(0)
Atazanavir	448	(20)	489	(21)	545	(23)	559	(24)	582	(24)	578	(23)	569	(22)	529	(20)	475	(18)	394	(15)	295	(12)
Darunavir	42	(2)	74	(3)	120	(5)	167	(7)	200	(8)	231	(9)	269	(11)	280	(11)	305	(12)	307	(12)	299	(12)
Evotaz ⁷	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	3	(0)
Fosamprenavir	36	(2)	32	(1)	30	(1)	24	(1)	17	(1)	15	(1)	13	(1)	11	(0)	10	(0)	7	(0)	5	(0)
Indinavir	49	(2)	34	(1)	21	(1)	12	(1)	8	(0)	6	(0)	6	(0)	6	(0)	3	(0)	3	(0)	3	(0)
Kaletra ⁸	281	(13)	276	(12)	262	(11)	245	(10)	243	(10)	214	(9)	185	(7)	158	(6)	126	(5)	90	(4)	64	(3)
Nelfinavir	47	(2)	36	(2)	9	(0)	8	(0)	7	(0)	6	(0)	6	(0)	5	(0)	4	(0)	3	(0)	3	(0)
Prezcobix ⁹	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	12	(0)
Ritonavir	671	(30)	695	(31)	743	(32)	749	(32)	793	(33)	815	(33)	844	(33)	802	(30)	760	(29)	678	(27)	558	(23)
Saquinavir	109	(5)	90	(4)	70	(3)	44	(2)	35	(1)	32	(1)	28	(1)	24	(1)	20	(1)	14	(1)	10	(0)
Integrase Inhibitors																						
Bictegravir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)
Dolutegravir	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	7	(0)	10	(0)	198	(8)	357	(14)	340	(14)
Elvitegravir	0	(0)	0	(0)	0	(0)	1	(0)	1	(0)	1	(0)	4	(0)	19	(1)	23	(1)	25	(1)	46	(2)
Raltegravir	10	(0)	64	(3)	184	(8)	307	(13)	450	(19)	515	(21)	609	(24)	665	(25)	681	(26)	582	(23)	462	(19)
Class Combinations																						
Atripla ¹⁰	2	(0)	5	(0)	6	(0)	17	(1)	297	(12)	399	(16)	442	(17)	485	(18)	452	(17)	400	(16)	324	(13)
Eviplera ¹¹	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	3	(0)	59	(2)	123	(5)	144	(5)	145	(6)	136	(6)
Stribild ¹²	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	3	(0)	68	(3)	113	(4)	120	(5)
Triumeq ¹³	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(0)	250	(10)	345	(14)
Genvoya ¹⁴	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(0)	2	(0)	5	(0)	183	(7)
Odefsey ¹⁵	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 & rilipivirine. 12. Tenofovir, emtricitabine, elvitegravir & cobicistat. 13. Abacavir, lamivudine, dolutegravir. 14. Tenofovir (TAF), emtricitabine, elvitegravir & cobicistat. 15. Rilipivirine, emtricitabine & Tenofovir (TAF)

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}					
	2011	2012	2013	2014 ³	2015 ³	2016 ³
Nucleoside analogue reverse transcriptase inhibitors						
Abacavir	473	425	400	460	440	330
Didanosine	117	84	60	130	80	≤30
Emtricitabine	146	157	60	90	120	110
Lamivudine	718	609	540	650	710	610
Stavudine	48	36	20	50	40	≤30
Zidovudine	98	70	60	70	60	≤30
Lamivudine & Zidovudine	602	461	400	420	370	300
Abacavir & Lamivudine	2179	2041	2500	3470	3350	1710
Abacavir, Lamivudine & Zidovudine	133	103	100	100	60	40
Tenofovir	1967	2039	2480	770	660	590
Tenofovir & Emtricitabine	4510	4404	4340	6150	5890	5380
TAF & Emtricitabine	-	-	-	-	-	420
Non-nucleoside analogue reverse transcriptase inhibitors						
Efavirenz	973	738	700	830	670	420
Nevirapine	2728	2376	2260	2780	2550	2140
Etravirine	456	454	520	580	540	510
Rilpivirine	-	18	40	140	240	260
Protease inhibitors						
Atazanavir	2906	2582	2380	2790	2190	1660
Darunavir	1058	1131	1140	1800	1980	2000
Fosamprenavir	148	111	80	120	100	60
Indinavir	21	18	20	≤30	≤30	≤30
Lopinavir & Ritonavir	1581	1341	960	1030	690	380
Ritonavir	3098	2652	3180	4010	3740	3170
Saquinavir	95	72	40	≤30	≤30	≤30
Tipranavir	15	11	<5	≤30	≤30	≤30
Darunavir & Cobicistat	-	-	-	-	-	130
Atazanavir & Cobicistat	-	-	-	-	-	100
Entry inhibitors						
Enfuvirtide	22	13	20	-	-	-
Maraviroc	118	122	160	310	250	290
Integrase inhibitor						
Raltegravir	1848	2250	2740	3900	3200	2610
Dolutegravir	-	-	-	1910	2990	2380
Combination Class Agents						
Tenofovir, Emtricitabine & Efavirenz	2873	2786	3100	3710	3250	2620
Tenofovir, Emtricitabine & Rilpivirine	-	217	1040	2250	2550	2300
Tenofovir, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	880	1690	1800
TAF, Emtricitabine, Elvitegravir & Cobicistat	-	-	-	-	-	2820
Abacavir, Lamivudine & Dolutegravir	-	-	-	-	2840	4690
Total patients	12,700⁴	12,800⁴	13,700⁴	17,500	18,720	19,940
Total cost⁵ (\$'000s)	200,165	210,005	229,000	230,872	250,688	260,811

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/>], 26 September 2017]

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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