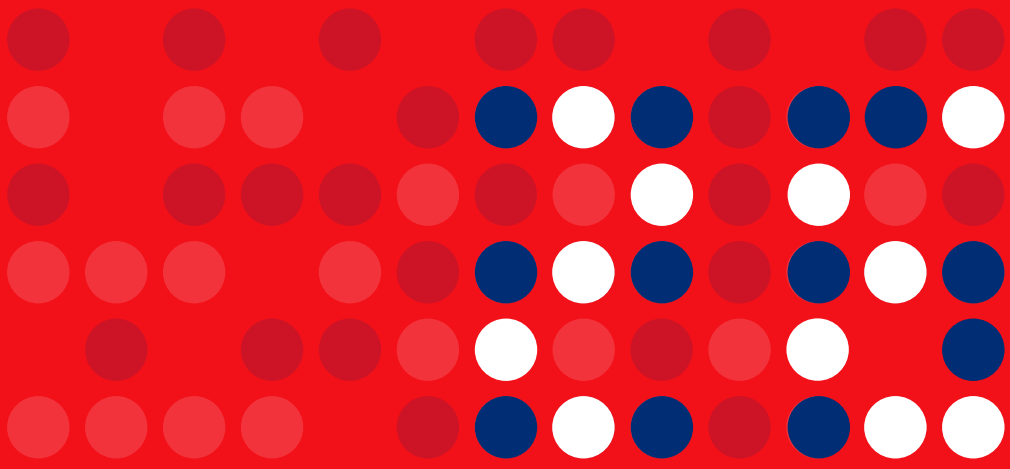
Human Immunodeficiency Virus (HIV)
Infection in the Netherlands

hiv Monitoring

HIV Monitoring Report 2026

Chapter 3: Antiretroviral therapy



3. Antiretroviral therapy

Ferdinand Wit, Kees Brinkman, Kees van Nieuwkoop, Casper Rokx, Wouter Bierman, Marc van der Valk

Summary

Starting ART and the initial regimen

- Between 2016 and 2025, 6,484 newly diagnosed individuals aged 15 years and older entered into HIV care in the Netherlands and initiated first-line ART.
- Since 2015, guidelines have recommended starting ART as soon as possible after HIV diagnosis, irrespective of CD4 count. In line with this, the median time from diagnosis to ART initiation has continued to fall, reaching 15 (IQR 8–26) days in 2025. The median time between entry into care in an HIV treatment centre and start of ART in 2025 was 8 (IQR 3-14) days.
- Between 2016 and 2021 there was a slowly decreasing trend in the CD4 count at ART initiation. However, since 2022 the CD4 count at the start of ART has slightly risen again. In 2025, 25.3% of individuals initiating ART had a CD4 count below 200 cells/mm^3, and another 20.2% had a CD4 count between 200 and <350 cells/mm^3. Immunological recovery (i.e. reaching a CD4 count of ≥500 cells/mm^3) was faster and more frequent when ART was started at a higher baseline CD4 count.
- In 2025, 85.3% of initial regimens contained an integrase inhibitor in combination with one or two nucleoside-analogue RT inhibitors (87.8% when including other integrase inhibitor-containing regimens). In 2025, the most frequently used initial regimens were TDF/FTC/DTG (39.5%), TAF/FTC/BIC (33.3%), 3TC/DTG (7.2%), and TDF/3TC/DOR (10.4%).

In care and receiving ART

- The number of people on ART and in active follow-up in the cohort grew from 18,972 individuals in 2016 to 23,094 individuals in 2025.
- In 2025, the vast majority (90.6%) of individuals received a regimen based on one or two nucleoside-analogue reverse transcriptase inhibitors (NRTIs), combined with an integrase inhibitor (59.0%), a non-nucleoside reverse transcriptase inhibitor (24.4%) or a protease inhibitor (7.2%).
- Long-acting injectables (cabotegravir/rilpivirine) were used by 3.8%.
- The population had been diagnosed with HIV a median of 15.4 (IQR 9.3-21.7) years ago, and started their first-line ART regimen a median of 13.3 (IQR 8.5-19.2) years ago.
- Their last measured viral load was <50 c/ml in 95.3% (<200 c/ml in 97.9%), and 80.4% had a last measured CD4 count of 500 cells/mm^3 or higher.
- ART regimens were modified often, with the most common reasons for regimen modification being (mostly mild) toxicity (17.6%), treatment simplification (16.5%), patient decision/compliance (7.2%), and preventive modifications (6.7%). In only 1,078 (1.4%) regimen changes the reported reason for modification was virological treatment failure. The rate of ART regimen modifications continued to decrease over time from a peak of 336.2 modifications per 1,000 person years of follow-up in 2016 to 139.6 in 2025.
- The proportion of the treated population that at any moment temporarily interrupted ART continued to decrease, from 1.9% in 2016 to 0.7% in 2025, likely reflecting the improved ease of use and tolerability of modern ART regimens.
- In 2,577 individuals a total of 4,203 treatment interruptions of 14 days or longer were recorded between 2016 and 2025. The median duration of the recorded treatment interruptions was 12.3 (IQR 4.6-30.9) weeks. Many long interruptions constituted temporary disengagement from care. During longer treatment interruptions the CD4 count often dropped substantially, and such interruptions were strongly associated with death due to advanced HIV/AIDS. Women and people with a non-Western migration background were overrepresented among individuals in whom treatment interruptions were recorded.

Virological and immunological outcomes

- Virological suppression improved further over the decade: among individuals on ART for more than 6 months, the proportion with a viral load <50 c/ml rose from 93.1% in 2016 to 95.1% in 2025 (97.5% <200 c/ml).
- Sustained low-level viraemia was uncommon: 76.3% of individuals never had a viral load between 50-199 c/ml, and only 2.1% had more than 20% of their measurements in this range.
- Loss of viral suppression (≥200 c/ml) occurred in two settings: during treatment interruptions (2,084 episodes) and while ART was continued (4,569 episodes). Most episodes resolved (90.5% and 92.3%, respectively), but a minority ended in death, with advanced HIV/AIDS-defining conditions as the predominant cause, which is a markedly higher proportion than in the overall population in care.
- Emergence of drug resistance was more likely with higher and more sustained viraemia: a genotypic resistance test was performed in 25.9% of episodes, and an increased resistance score was detected in 34.0% of those tested, rising with both the maximum viral load and the number of consecutive measurements >200 c/ml.
- Immunological recovery continued: the proportion of people on ART with a normalised CD4 count (≥500 cells/mm^3) rose from 73.7% in 2016 to 80.4% in 2025, while the proportion below 350 cells/mm^3 fell from 10.4% to 7.3%.
- Recovery depended strongly on the CD4 count at ART initiation: five years after starting ART, only 11.7% of those who began with a CD4 count below 50 cells/mm^3, and 3.4% of those beginning at 50-199 cells/mm^3, still had a CD4 count below 200 cells/mm^3.

Introduction

The primary goals of antiretroviral therapy (ART) are to prevent HIV disease progression, improve clinical outcomes, and prevent HIV transmission[1,2]. Treatment guidelines across the globe recommend the initiation of ART as soon as possible in all people diagnosed with HIV, irrespective of CD4 count, HIV viral load or clinical disease stage. In people with very low CD4 counts or with active opportunistic infections, ART is often started as soon as possible, while in others ART is started after the initial evaluation (complete medical history, physical examination, and laboratory testing) has been completed. The decision to initiate ART should always include consideration of a person's comorbid conditions, possible antiretroviral drug resistance, as well as readiness to start and maintain ART[3-7]. In general, the guidelines of the Dutch Association of HIV Treating Physicians (Nederlandse Vereniging van HIV Behandelaren, NVHB) follow the US Department of Health and Human Services guidelines[5,8].

Rapid initiation of ART not only prevents clinical events such as opportunistic infections and malignancies, but also reduces HIV transmission more effectively than deferred initiation[9,10]. People with HIV on ART with an undetectable viral load in their blood have no risk of sexual transmission of HIV, (i.e. "undetectable equals untransmittable", or "U = U"[11-16]). Sustained suppression of HIV replication requires selection of appropriate treatment, and reliable access and good adherence to treatment.

In this chapter, we describe trends over time in the use of ART, and trends in the virological and immunological responses to ART during the last 10 calendar years, in adults registered by "Stichting hiv monitoring" (SHM) and enrolled in the ATHENA cohort[17].

Time from diagnosis to ART initiation

In total, 6,484 ART-naïve people with HIV were aged 15 years or above at the time of diagnosis and initiated first-line ART in the Netherlands between January 2016 and December 2025. Of the 6,484 people known to have initiated ART since January 2016, 3,857 (59.5%) were men who have sex with men (MSM), 1,389 (21.4%) men other than MSM, 1,054 (16.3%) women, and 184 (2.8%) were transgender / non-binary people. Overall, 3,350 (51.7%) were born in the Netherlands. In Table 3.1, we have grouped people by calendar year of ART initiation: 3,948 started in 2016-2020, 474 in 2021, 503 in 2022, 540 in 2023, 536 in 2024, and 483 in 2025. SHM systematically collects the date of entry into the Netherlands for people born in other countries. For an increasing proportion of these people, it is known if they have been diagnosed with HIV and started ART before or after entering the Netherlands. People known to have been diagnosed with HIV in other countries and who had already initiated ART prior to arriving in the Netherlands are not included in this analysis.

Prompt initiation of ART following HIV diagnosis has increased over time, reflecting implementation and uptake of evolving HIV treatment guidelines (Figure 3.1A). Among people with an accurate date of HIV diagnosis in our database who started ART in the Netherlands, the median time between HIV diagnosis and ART initiation shifted from 31 days (interquartile range [IQR] 16-53) for those who entered care in 2016, to 19 days (IQR 9-35) in 2020, to 15 days (IQR 8-26) in 2025. Likewise, the time between entering care in an HIV treatment centre and starting ART decreased over time (*Figure 3.1B*). The vast majority of newly diagnosed, ART-naïve people entering care in the Netherlands initiated ART within one month (95.8% in 2025), or even within one day (19.7% in 2025).

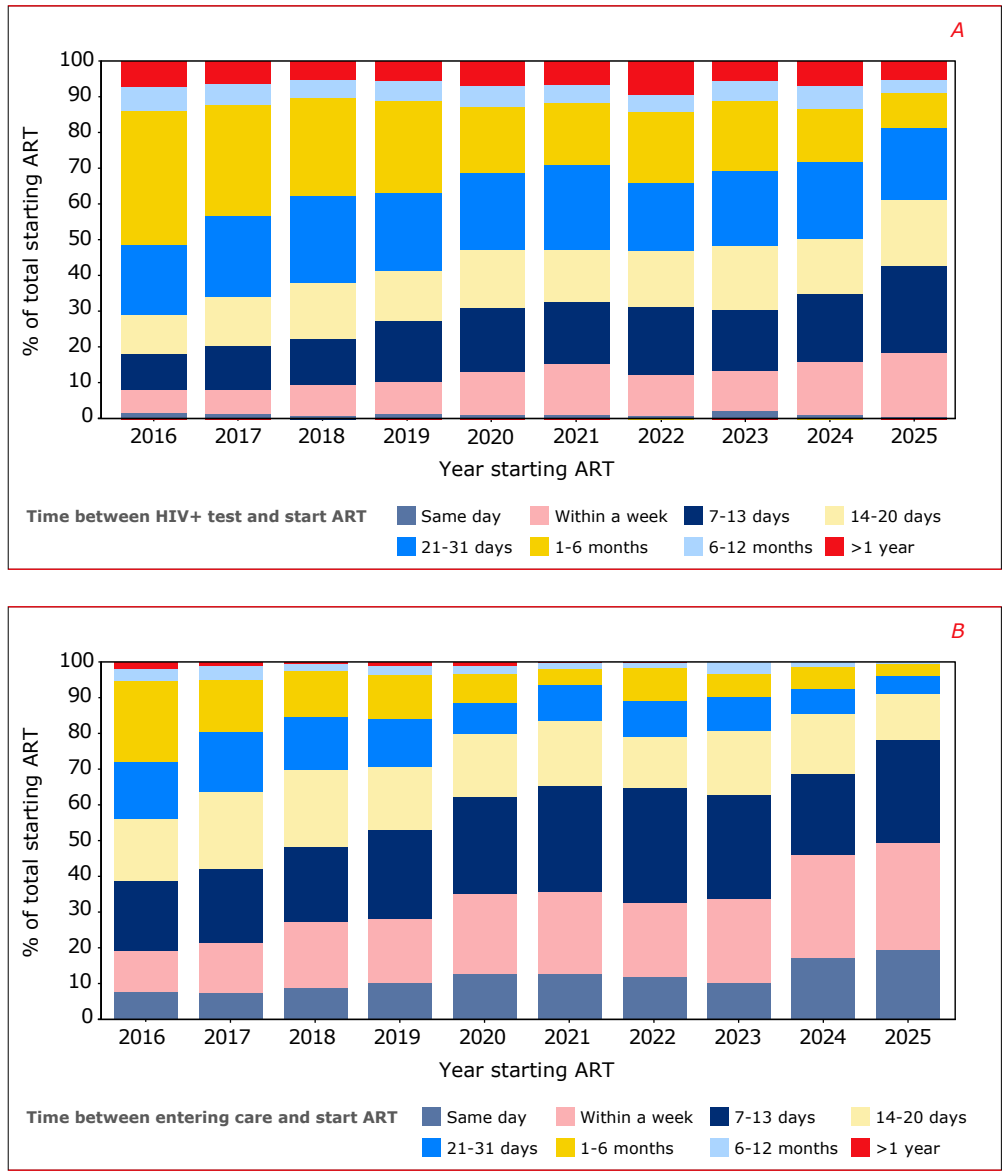
Table 3.1 Characteristics of people starting antiretroviral therapy in 2016–2025.

Year of ART initiation		2016–2020	2021	2022	2023	2024	2025	2016–2025
Number of individuals		3,948	474	503	540	536	483	6,484
DEMOGRAPHICS								
Age at ART initiation (years)	Median	39.2	39.6	39.7	39.5	38.4	36.9	39
	Q1	29.9	31.2	30.9	30.8	29.3	28.9	30.1
	Q3	50.1	52.2	51.3	50.6	50.3	48.9	50.3
Male sex (at birth)	n	3,357	397	401	439	447	384	5,425
	%	85	83.8	79.7	81.3	83.4	79.5	83.7
HIV acquisition group								
MSM	n	2,503	272	253	288	304	237	3,857
	%	63.4	57.4	50.3	53.3	56.7	49.1	59.5
Men other than MSM	n	769	106	131	137	116	130	1,389
	%	19.5	22.4	26	25.4	21.6	26.9	21.4
Women	n	591	76	102	100	88	97	1,054
	%	15	16	20.3	18.5	16.4	20.1	16.3
Transgender people	n	85	20	17	15	28	19	184
	%	2.2	4.2	3.4	2.8	5.2	3.9	2.8
Region of origin								
The Netherlands	n	2,185	227	236	237	241	224	3,350
	%	55.3	47.9	46.9	43.9	45	46.4	51.7
Western Europe/North America/	n	180	24	14	19	25	15	277
Australia	%	4.6	5.1	2.8	3.5	4.7	3.1	4.3
Eastern/central Europe	n	314	60	88	81	85	79	707
	%	8	12.7	17.5	15	15.9	16.4	10.9
Latin America and the Caribbean	n	556	80	52	83	64	53	888
	%	14.1	16.9	10.3	15.4	11.9	11	13.7
Sub-Saharan Africa	n	377	36	62	64	67	58	664
	%	9.5	7.6	12.3	11.9	12.5	12	10.2
Other	n	336	47	51	56	54	54	598
	%	8.5	9.9	10.1	10.4	10.1	11.2	9.2
CLINICAL								
Recent infection (within 12 months of diagnosis)	n	1010	80	89	112	142	113	1,546
	%	25.6	16.9	17.7	20.7	26.5	23.4	23.8
Ever having tested HIV-negative	n	2203	237	235	278	291	267	3,511
	%	55.8	50	46.7	51.5	54.3	55.3	54.1
CD4 count at start of ART	Median	380	300	352	351	409	390	370
	Q1	180	130	150	160	180	194	170
	Q3	570	543	556	568	598	560	570
HIV RNA (log_{10} cp/ml) at start of ART	Median	4.8	5.2	5	5.2	5	5.1	4.9
	Q1	4.1	4.5	4.2	4.3	4.3	4.4	4.2
	Q3	5.4	5.8	5.6	5.8	5.7	5.8	5.6
(Prior) AIDS at start of ART	n	588	91	81	97	79	72	1,008
	%	14.9	19.2	16.1	18	14.7	14.9	15.5
Hepatitis B status at start of ART								
HBV-negative (HBsAg-negative)	n	3,724	450	468	513	508	449	6,112
	%	94.3	94.9	93	95	94.8	93	94.3
HBV-positive (HBsAg-positive)	n	111	9	28	15	15	15	193
	%	2.8	1.9	5.6	2.8	2.8	3.1	3
Unknown	n	113	15	7	12	13	19	179
	%	2.9	3.2	1.4	2.2	2.4	3.9	2.8
Hepatitis C status at start of ART								
HCV-negative	n	3,769	446	473	510	508	455	6,161
	%	95.5	94.1	94	94.4	94.8	94.2	95
HCV RNA-positive	n	68	6	17	15	9	9	124
	%	1.7	1.3	3.4	2.8	1.7	1.9	1.9
HCV Ab seropositive, HCV RNA negative or unknown	n	56	10	5	11	10	8	100
	%	1.4	2.1	1	2	1.9	1.7	1.5
Unknown	n	55	12	8	4	9	11	99
	%	1.4	2.5	1.6	0.7	1.7	2.3	1.5
ART started during pregnancy*	n	77	9	8	14	7	8	123
	%	2	1.9	1.6	2.6	1.3	1.7	1.9

Legend: *ART = antiretroviral therapy; HBV = hepatitis B virus; HCV = hepatitis C virus; NRTI = nucleoside analogue reverse transcriptase inhibitor.*

** These are mainly women first diagnosed with HIV during pregnancy.*

Figure 3.1A&B: *Time between HIV diagnosis and initiation of antiretroviral therapy (ART) in 2016-2025 (A) and time between entry into HIV care and initiation of ART in 2016-2025 (B).*



Legend: *ART = antiretroviral therapy.*

There was a slight decrease in the median CD4 count at the start of ART from 380 cells/mm^3 (IQR 180-570) in 2016-2020, to a low of 300 (130-543) in 2021 during COVID-19 lockdowns, followed by an increase to 390 (194-560) cells/mm^3 in 2025. Chapter 1 provides more detailed information on changing trends in the CD4 count at the start of ART, and additional aspects of the continuum of HIV care.

Changes in initial ART regimen

Data from clinical trials on contemporary antiretroviral drugs have shown good outcomes in terms of viral suppression, convenience, tolerability, and toxicity. Over the past years, several new antiretroviral drugs and new, once-daily, fixed-dose combination regimens have been approved in the Netherlands (*Box 3.1*). In this section, we evaluate the post-approval implementation of these new drugs/regimens in HIV treatment.

Box 3.1: *Approval dates of new antiretroviral drugs/regimens for HIV treatment in the Netherlands in 2013-2025.*

Medicine	Authorisation date
TDF/FTC/elvitegravir/cobicistat (Stribild®)	24 May 2013
Dolutegravir (Tivicay®)	16 January 2014
ABC/3TC/dolutegravir (Triumeq®)	01 September 2014
DRV/cobicistat (Rezolsta®)	19 November 2014
TAF/FTC/elvitegravir/cobicistat (Genvoya®)	19 November 2015
TAF/FTC (Descovy®)	21 April 2016
TAF/FTC/rilpivirine (Odefsey®)	21 June 2016
TAF (Vemlidy®)	09 January 2017
TAF/FTC/darunavir/cobicistat (Symtuza®)	21 September 2017
Dolutegravir/rilpivirine (Juluca®)	21 May 2018
TAF/FTC/bictegravir (Biktarvy®)	25 June 2018
Doravirine (Pifeltro®)	22 November 2018
TDF/3TC/doravirine (Delstrigo®)	22 November 2018
3TC/dolutegravir (Dovato®)	03 July 2019
Cabotegravir (Vocabria®, oral and intramuscular administration)	17 December 2020
Rilpivirine (Rekambys®, intramuscular administration)	17 December 2020
Fostemsavir (Rukobia®)	04 February 2021
Lenacapavir (Sunlenca®)	17 August 2022

Legend: *3TC = lamivudine; ABC = abacavir; FTC = emtricitabine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.*

Source: *Medicines Evaluation Board http://english.cbg-meb.nl/ and European Medicines Agency http://www.ema.europa.eu/*

In the period 2016-2025, all guideline-recommended first-line ART regimen consist of a nucleoside-analogue reverse transcriptase inhibitor (NRTI) backbone, plus one anchor-drug. The NRTI-backbone usually consists of two NRTIs, except for the regimen lamivudine(3TC)/ dolutegravir(DTG). In the period 2016-2025, the recommended anchor-drugs are from the integrase inhibitor (INSTI), non-nucleoside RT inhibitor (NNRTI), or protease inhibitor (PI) class. The use of other ART regimen, i.e. dual-anchor class regimen with or without the addition of NRTI, have become more common in recent years, but only as maintenance therapy in treatment-experienced individuals.

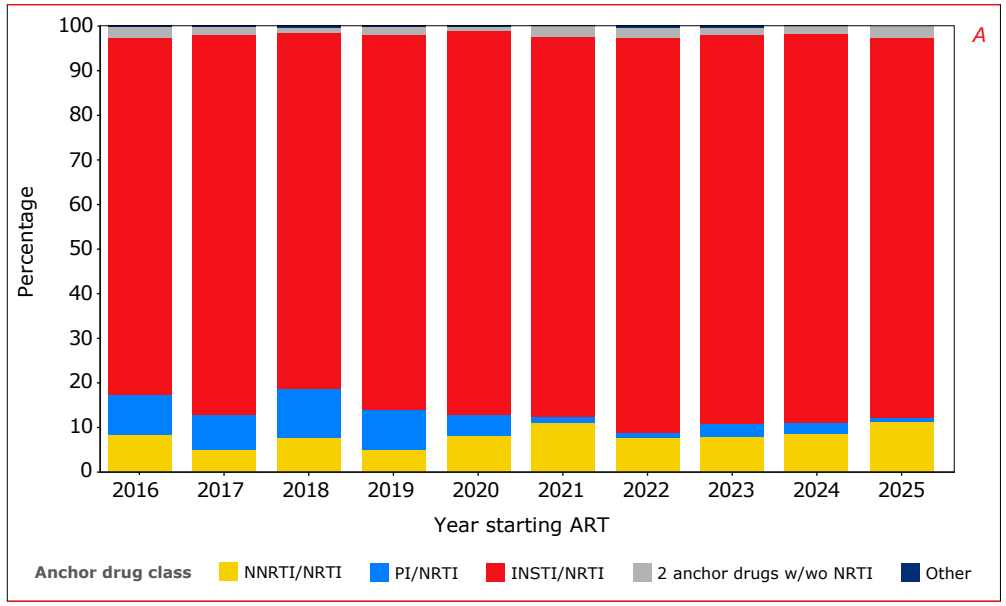
In the studied period, in certain groups of newly diagnosed individuals, a 2-step 'induction-maintenance' approach has sometimes been used, where at the time of ART initiation it is the explicit intention to replace the first ART regimen as soon as possible with another regimen. For the purpose of our analyses here, when the switch happened within 6 months and there was explicit mention of the 'induction-maintenance' approach in the electronic medical records, the starting regimens of the individuals who initiated therapy using this strategy have been set to their second simplified guideline-recommended regimen.
Common examples of this 'induction-maintenance' approach are ART initiation with a regimen containing 2 anchor-drugs plus 2 NRTI in individuals initiating ART during acute HIV infection (often as part of a study protocol) or individuals with low CD4 counts and opportunistic infections who quickly initiate ART before the results of HIV genotypic resistance testing (and HBV testing) have become available. In these individuals, ART is subsequently simplified to a guideline-recommended regimen as soon as the first undetectable viral load measurement and/or the results of the genotypic resistance testing have become available. Another common similar strategy is that individuals are started on a dolutegravir-based regimen combined with 2 NRTI, which is then quickly 'simplified' to either 3TC/DTG or TDF/3TC/doravirine(DOR), as soon as the first undetectable viral load measurement and/or the results of genotypic resistance testing have become available. Also in these cases, we considered their second simplified guideline-recommended regimen as their starting regimen when the switch occurred with 6 months and when the reason for the switch was not documented as 'virological failure' or 'toxicity'.

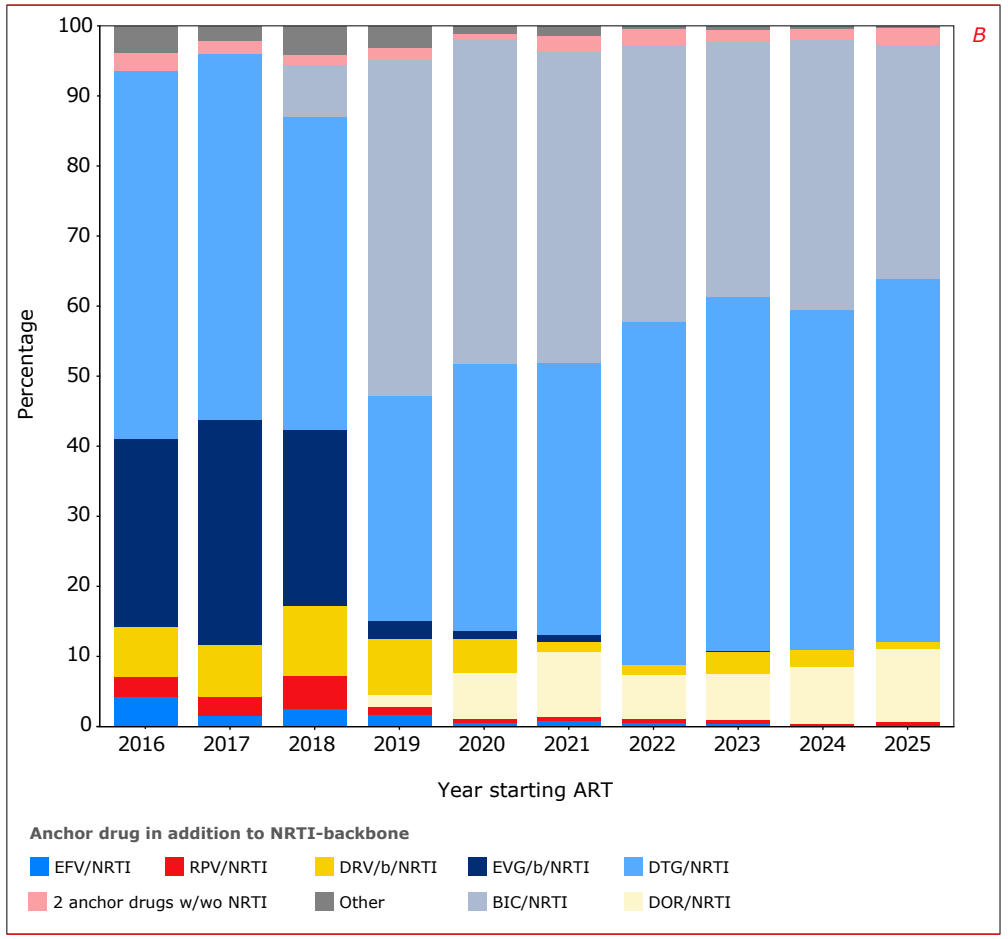
For the 6,484 ART-naïve people who initiated first-line ART between 2016 and 2025, Figures 3.2A&B show the trends over time in anchor-drug additions to the NRTI backbone used as part of the initial ART regimen. The use of INSTI in combination with a (mono- or dual-) NRTI backbone as initial therapy fluctuated between 79% and 88.5% and was 85.3% in 2025. The use of NNRTIs in combination with a NRTI backbone as the initial regimen was fairly stable over time and was 11.2% in 2025. The use of PIs in combination with a NRTI backbone as the initial regimen decreased from 9.1% in 2016 to 1.0% in 2025.

In the period 2016-2025, between 0.8% and 2.5% of individuals (2.5% in 2025) initiated ART with a dual anchor-drug regimen. As explained above, this excludes individuals in whom the abovementioned strategy was implemented of starting with a dual anchor-drug regimen quickly followed by a simplification to a standard guideline-recommended regimen when this was deemed to be safe.

Figure 3.2B shows all individual anchor-drug additions to the NRTI backbone that were used as part of the initial regimen in at least 5% of individuals during one or more calendar years between 2016-2025. The regimens that were used less frequently have therefore been included in the category 'other' in *Figure 3.2B*. Full details on the initial regimens are shown in *Table 3.2*.

Figure 3.2A&B: *Anchor-class (A) and individual anchor-drug (B) plus nucleoside reverse transcriptase backbone used as part of the initial regimen in 2016-2025.*

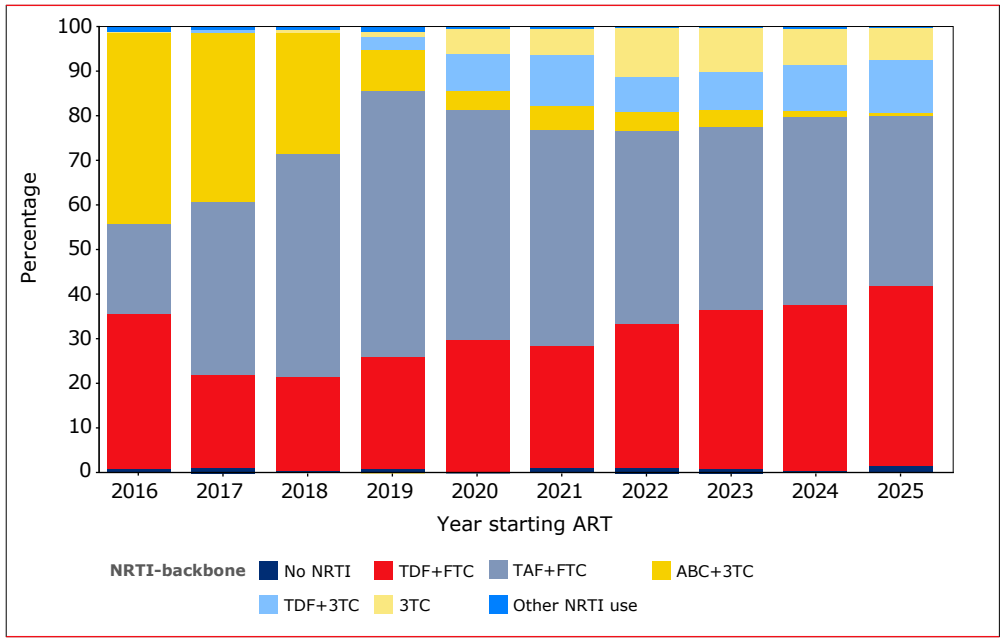




Legend: *ART = antiretroviral therapy; b = boosted (cobicistat or ritonavir); BIC = bictegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; INSTI = integrase inhibitor; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; PI = protease inhibitor; RPV = rilpivirine.*

Figure 3.3 provides an overview of the NRTI backbone components of the initial regimens used in 2016-2025. The combination of tenofovir disoproxil fumarate (TDF) or alafenamide (TAF) with emtricitabine (FTC) was the predominant backbone prescribed. Following its introduction at the end of 2015, use of TAF in in initial ART regimens rapidly increased with a maximum of 60.1% in 2019, but has since slowly declined to 38.1% in 2025. At the same time, TDF use increased from a low of 21.1% in 2018, after which its use increased again to 52.6% in 2025. The use of abacavir steadily decreased from a high of 43.0% of all initial regimens in 2016 to 1.0% in 2025.

Figure 3.3: Nucleoside analogue reverse transcriptase inhibitor backbone used as part of the initial regimen in 2016-2025.



Legend: *ART = antiretroviral therapy; 3TC = lamivudine; ABC = abacavir; FTC = emtricitabine; NRTI = nucleoside analogue reverse transcriptase inhibitor; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.*

The most common ART regimens initiated in 2016-2025 are presented in *Table 3.2*. In 2025, the most frequently used initial regimen was TDF/FTC/DTG (39.5%). TAF/FTC/bictegravir (BIC) was used in 33.3% and TDF/3TC/doravirine (DOR) in 10.4% of initial regimens (*Figure 3.4*). *Table 3.2* provides more detail on the other initial regimens and other calendar years that are not further specified in *Figures 3.2A&B, 3.3 and 3.4*. In 2025 97.3% of people initiating ART used a DHHS guideline recommended regimen or a regimen recommended in certain clinical situations.

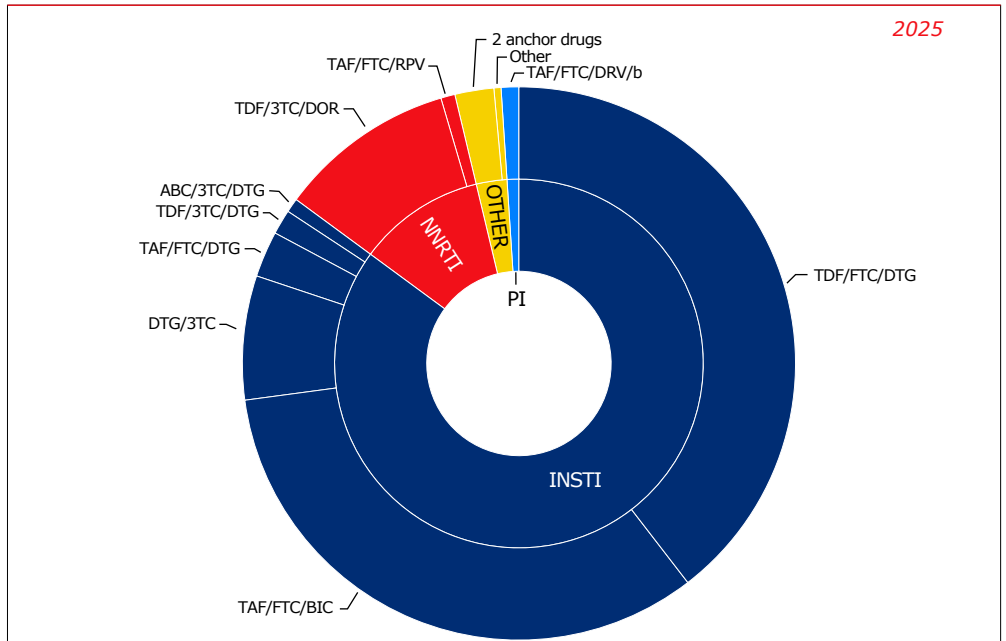
Table 3.2: Initial regimens in 2016-2025.

		2016-2020	2021	2022	2023	2024	2025	2016-2025
	n	3,948	474	503	540	536	483	6,484
INSTI + NRTI								
TAF/FTC/BIC	n	640	210	198	196	207	161	1,612
	%	16.2	44.3	39.4	36.3	38.6	33.3	24.9
TDF/FTC/DTG	n	529	115	152	182	191	191	1,360
	%	13.4	24.3	30.2	33.7	35.6	39.5	21
ABC/3TC/DTG	n	1,062	25	21	20	7	4	1,139
	%	26.9	5.3	4.2	3.7	1.3	0.8	17.6
3TC/DTG	n	44	28	54	53	43	35	257
	%	1.1	5.9	10.7	9.8	8	7.2	4
TAF/FTC/DTG	n	127	9	10	9	5	13	173
	%	3.2	1.9	2	1.7	0.9	2.7	2.7
TDF/3TC/DTG	n	13	7	9	9	13	7	58
	%	0.3	1.5	1.8	1.7	2.4	1.4	0.9
TAF/FTC/EVG/b	n	645	2	.	1	.	.	648
	%	16.3	0.4	.	0.2	.	.	10
TDF/FTC/EVG/b	n	146	2	.	.	.	.	148
	%	3.7	0.4	.	.	.	.	2.3
TDF/FTC/RAL	n	29	4	1	1	.	.	35
	%	0.7	0.8	0.2	0.2	.	.	0.5
Other NRTI + INSTI	n	32	2	.	1	2	.	37
	%	0.8	0.4	.	0.2	0.4	.	0.6
NNRTI + NRTI								
TDF/3TC/DOR	n	46	44	31	36	43	50	250
	%	1.2	9.3	6.2	6.7	8	10.4	3.9
TDF/FTC/EFV	n	82	2	4	1	1	.	90
	%	2.1	0.4	0.8	0.2	0.2	.	1.4
TAF/FTC/RPV	n	68	1	3	2	2	4	80
	%	1.7	0.2	0.6	0.4	0.4	0.8	1.2
TDF/FTC/RPV	n	36	2	.	1	.	.	39
	%	0.9	0.4	.	0.2	.	.	0.6
TDF/FTC/NVP	n	12	1	.	.	.	.	13
	%	0.3	0.2	.	.	.	.	0.2
Other NRTI + NNRTI	n	18	2	.	2	.	.	22
	%	0.5	0.4	.	0.4	.	.	0.3

PI + NRTI								
TAF/FTC/DRV/b	n	146	5	5	13	11	5	185
	%	3.7	1.1	1	2.4	2.1	1	2.9
TDF/FTC/DRV/b	n	140	2	2	2	2	.	148
	%	3.5	0.4	0.4	0.4	0.4	.	2.3
TDF/FTC/ATV/b	n	30	.	.	.	.	.	30
	%	0.8	.	.	.	.	.	0.5
TDF/FTC/LPV/b	n	1	.	.	.	.	.	1
	%	0	.	.	.	.	.	0
Other NRTI + PI	n	26	.	.	1	.	.	27
	%	0.7	.	.	0.2	.	.	0.4
2 anchor-drugs								
DTG/DRV/b	n	23	4	5	3	1	3	39
	%	0.6	0.8	1	0.6	0.2	0.6	0.6
DTG/RPV	n	1	.	.	.	1	1	3
	%	0	.	.	.	0.2	0.2	0
CAB/RPV-LA	n	.	.	.	1	.	1	2
	%	.	.	.	0.2	.	0.2	0
2 anchor-drugs w/wo NRTI	n	46	7	7	5	6	6	77
	%	1.2	1.5	1.4	0.9	1.1	1.2	1.2
Other ART	n	6	.	1	1	1	2	11
	%	0.2	.	0.2	0.2	0.2	0.4	0.2

Legend: *b = boosted (cobicistat or ritonavir); 3TC = lamivudine; ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LPV = lopinavir; INSTI = integrase inhibitor; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; NVP = nevirapine; PI = protease inhibitor; RPV = rilpivirine; RAL = raltegravir; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.*

Figure 3.4: The initial antiretroviral therapy regimens given in 2025.



Legend: *3TC = lamivudine; ABC = abacavir; b = boosted (cobicistat or ritonavir); BIC = bictegravir; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; INSTI = integrase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; NRTI = nucleoside analogue reverse transcriptase inhibitor; PI = protease inhibitor; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.*

In care and on ART

A total of 27,108 people with HIV were in care and on ART at some point during the 10-year period from January 2016 to December 2025. The number of people who had initiated ART and were in active follow-up grew from 18,972 individuals in 2016 to 23,094 individuals in 2025. Over time new individuals enrol into the cohort as they enter HIV care in one of the Dutch HIV treatment centres, or they leave the cohort when they die, move abroad, withdraw consent, or otherwise become lost to follow-up. In this section we have not excluded people who (temporarily) interrupted ART from the analyses. Most of these individuals had medical, psychiatric, and/or psycho-social issues that temporarily prevented them from continuing ART, and most of them re-started ART when those issues had been sufficiently resolved.

Table 3.3 shows the evolution over the last 10 years of the size, demographical, clinical and ART characteristics of the treated individuals who constitute the cohort. For selected calendar years a cross section of the cohort is shown of all people in active follow-up in the cohort during that particular calendar year. For each included individual the status at the last clinic visit of that calendar year was used. In 2025, 23,094 people on ART were in care at some point during the calendar year. In 2025, 18,821 (81.5%) were men, and 14,345 (62.1%) were MSM. Their median age was 53.7 (IQR 43.2-62.2) years. The majority (53.9%) originated from the Netherlands, followed by Latin America / the Caribbean (13.4%, 3.9% were from Surinam and 3.4% from the Dutch Antilles) and sub-Saharan Africa (12.1%). They had been diagnosed with HIV a median of 15.4 (IQR 9.3-21.7) years ago and started their first-line ART regimen a median of 13.3 (IQR 8.5-19.2) years ago. Their most recently measured viral load was <50 c/ml in 95.3% (97.9% <200 c/ml), and 80.4% had a last measured CD4 count of 500 cells/mm^3 or higher.

Table 3.3: Yearly cross-sectional description of the characteristics of people in care receiving antiretroviral therapy between 2016-2025.

Calendar year		2016	2021	2022	2023	2024	2025
Total population size	n	18,972	21,718	22,212	22,658	22,982	23,094
Age	Median	48.7	51.7	52.1	52.7	53.2	53.7
	Q1	40.2	41.8	42.2	42.5	42.8	43.2
	Q3	56.2	59.5	60.2	60.8	61.5	62.2
Male sex (at birth)	n	15,503	17,822	18,141	18,499	18,748	18,821
	%	81.7	82.1	81.7	81.6	81.6	81.5
HIV acquisition group							
MSM	n	11,887	13,695	13,901	14,133	14,324	14,345
	%	62.7	63.1	62.6	62.4	62.3	62.1
Men other than MSM	n	3,422	3,822	3,918	4,018	4,058	4,097
	%	18	17.6	17.6	17.7	17.7	17.7
Women	n	3,467	3,893	4,067	4,153	4,227	4,265
	%	18.3	17.9	18.3	18.3	18.4	18.5
Transgender people	n	196	308	326	354	373	387
	%	1	1.4	1.5	1.6	1.6	1.7
Region of origin							
The Netherlands	n	11,452	12,482	12,484	12,499	12,518	12,455
	%	60.4	57.5	56.2	55.2	54.5	53.9
Western Europe/North	n	1,243	1,356	1,350	1,371	1,374	1,359
America/Australia	%	6.6	6.2	6.1	6.1	6	5.9
Eastern/central Europe	n	617	1,008	1,313	1,447	1,544	1,614
	%	3.3	4.6	5.9	6.4	6.7	7
Latin America/Caribbean	n	2,137	2,777	2,848	2,978	3,060	3,091
	%	11.3	12.8	12.8	13.1	13.3	13.4
Sub-Saharan Africa	n	2,367	2,583	2,627	2,691	2,765	2,804
	%	12.5	11.9	11.8	11.9	12	12.1
Other	n	1,156	1,512	1,590	1,672	1,721	1,771
	%	6.1	7	7.2	7.4	7.5	7.7
CD4 at start ART							
No data	n	1,470	2,318	2,666	2,876	3,081	3,203
	%	7.7	10.7	12	12.7	13.4	13.9
<50	n	1,921	2,100	2,123	2,146	2,151	2,142
	%	10.1	9.7	9.6	9.5	9.4	9.3
50-199	n	3,928	4,140	4,146	4,158	4,138	4,113
	%	20.7	19.1	18.7	18.4	18	17.8
200-349	n	5,622	5,856	5,848	5,878	5,839	5,793
	%	29.6	27	26.3	25.9	25.4	25.1
350-499	n	3,226	3,645	3,680	3,732	3,760	3,767
	%	17	16.8	16.6	16.5	16.4	16.3
500+	n	2,805	3,659	3,749	3,868	4,013	4,076
	%	14.8	16.8	16.9	17.1	17.5	17.6

Calendar year		2016	2021	2022	2023	2024	2025
Viral load at start ART	Median	4.9	4.9	4.9	4.9	4.9	4.9
	Q1	4.3	4.3	4.3	4.3	4.3	4.3
	Q3	5.3	5.3	5.4	5.4	5.4	5.4
Years known HIV+	Median	9.7	12.8	13.4	14.1	14.7	15.4
	Q1	5.2	7.4	7.9	8.3	8,8	9.3
	Q3	15.5	18.9	19.6	20.3	21	21.7
Years since start ART	Median	7.5	10.7	11.3	12	12.5	13.3
	Q1	3.5	6.4	6.9	7.4	8	8.5
	Q3	13.5	16.5	17.2	17.9	18.5	19.2
Current CD4 count							
Missing*	n	20	29	28	30	18	11
	%	0.1	0.1	0.1	0.1	0.1	0
<50	n	68	61	63	61	54	50
	%	0.4	0.3	0.3	0.3	0.2	0.2
50–199	n	468	418	430	426	406	386
	%	2.5	1.9	1.9	1.9	1.8	1.7
200–349	n	1,432	1,441	1,481	1,399	1,315	1,257
	%	7.5	6.6	6.7	6.2	5.7	5.4
350–499	n	3,018	3,117	2,992	2,865	2,783	2,820
	%	15.9	14.4	13.5	12.6	12.1	12.2
500–749	n	6,811	7,336	7,399	7,281	7,259	7,271
	%	35.9	33.8	33.3	32.1	31.6	31.5
750+	n	7,155	9,316	9,819	10,596	11,147	11,299
	%	37.7	42.9	44.2	46.8	48.5	48.9
Viral load <50 c/ml							
Missing	n	12	15	20	14	6	5
	%	0.1	0.1	0.1	0.1	0	0
≥50 c/ml	n	1,670	1,000	1,108	1,022	1,042	1,070
	%	8.8	4.6	5	4.5	4.5	4.6
<50 c/ml	n	17,290	20,703	21,084	21,622	21,934	22,019
	%	91.1	95.3	94.9	95.4	95.4	95.3
Viral load <200 c/ml							
Missing	n	12	15	20	14	6	5
	%	0.1	0.1	0.1	0.1	0	0
≥200 c/ml	n	678	497	548	515	475	473
	%	3.6	2.3	2.5	2.3	2.1	2
<200 c/ml	n	18,282	21,206	21,644	22,129	22,501	22,616
	%	96.4	97.6	97.4	97.7	97.9	97.9

Calendar year		2016	2021	2022	2023	2024	2025
ART regimen							
INSTI + NRTI							
TAF/FTC/BIC	n	9	3,170	3,580	3,973	4,381	4,619
	%	0	14.6	16.1	17.5	19.1	20
TDF/FTC/DTG	n	734	770	919	991	1,050	1,083
	%	3.9	3.5	4.1	4.4	4.6	4.7
ABC/3TC/DTG	n	2,940	2,177	1,891	1,608	1,283	1,016
	%	15.5	10	8.5	7.1	5.6	4.4
3TC/DTG	n	50	1,734	2,374	3,063	3,710	4,284
	%	0.3	8	10.7	13.5	16.1	18.6
TAF/FTC/DTG	n	141	527	498	471	436	432
	%	0.7	2.4	2.2	2.1	1.9	1.9
TDF/3TC/DTG	n	12	24	65	79	73	79
	%	0.1	0.1	0.3	0.3	0.3	0.3
TAF/FTC/EVG/b	n	1,522	2,272	2,016	1,808	1,657	1,562
	%	8	10.5	9.1	8	7.2	6.8
TDF/FTC/EVG/b	n	988	532	458	399	356	322
	%	5.2	2.4	2.1	1.8	1.5	1.4
TDF/FTC/RAL	n	299	161	134	101	91	84
	%	1.6	0.7	0.6	0.4	0.4	0.4
Other INSTI + NRTI	n	157	220	185	168	152	137
	%	0.8	1	0.8	0.7	0.7	0.6
NNRTI + NRTI							
TDF/3TC/DOR	n	2	1,404	1,643	1,853	2,055	2,277
	%	0	6.5	7.4	8.2	8.9	9.9
TDF/FTC/EFV	n	2,513	1,224	1,051	943	854	658
	%	13.2	5.6	4.7	4.2	3.7	2.8
TAF/FTC/RPV	n	176	992	953	922	887	857
	%	0.9	4.6	4.3	4.1	3.9	3.7
TDF/FTC/RPV	n	1,471	434	366	319	269	246
	%	7.8	2	1.6	1.4	1.2	1.1
TAF/FTC/NVP	n	203	722	717	707	681	646
	%	1.1	3.3	3.2	3.1	3	2.8
TDF/FTC/NVP	n	1,912	914	788	698	615	572
	%	10.1	4.2	3.5	3.1	2.7	2.5
ABC/3TC/NVP	n	549	295	254	210	176	133
	%	2.9	1.4	1.1	0.9	0.8	0.6
Other NNRTI + NRTI	n	530	314	274	251	241	237
	%	2.8	1.4	1.2	1.1	1	1

Calendar year		2016	2021	2022	2023	2024	2025
PI + NRTI							
TAF/FTC/DRV/b	n	90	1,275	1,279	1,291	1,290	1,265
	%	0.5	5.9	5.8	5.7	5.6	5.5
TDF/FTC/DRV/b	n	1,369	409	340	269	226	190
	%	7.2	1.9	1.5	1.2	1	0.8
TDF/FTC/ATV/b	n	691	156	121	80	62	49
	%	3.6	0.7	0.5	0.4	0.3	0.2
TDF/FTC/LPV/b	n	76	16	10	5	3	3
	%	0.4	0.1	0	0	0	0
Other PI + NRTI	n	681	242	192	167	135	112
	%	3.6	1.1	0.9	0.7	0.6	0.5
2 anchor-drugs							
DTG/DRV/b	n	191	357	372	383	389	372
	%	1	1.6	1.7	1.7	1.7	1.6
DTG/RPV	n	12	129	138	146	155	162
	%	0.1	0.6	0.6	0.6	0.7	0.7
CAB/RPV injectables #	n	.	69	497	720	805	882
	%	.	0.3	2.2	3.2	3.5	3.8
2 anchor-drugs w/wo NRTI	n	561	428	391	374	357	338
	%	3	2	1.8	1.7	1.6	1.5
Other ART	n	654	352	335	315	301	305
	%	3.4	1.6	1.5	1.4	1.3	1.3
ART temporarily interrupted	n	439	399	371	344	292	172
	%	2.3	1.8	1.7	1.5	1.3	0.7

Legend: *3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LPV = lopinavir; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

** Whenever possible we used last-observation-carried-forward to impute missing values.*

 # Some individuals using this regimen were participating in a clinical trial.

Among the 23,094 individuals in HIV care and on ART in 2025, the vast majority (90.6%) received a regimen based on one or two NRTIs, combined with either (*Figure 3.5A*) an integrase inhibitor (INSTI) (59.0%), a non-nucleoside reverse transcriptase inhibitor (NNRTI) (24.4%), or a protease inhibitor (PI) (7.2%).

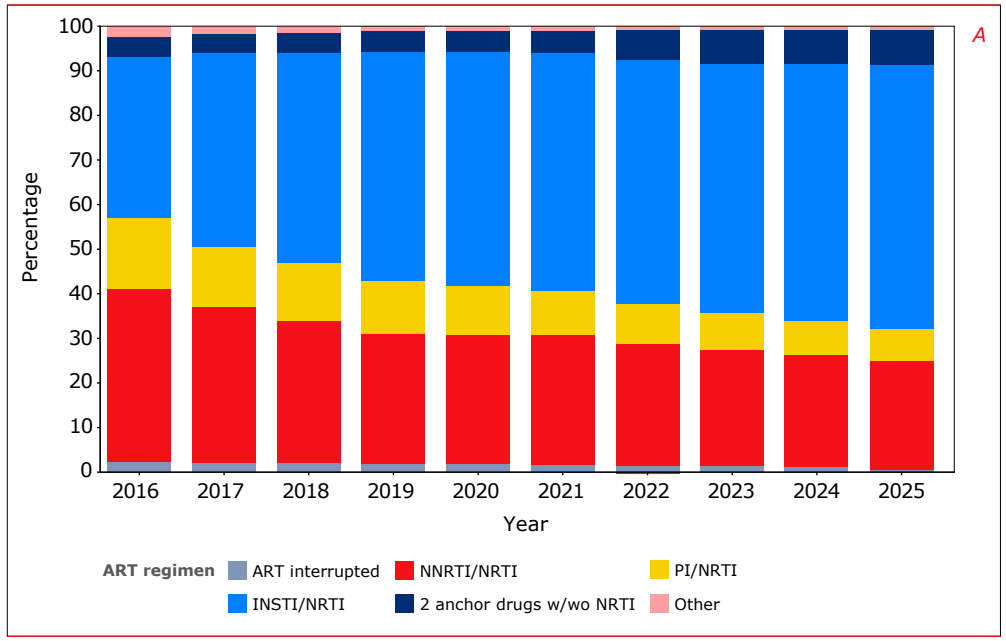
The proportion of individuals who had (temporarily) interrupted ART at the end of the calendar year, decreased from 2.3% in 2016 to 0.7% in 2025. In a later section in this chapter more details are shown about the number, reasons, duration and outcome of these treatment interruptions.

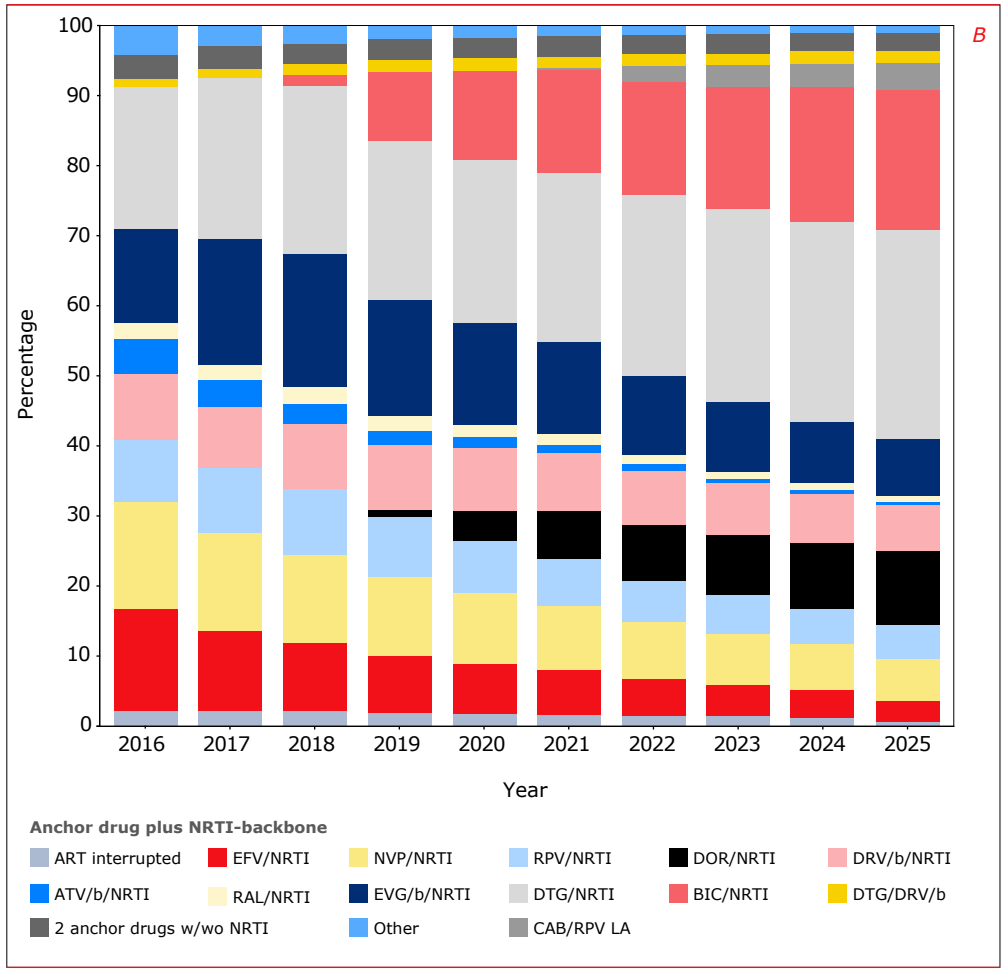
The changes over time in the distribution of specific ART regimens among the population in care in 2016-2025 are presented in *Figure 3.5B* and *3.7* and in *Table 3.3*. The most frequently used regimens in 2025 (used by at least 5% of the cohort) were:

- tenofovir alafenamide (TAF)/emtricitabine (FTC)/bictegravir (BIC) (20.0%);
- dolutegravir (DTG)/lamivudine (3TC) (18.6%);
- tenofovir disoproxil fumarate (TDF)/lamivudine (3TC)/doravirine (DOR) (9.9%);
- tenofovir alafenamide (TAF)/emtricitabine (FTC)/elvitegravir (EVG)/cobicistat (6.8%); and
- tenofovir alafenamide (TAF)/emtricitabine (FTC)/darunavir (DRV)/cobicistat (5.5%)

In 2025, the use of regimens consisting of 2 anchor-drugs (an NNRTI, PI, or INSTI) with or without one or two additional NRTI, was 7.6%. The most common of these regimens were a combination of cabotegravir/rilpivirine injectables (3.8%), dolutegravir/darunavir/cobicistat (1.6%), and dolutegravir/rilpivirine (0.7%).

Figure 3.5A&B: *Anchor-drug class (A) and individual anchor-drugs (B) plus nucleoside reverse transcriptase backbone used as part of the current regimen in 2016-2025.*

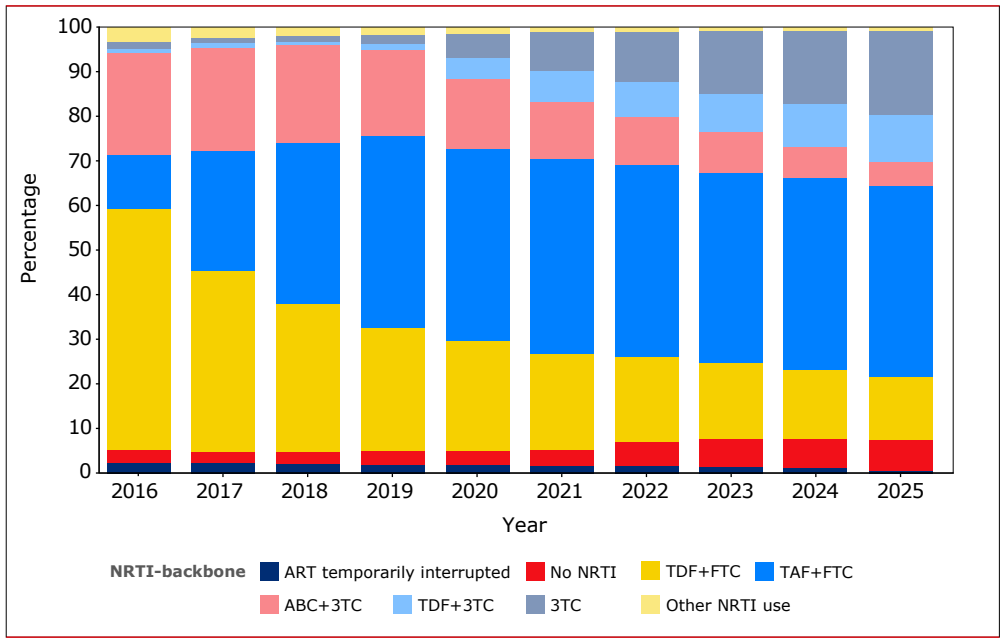




Legend: *ART = antiretroviral therapy; b = boosted (cobicistat or ritonavir); ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; INSTI = integrase inhibitor; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine.*

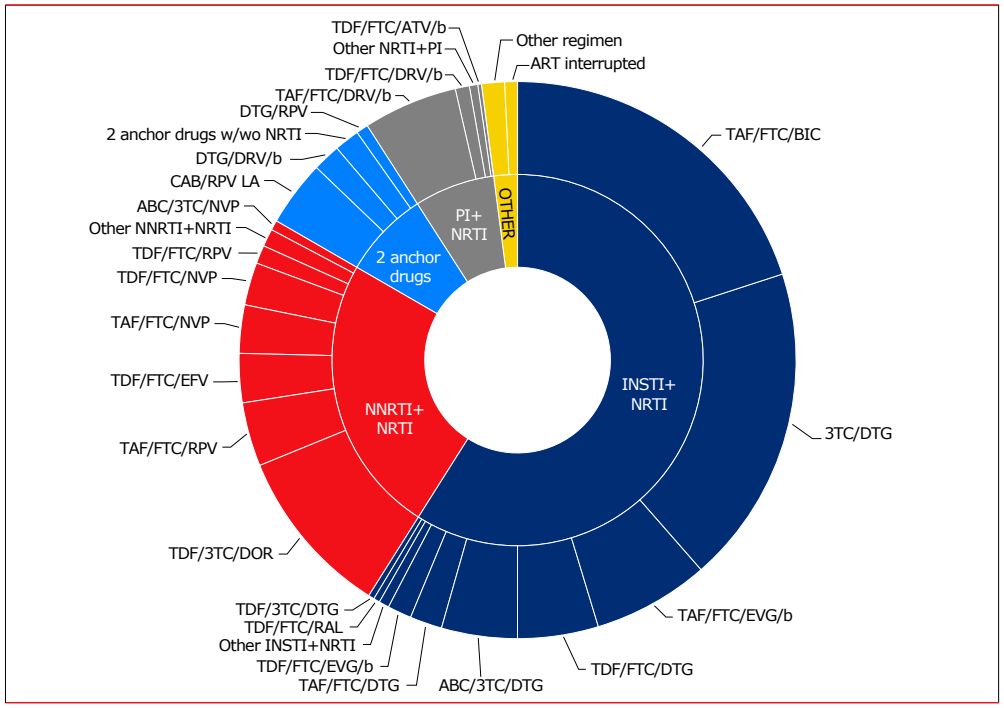
Figure 3.6 provides an overview of the NRTI backbone components of the current ART regimens used in 2016-2025. The combination of tenofovir disoproxil fumarate (TDF) or alafenamide (TAF) with emtricitabine (FTC) or lamivudine (3TC) was the predominant backbone used, being part of 67.7% of the regimen used in 2016, and 67.2% in 2025. Following its introduction at the end of 2015, use of TAF in ART regimens rapidly increased to 42.9% of all regimens used since 2019 and has since remained stable at that level. At the same time, TDF use decreased from 55.7% of all regimens used in 2016 to 29.2% in 2019, after which TDF use slowly continued to decrease to 24.5% in 2025. ABC was used in 22.6% of all regimens in 2016. Following the introduction of the fixed dose combination ABC/3TC/DTG its use increased to 23.1% in 2017, after which its use slowly decreased to 5.6% of all regimens used in 2025.

***Figure 3.6:** Nucleoside analogue reverse transcriptase inhibitor backbone used as part of the current regimen in 2016–2025.*



***Legend:** ART = antiretroviral therapy; 3TC = lamivudine; ABC = abacavir; FTC = emtricitabine; NRTI = nucleoside analogue reverse transcriptase inhibitor; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate.*

***Figure 3.7:** antiretroviral therapy use in 2025.*



***Legend:** 3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

Treatment modifications

For the 27,108 individuals who were on ART between January 2016 and December 2025, we assessed the frequency and reported reasons for modifications and (temporary) interruptions of ART. The unit of analysis for this section is therefore the treatment episodes, and a single individual can contribute multiple treatment episodes with multiple regimens to this analysis.

Modification of ART was defined as a change in, or discontinuation of, one or more of the drugs included in the regimen. Simplification to a fixed-drug combination formulation containing the same antiretroviral agents (in the same dose) was not considered a modification of the regimen. Likewise, the breakup of a (more expensive) single tablet regimen (STR) into separately formulated (cheaper) generic components of the original STR, was also not considered a modification. A switch from one pharmacological booster to another was also ignored. We also ignored treatment interruptions that lasted less than 14 days. Whenever an individual became lost to follow-up (e.g. because they moved abroad) this was not considered to be a regimen discontinuation, instead regimens used at the end of available follow-up were categorized as "treatment episode still ongoing".

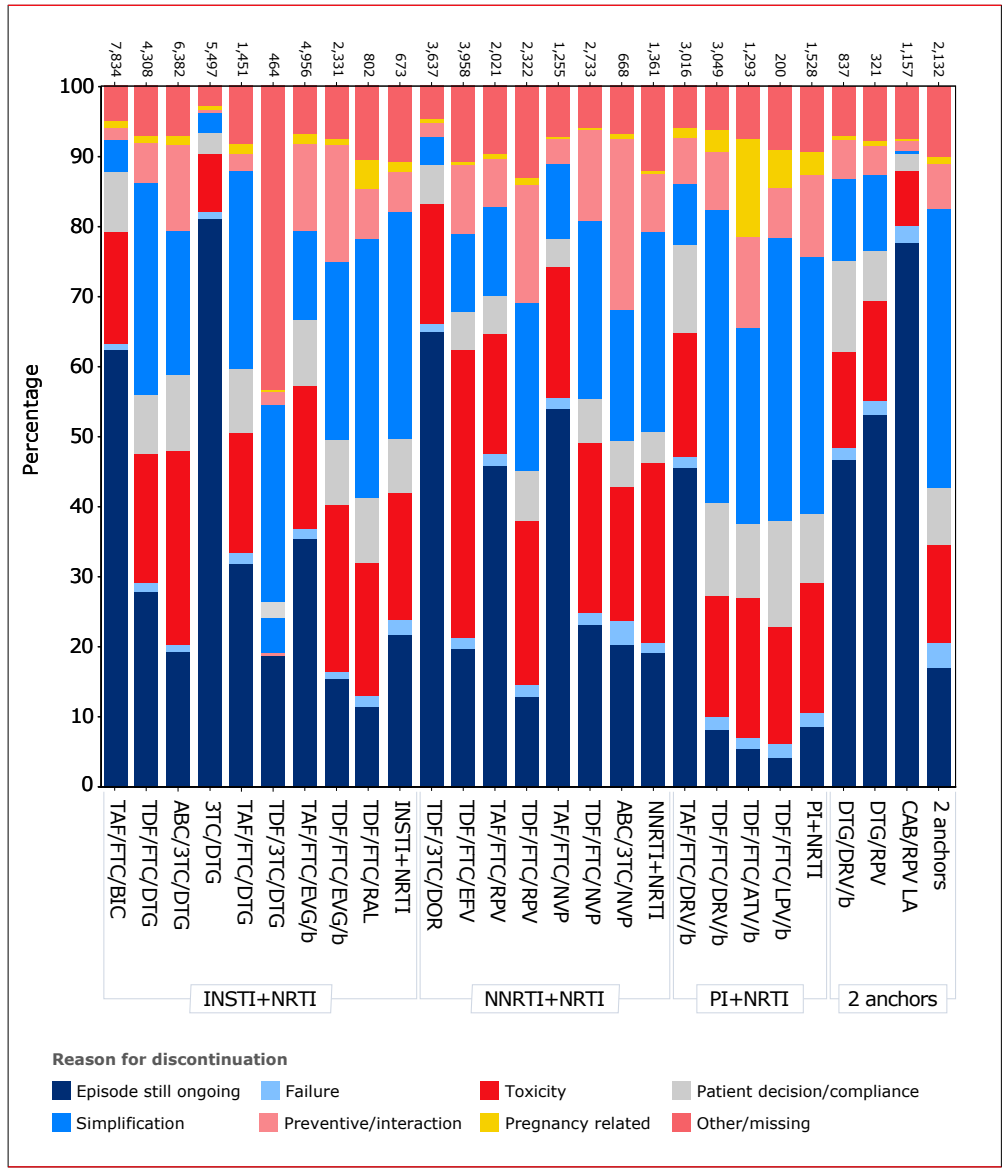
For each commonly used regimen we report the total number of treatment episodes with that regimen, the cumulative persons years of exposure to that regimen, the frequency of treatment modifications, and the distribution of the reasons for modification of that regimen. The denominator for these analyses is the total number of treatment episodes with any particular regimen (*Table 3.4*).

During the period 2016 to 2025, the cohort of 27,108 individuals on ART accrued a total of 198,939 person years of follow-up, during which a total of 75,536 ART regimen episodes were registered. At the end of the follow-up period in 2025 (but for some individuals follow-up ended earlier, i.e. because they died, moved out of the country, or otherwise became disengaged from HIV care), 33.2% of these regimen episodes were still ongoing, and 66.8% of the regimen episodes had ended in a regimen modification. The most common reasons for regimen modification were: toxicity (17.6%), treatment simplification (16.5%), patient decision/compliance (7.2%), and preventive modifications (6.7%). In only 1,078 (1.4%) regimens the reported reason for modification was virological treatment failure. Specific reasons for 'preventive modifications' consist of (CVD) risk optimization, prevention of long term renal, bone and metabolic toxicities, drug-drug interactions, (further) weight gain, etc.

Table 3.4 provides these statistics for all commonly used regimen and *Figure 3.8* provides a visual presentation of the same data. However, it should be noted that the average duration of exposure varies greatly for different regimens, which biases cross-regimen comparisons and making differences difficult to interpret. The apparent persistence of newer regimens is partly an artefact of follow-up time: having been available for less time, there has been less opportunity for discontinuation. Appendix *Table 3.1* provides the rates of the various reasons for treatment modifications for each particular regimen per 1,000 person years of cumulative exposure.

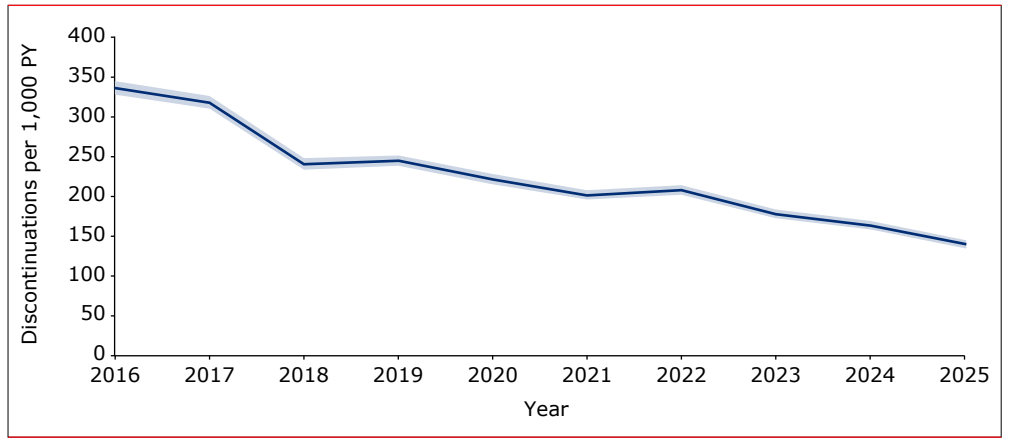
During the period 2016-2025, the overall rate of regimen changes was 222.1 modifications per 1,000 person years of follow-up. This rate peaked in 2016 at 336.2 modifications per 1,000 person years, after which the rate continuously decreased to 139.6 in 2025 (*Figure 3.9*).

Figure 3.8: *Reasons for discontinuation / modification of antiretroviral therapy (ART) used in 2016–2025. The number at the top of each bar represent the total number of treatment episodes with that particular ART regimen.*



Legend: *3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ATV = atazanavir; ART = antiretroviral therapy; BIC = bictegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

Figure 3.9: *Rate of regimen modifications in 2016–2025.*



Legend: *Blue band represents the 95% confidence interval.*

Table 3.4: Exposure to various ART regimen and reasons for discontinuation / modification in the period 2016–2025.

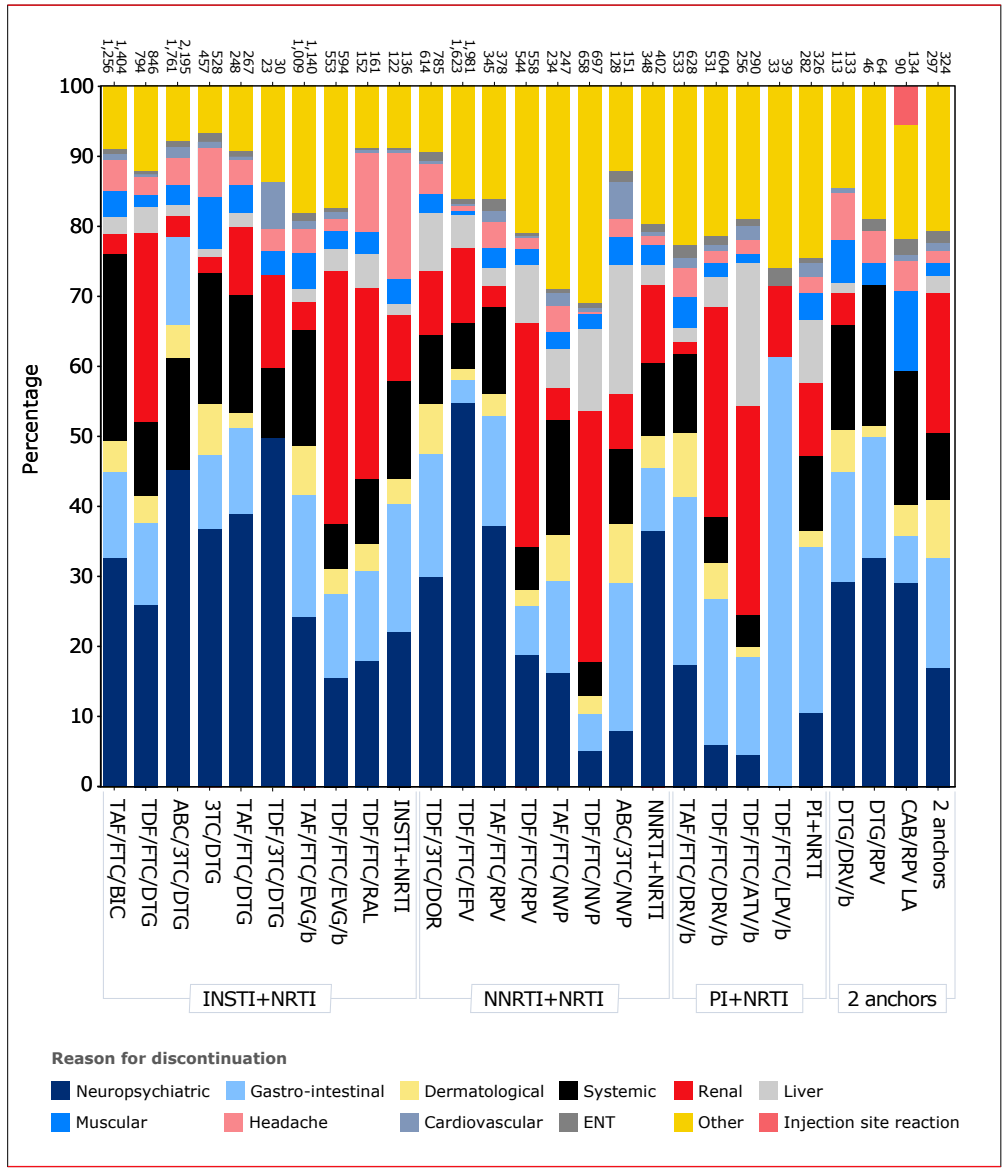
	Person years exposure	Total ART episodes	Reasons for discontinuation / modification				Reasons for discontinuation / modification											
			Episode still ongoing		Failure		Toxicity		Patient decision/ compliance		Simplification		Preventive/ interaction		Pregnancy related		Missing / Other reasons	
	PY	n	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total dataset	198939	75536	25113	33.2	1078	1.4	13318	17.6	5462	7.2	12490	16.5	5081	6.7	776	1	12218	16.2
INSTI + NRTI																		
TAF/FTC/BIC	21072	7834	4892	62.4	68	0.9	1256	16	669	8.5	345	4.4	152	1.9	58	0.7	394	5
TDF/FTC/DTG	7603	4308	1216	28.2	52	1.2	794	18.4	355	8.2	1303	30.2	246	5.7	40	0.9	302	7
ABC/3TC/DTG	22571	6382	1247	19.5	66	1	1761	27.6	687	10.8	1318	20.7	770	12.1	88	1.4	445	7
3TC/DTG	13723	5497	4460	81.1	56	1	457	8.3	159	2.9	153	2.8	25	0.5	37	0.7	150	2.7
TAF/FTC/DTG	4145	1451	465	32	23	1.6	248	17.1	133	9.2	408	28.1	36	2.5	20	1.4	118	8.1
TDF/3TC/DTG	306	464	88	19	2	0.4	23	5	10	2.2	131	28.2	8	1.7	2	0.4	200	43.1
TAF/FTC/EVG/b	20283	4956	1763	35.6	77	1.6	1009	20.4	465	9.4	630	12.7	608	12.3	73	1.5	331	6.7
TDF/FTC/EVG/b	6250	2331	365	15.7	27	1.2	553	23.7	214	9.2	590	25.3	388	16.6	20	0.9	174	7.5
TDF/FTC/RAL	1665	802	94	11.7	13	1.6	152	19	74	9.2	295	36.8	57	7.1	34	4.2	83	10.3
Other INSTI+NRTI	1833	673	148	22	14	2.1	122	18.1	51	7.6	218	32.4	39	5.8	10	1.5	71	10.5
NNRTI + NRTI																		
TDF/3TC/DOR	8738	3637	2366	65.1	47	1.3	614	16.9	204	5.6	143	3.9	73	2	21	0.6	169	4.6
TDF/FTC/EFV	14374	3958	791	20	65	1.6	1623	41	213	5.4	439	11.1	389	9.8	20	0.5	418	10.6
TAF/FTC/RPV	7865	2021	932	46.1	32	1.6	345	17.1	112	5.5	254	12.6	138	6.8	16	0.8	192	9.5
TDF/FTC/RPV	6641	2322	305	13.1	42	1.8	544	23.4	164	7.1	552	23.8	388	16.7	26	1.1	301	13
TAF/FTC/NVP	5581	1255	680	54.2	19	1.5	234	18.6	49	3.9	135	10.8	45	3.6	2	0.2	91	7.3
TDF/FTC/NVP	10656	2733	639	23.4	50	1.8	658	24.1	171	6.3	696	25.5	353	12.9	5	0.2	161	5.9
ABC/3TC/NVP	3224	668	138	20.7	22	3.3	128	19.2	43	6.4	125	18.7	163	24.4	4	0.6	45	6.7
Other NNRTI+NRTI	3199	1361	263	19.3	21	1.5	348	25.6	61	4.5	388	28.5	110	8.1	6	0.4	164	12
PI + NRTI																		
TAF/FTC/DRV/b	9060	3016	1378	45.7	50	1.7	533	17.7	374	12.4	264	8.8	192	6.4	48	1.6	177	5.9
TDF/FTC/DRV/b	5979	3049	256	8.4	57	1.9	531	17.4	400	13.1	1270	41.7	254	8.3	94	3.1	187	6.1
TDF/FTC/ATV/b	2778	1293	73	5.6	23	1.8	256	19.8	138	10.7	528	40.8	137	10.6	42	3.2	96	7.4
TDF/FTC/LPV/b	278	200	9	4.5	4	2	33	16.5	30	15	81	40.5	14	7	11	5.5	18	9
Other PI+NRTI	3406	1528	137	9	30	2	282	18.5	151	9.9	558	36.5	179	11.7	50	3.3	141	9.2
2 anchor-drugs																		
DTG/DRV/b	2880	837	393	47	14	1.7	113	13.5	110	13.1	98	11.7	45	5.4	6	0.7	58	6.9
DTG/RPV	845	321	171	53.3	6	1.9	46	14.3	23	7.2	35	10.9	13	4	2	0.6	25	7.8
CAB/RPV injectables	2460	1157	899	77.7	29	2.5	90	7.8	28	2.4	6	0.5	15	1.3	3	0.3	87	7.5
2 anchor-drugs w/wo NRTI	4098	2132	370	17.4	75	3.5	297	13.9	172	8.1	849	39.8	131	6.1	23	1.1	215	10.1
Other ART	3919	2064	331	16	93	4.5	267	12.9	193	9.4	665	32.2	112	5.4	14	0.7	389	18.8

Legend: *3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LPV = lopinavir; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

The nature and severity of (presumed) ART-related toxicities leading to modification of the regimen have changed considerably over time. Because of the availability of a large number of potent and well-tolerated recommended and alternative regimens, with new treatment options becoming available regularly, as well as the very low risk of viral breakthrough following a switch, the threshold for modifying a regimen has in general become much lower over the years. *Figure 3.10* provides a visual breakdown of the reported ART-related adverse events leading to the modification of the various regimen. As more than one adverse event can be reported for each toxicity-driven regimen modification, the total number of adverse events reported in *Figure 3.10* is greater than the number of regimens.

There were 13,050 toxicity-driven regimen modifications for which specific adverse events were recorded: 15,042 individual adverse effects were recorded. The predominant adverse effects were: neuropsychiatric (mainly insomnia, mood changes, dizziness, and depression) 30.4%; gastrointestinal (mainly diarrhoea and nausea) 13.3%; renal (renal insufficiency and increased serum creatinine) 12.5%; systemic (tiredness, apathy, loss of appetite, weight gain) 12.2%; dermatological (rash due to medication, itching) 4.4%; and liver (increased transaminases) 4.3%.

Figure 3.10: *Adverse effects resulting in toxicity-related modifications of ART regimen used in the period 2016–2025. The bars represent the distribution of all reported adverse effects, by regimen. The numbers above the bars represent 1) the total number of adverse effects reported as reasons for regimen modification (top row), and 2) the total number of times that particular regimen was modified because of adverse effects (bottom row).*



Treatment interruptions

We have analysed treatment interruptions separately from regimen modifications. During the period 2016-2025, the proportion of individuals at any particular time that have interrupted their use of ART has continued to decrease. The proportion of individuals who had started ART at least 6 months ago, who at yearly cross-sectional evaluation of the virological response were observed to have (temporarily) interrupted ART, decreased from 1.9% in 2016 to 0.7% in 2025 (see *Figure 3.11* from the next section on Virological response).

During the period 2016-2025, the cohort of 27,108 individuals accrued a total of 198,939 person years of follow-up, in which a total of 75,536 ART regimens were used. In 2,577 individuals a total of 4,203 treatment interruptions (of 14 days or longer) were recorded (*Table 3.5*). However, it must be assumed that many more treatment interruptions have not been disclosed and hence have gone unrecorded in the medical dossier (see also the next paragraph on loss of viral suppression, where we show evidence of frequent episodes of loss of viral suppression followed by a return to undetectable levels without a change in the treatment regimen).
In most of the treatment interruptions, patients themselves interrupted ART (75.2%), with their treating physicians becoming aware of the interruption only during the next clinic visit. Unfortunately, we cannot with certainty determine from the available data if these treatment interruptions were caused by the circumstances of the patient (e.g. unintentionally running out of medicine while on vacation), or secondly if the patients themselves actively decided to interrupt ART, or thirdly if the interruption was decided on by their treating physician. A further 10.8% of interruptions had ART-associated toxicity as the recorded reason, and 0.6% of interruptions were pregnancy-related.
The median duration of recorded treatment interruptions was 12.3 weeks (IQR 4.6–30.9). During many of the longer interruptions, most of these individuals had also effectively disengaged from care, with no visits to the HIV outpatient clinic for more than six months. In 68.4% of the interruptions the same regimen as that was used at the start of the treatment interruption was restarted.

We evaluated the median change in CD4 count during treatment interruptions of more than 90 days duration (n=2,057). In 935 of these 2,057 treatment interruptions of at least 90 days duration a pre-interruption CD4 count had been measured within 180 days of the start of the interruption (median 470, IQR 260 to 724, cells/mm^3). And in 1,182 episodes there was a CD4 count measured during (and at least 60 days after the start of) the treatment interruption (median 310, IQR 130 to 532 cells/mm^3). For 566 treatment interruptions of more than 90 days, a pre-interruption CD4 count was available and also a CD4 count that had been measured during the interruption. During these 566 interruptions the median change in the CD4 count was -120 (IQR -20 to -253) cells/mm^3.

Table 3.5: Frequency, duration and reasons for treatment interruptions in the period 2016–2025.

	Duration of interruption (weeks)			Patients	Total episodes	Reasons for interruption										Restarted same regimen
						Failure		Toxicity		Patient decision/ compliance		Pregnancy related		Other		
	Median	Q1	Q3	n	n	n	%	n	%	n	%	n	%	n	%	%
Total dataset	12.3	4.6	30.9	2577	4203	42	1.0	456	10.8	3162	75.2	24	0.6	519	12.3	68.4
INSTI + NRTI																
TAF/FTC/BIC	11.7	4.4	30.9	438	591	3	0.5	56	9.5	455	77.0	.	.	77	13.0	81.7
TDF/FTC/DTG	10.9	4.4	30.2	191	256	1	0.4	26	10.2	198	77.3	3	1.2	28	10.9	77.0
ABC/3TC/DTG	14.6	4.6	36.7	394	567	1	0.2	65	11.5	425	75.0	.	.	76	13.4	71.1
3TC/DTG	9.9	4.3	25.9	88	100	.	.	13	13.0	71	71.0	1	1.0	15	15.0	70.0
TAF/FTC/DTG	15.3	4.9	38.9	73	99	1	1.0	9	9.1	80	80.8	.	.	9	9.1	72.7
TDF/3TC/DTG	5.9	4.1	12.4	9	10	.	.	.	.	4	40.0	.	.	6	60.0	10.0
TAF/FTC/EVG/b	12.7	5.0	30.1	277	363	6	1.7	54	14.9	260	71.6	.	.	43	11.8	65.0
TDF/FTC/EVG/b	12.9	6.1	28.9	110	169	3	1.8	15	8.9	137	81.1	1	0.6	13	7.7	63.3
TDF/FTC/RAL	10.7	4.3	34.4	48	58	2	3.4	10	17.2	34	58.6	3	5.2	9	15.5	50.0
Other INSTI+NRTI	8.9	4.3	17.6	32	38	.	.	6	15.8	24	63.2	.	.	8	21.1	50.0
NNRTI + NRTI																
TDF/3TC/DOR	9.4	4.3	26.0	131	158	4	2.5	19	12.0	112	70.9	.	.	23	14.6	71.5
TDF/FTC/EFV	10.9	4.6	28.1	139	172	3	1.7	14	8.1	122	70.9	1	0.6	32	18.6	54.1
TAF/FTC/RPV	9.4	4.3	24.7	74	97	2	2.1	16	16.5	61	62.9	.	.	18	18.6	68.0
TDF/FTC/RPV	11.7	4.7	40.4	100	115	3	2.6	10	8.7	86	74.8	.	.	16	13.9	56.5
TAF/FTC/NVP	12.9	6.0	27.1	31	34	.	.	3	8.8	25	73.5	.	.	6	17.6	55.9
TDF/FTC/NVP	13.9	5.0	46.0	101	118	1	0.8	9	7.6	97	82.2	1	0.8	10	8.5	51.7
ABC/3TC/NVP	11.1	5.1	23.0	22	30	1	3.3	5	16.7	22	73.3	.	.	2	6.7	73.3
Other NNRTI+NRTI	8.6	5.4	19.6	43	51	2	3.9	7	13.7	29	56.9	1	2.0	12	23.5	60.8
PI + NRTI																
TAF/FTC/DRV/b	12.5	4.9	31.4	204	306	2	0.7	35	11.4	239	78.1	.	.	30	9.8	77.5
TDF/FTC/DRV/b	13.9	5.4	39.9	217	280	1	0.4	29	10.4	223	79.6	5	1.8	22	7.9	56.4
TDF/FTC/ATV/b	14.9	5.1	35.7	80	101	.	.	7	6.9	86	85.1	1	1.0	7	6.9	55.4
TDF/FTC/LPV/b	21.6	8.7	57.4	10	17	.	.	.	.	16	94.1	.	.	1	5.9	70.6
Other PI+NRTI	13.3	4.4	33.9	85	116	.	.	15	12.9	87	75.0	5	4.3	9	7.8	67.2
2 anchor-drugs																
DTG/DRV/b	10.6	4.7	25.3	57	73	.	.	3	4.1	64	87.7	.	.	6	8.2	83.6
DTG/RPV	4.4	3.3	22.4	13	18	1	5.6	2	11.1	14	77.8	.	.	1	5.6	72.2
CAB/RPV injectables	5.2	2.9	10.7	18	18	.	.	4	22.2	8	44.4	.	.	6	33.3	38.9
2 anchor-drugs w/wo NRTI	16.1	5.6	31.1	74	112	3	2.7	5	4.5	90	80.4	.	.	14	12.5	80.4
Other ART	7.7	4.4	23.6	96	121	2	1.7	19	15.7	85	70.2	1	0.8	14	11.6	60.3

Legend: *3TC = lamivudine; b = boosted (cobicistat or ritonavir); /r = ritonavir-boosted; /c = cobicistat-boosted; ABC = abacavir; ATV = atazanavir; ART = antiretroviral therapy; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LPV = lopinavir; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

Virological response

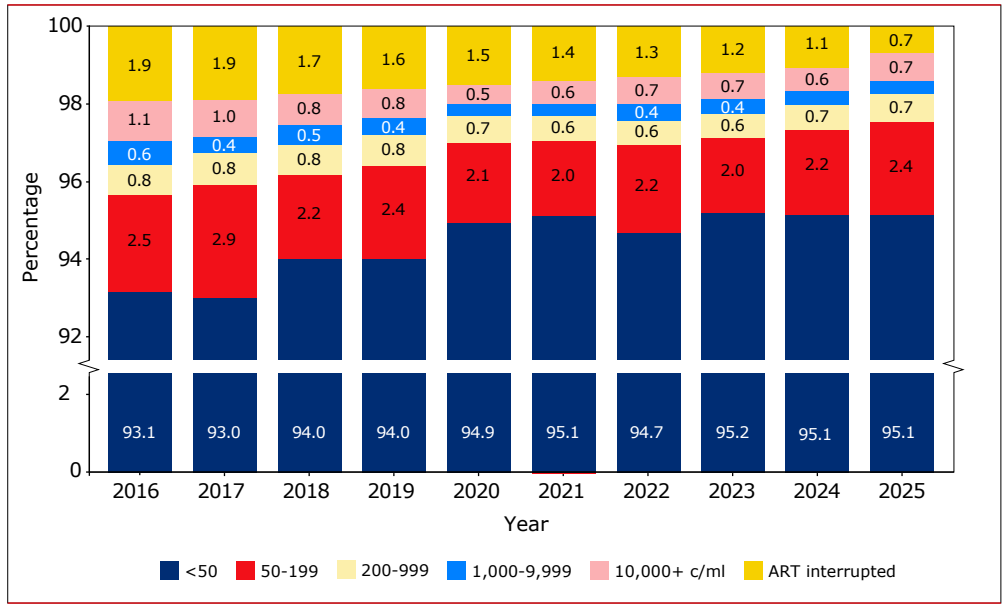
The study population for the analyses in this section consisted of all individuals on ART for more than 6 months who were in care during (part of) the period 2016-2025. For each calendar year between 2016 and 2025 we selected the last measured plasma HIV-RNA load measured in the 24 months prior to 31 December of that year. In the rare cases that no viral load had been measured in the investigated calendar nor in the year prior, that individual was excluded from the analysis of that calendar year.
Viral load measurements were classified into six categories (see also *Box 4.2*).
Five were defined by value:

1. <50 c/ml ("virally suppressed"; including "target not detected/undetectable", values "below the lower limit of quantification of the assay used", and "residual viraemia" below 50 c/ml),
2. 50–199 c/ml ("low-level viraemia", including isolated "blips"),
3. 200–999 c/ml,
4. 1,000–9,999 c/ml, and
5. ≥10,000 c/ml.
6. Measurements taken when ART was known to be interrupted; these were classified separately irrespective of the measured value.

At higher viral loads it becomes increasingly likely that ART had been interrupted at, or shortly before, the measurement, or that adherence was suboptimal — though these possibilities cannot be distinguished.
Figure 3.11 shows the distribution of the yearly cross-sectional viral load evaluations. During the last 10 years of follow-up, the proportion of individuals on ART for more than 6 months who had a viral load <50 c/ml increased from 93.1% in 2016 (95.7% <200 c/ml) to 95.1% (97.5% <200 c/ml) in 2025. Likewise, all viral load categories higher than 50 c/ml, decreased slowly over time (the number of analysed viral load measurements and more precise percentages are shown in Appendix *Table 3.2*).

Quantifiable viral loads between 50-199 c/ml are frequently observed. When a single isolated viral load measurement between 50-199 c/ml occurs preceded by and followed by viral load measurements <50 c/ml this is often referred to as a "blip". We investigated which proportion of the population on ART shows signs of sustained low-level viraemia, i.e. individuals who had multiple consecutive viral load measurements between 50-199 c/ml while on ART. We calculated what proportion of all viral load measurements within individuals classifies as low-level viraemia, in all 23,753 individuals who had started ART more than 6 months earlier, who had not interrupted ART, and who had at least 5 viral load measurements available for analysis in the period 2016-2025. Of all individuals on ART, 76.3% did not have a single viral load measurement between 50-199 c/ml. In 17.0% of individuals the proportion of viral load measurements between 50-199 c/ml was greater than 0% and up to 10%. In a further 4.9% this proportion was greater than 10% and up to 20% of all viral load measurements. And in 2.1% of all individuals there was evidence of sustained low-level viraemia with more than 20% of all their viral load measurements being between 50-199 c/ml.

Figure 3.11: *Yearly cross-sectional analysis of virological treatment response in people on ART for at least 6 months in 2016–2025.*



Box 4.2: Definitions of virological response.

Virological response

Viral suppression
HIV viral load below 50 c/ml in individuals on antiretroviral therapy (ART) for more than six months. This includes residual viraemia between 20-50 c/ml.

The last measured viral load measurement prior to 31 December of each calendar year was included in the analysis, irrespective of (temporary) treatment interruptions.

Viral 'blips'
A single quantifiable viral load measurement between 50-199 c/ml, preceded by and followed by viral load measurements <50 c/ml.

Low-level viraemia
Two or more consecutive viral load measurements between 50-199 c/ml.

Loss of viral suppression
Any viral load measurements of at least 200 c/ml in individuals on ART for more than six months.

Loss of viral suppression

Loss of viral suppression was defined as a viral load measurement of at least 200 c/ml in individuals on ART for more than six months. We assessed the frequency, magnitude, duration and outcome of all episodes of loss of viral suppression in all individuals on ART for more than 6 months and in care in the period 2016-2025.
Each individual could contribute more than one episode of loss of viral suppression to this analysis. We analysed episodes of loss of viral suppression that occurred during an ART interruption separately from those that occurred while ART had been used continuously. All analyses were stratified for MSM plus transgender people, men other than MSM, and women.
In those episodes that occurred while ART use was continued, we investigated whether the episode of loss of viral suppression resolved with or without a change in the ART regimen used. A major limitation is that we have very limited data on adherence. Nevertheless, the maximum viral load measured during episodes of loss of viral suppression is much higher (median 4.6 $\log_{10}$ c/ml) in those individuals who were known to have discontinued ART compared to individuals who indicated to still use ART (median 3.0 $\log_{10}$ c/ml).

Loss of viral suppression occurred in two distinct settings (Table 3.6): during a treatment interruption (2,084 episodes in 1,644 individuals) and while ART was assessed to have been used continuously (4,569 episodes in 3,107 individuals).

During treatment interruptions, most episodes were short: 81.2% (n=1,694) lasted less than 0.5 years, 5.5% (n=115) between 0.5 and <1.0 years, and 13.2% (n=275) longer than 1 year. By the end of follow-up, 90.5% (n=1,885) had resolved after restarting ART (with the same or a different regimen), 7.0% (n=145) were still ongoing, and 2.6% (n=54) had ended in death. Advanced HIV/AIDS-defining conditions were the predominant cause of these deaths (35.2%, n=19), which is a markedly higher proportion than in the overall population in HIV care in the Netherlands (see Chapter 6, Morbidity and mortality).

While ART was used continuously, 72.9% of episodes consisted of a single viral load above 200 c/ml. Among the remainder (two or more consecutive measurements above 200 c/ml), 17.0% lasted less than 0.5 years, 4.6% between 0.5 and <1.0 years, and 5.6% longer than 1 year. By the end of follow-up, 92.3% had resolved — 72.6% without and 19.7% after a regimen modification — 6.4% were still ongoing, and 1.2% (n=58) had ended in death. Here too, advanced HIV/AIDS-defining conditions were the leading cause of death (25.9%, n=15), closely followed by non-AIDS-defining malignancies (22.4%, n=13).
Across both settings, men other than MSM, and women most of all, were strongly overrepresented among those with loss of viral suppression relative to MSM and transgender people. Women also more often modified their ART regimen before the episode finally resolved.

We also analysed the occurrence of all fatal and non-fatal AIDS-defining conditions that occurred during or shortly after (within 90 days) episodes of loss of viral suppression. Similar to the previous analyses, we analysed the occurrence of AIDS-defining events during episodes of loss of viral suppression that occurred during an ART interruption separately from those that occurred while ART had been used continuously. During 152 (7.3%) of 2084 episodes (in 1644 individuals) of loss of viral suppression while ART was discontinued, one or more AIDS-defining events occurred. During 68 (1.5%) of 4569 episodes (in 3107 individuals) of loss of viral suppression while ART was continuously used, one or more AIDS-defining events occurred.

In 1,721 (25.9%) of these 6,653 episodes of loss of viral suppression a genotypic resistance test was performed. Resistance scores were calculated for all available antiretroviral agents using the latest version of the Stanford University HIV Drug Resistance Database (HIVdb). All available genotypes (including all historical genotypes) were scored using the same algorithm. To detect viral evolution, for each genotype we assessed if there was an increase in the resistance score for any antiretroviral agent compared to the maximum value observed in previously measured genotypes in that particular individual. If the genotype measured during the episode of loss of viral suppression was the first measured genotype for that individual, we considered any non-zero resistance score as evidence of viral evolution.

In 586 (34.0%) of these 1,721 genotypes an increase in the resistance score to one or more antiretroviral agents was detected (for a comprehensive analysis of genotypic resistance data see Chapter 5). The likelihood of a genotypic resistance test being performed and detecting an increase in the resistance score was associated with the number of sequential viral load measurements above 200 c/ml, and also with the maximum viral load value measured.

The likelihood that a genotypic resistance test was performed increased with the number of consecutive viral load measurements >200 c/ml:

- 839 of 4,584 episodes (19.3%) with a single measurement >200 c/ml
- 409 of 1,148 episodes (35.6%) with 2 consecutive measurements >200 c/ml
- 200 of 428 episodes (46.7%) with 3 measurements >200 c/ml
- 273 of 493 episodes (53.4%) with at least 4 measurements >200 c/ml

Among the genotypes performed, the probability of detecting an increase in the resistance score likewise rose with the number of consecutive measurements >200 c/ml:

- 243 of 839 genotypes (29.0%) from episodes with a single measurement >200 c/ml
- 166 of 409 genotypes (40.6%) from episodes with 2 consecutive measurements >200 c/ml
- 81 of 200 genotypes (40.5%) from episodes with 3 measurements >200 c/ml
- 96 of 273 genotypes (35.2%) from episodes with at least 4 measurements >200 c/ml

The likelihood that a genotypic resistance test was performed also increased with the maximum viral load reached during the episode:

- 158 of 1,732 episodes (9.1%) with a maximum viral load of 200-499 c/ml
- 162 of 752 episodes (21.5%) with 500-999 c/ml
- 524 of 1,590 episodes (33.0%) with 1,000-9,999 c/ml
- 877 of 2,579 episodes (34.0%) with >10,000 c/ml

Among the genotypes performed, the probability of detecting an increase in the resistance score also rose with the maximum viral load reached:

- 35 of 158 genotypes (22.2%) from episodes with a maximum viral load of 200-499 c/ml
- 57 of 162 genotypes (35.2%) from episodes with 500-999 c/ml
- 190 of 524 genotypes (36.3%) from episodes with 1,000-9,999 c/ml
- 304 of 877 genotypes (34.7%) from episodes with >10,000 c/ml

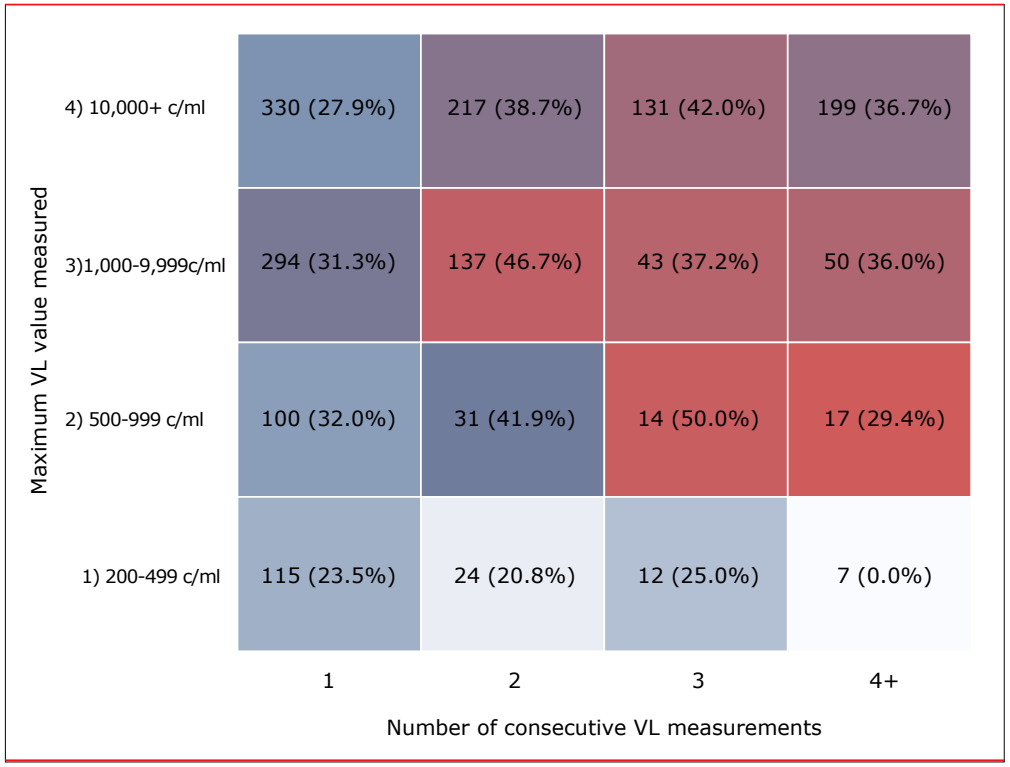
Figure 3.12 shows a heatmap of the probability of detecting an increase in the resistance score when considering both the number of consecutive viral load measurements above 200 c/ml and the maximum viral load value measured. When the maximum viral load value was between 200-499 c/ml the probability of detecting an increase in the resistance score increased was lowest. Higher maximum viral load values carried intermediate risk when the episode consisted of only a single viral load measurement >200 c/ml. The highest risks for detecting at least a single major RAM occurred when the maximum viral load was at least 500 c/ml and there were at least 2 consecutive viral load measurements above 200 c/ml.

Table 3.6: Occurrence of loss of viral suppression during 2016–2025 in individuals on ART for more than 6 months.

	All		MSM + TG		Men other than MSM		Women	
Loss of viral suppression because of ART interruption								
N of subjects	1,644		770		393		481	
N of episodes	2,084		963		507		614	
Duration of failure, n/%								
Single VL measurement	1266	60.7	573	59.5	316	62.3	377	61.4
<0.5 year	428	20.5	205	21.3	121	23.9	102	16.6
0.5 – <1 year	115	5.5	61	6.3	15	3.0	39	6.4
1 – <2 years	125	6.0	56	5.8	30	5.9	39	6.4
2+ years	150	7.2	68	7.1	25	4.9	57	9.3
Highest viral load, log_{10}, median, Q1–Q3	4.6 3.8–5.2		4.6 3.9–5.7		4.7 4.0–5.4		4.4 3.6–5.1	
Outcome, n/%								
Ongoing	145	7.0	77	8.0	32	6.3	36	5.9
Restarted, resolved	1885	90.5	859	89.2	461	90.9	565	92.0
Died while still off ART	54	2.6	27	2.8	14	2.8	13	2.1
Cause of death, n/%								
Advanced HIV / AIDS	19	35.2	10	37.0	5	35.7	4	30.8
Non-AIDS malignancies	8	14.8	2	7.4	3	21.4	3	23.1
Cardiovascular disease	4	7.4	2	7.4	1	7.1	1	7.7
Non-AIDS infection	2	3.7	.	.	1	7.1	1	7.7
Liver disease	2	3.7	1	3.7	1	7.1	.	.
Lung disease	4	7.4	2	7.4	1	7.1	1	7.7
Non-natural death	1	1.9	1	3.7	.	.	.	.
Alcohol and substance use	3	5.6	2	7.4	.	.	1	7.7
Other causes	3	5.6	2	7.4	1	7.1	.	.
Unknown	5	9.3	4	14.8	.	.	1	7.7
Sudden death	3	5.6	1	3.7	1	7.1	1	7.1
Loss of viral suppression while on ART								
N of subjects	3,107		1,485		767		855	
N of episodes	4,569		1,952		1,171		1,446	
Duration, n/%								
Single VL measurement	3331	72.9	1462	74.9	843	72.0	1026	71.0
<0.5 year	775	17.0	320	16.4	210	17.9	245	16.9
0.5 – 1 year	211	4.6	78	4.0	51	4.4	82	5.7
1 – 2 years	135	3.0	48	2.5	38	3.2	49	3.4
2+ years	117	2.6	44	2.3	29	2.5	44	3.0
Highest viral load during episode, median, Q1–Q3	3.0 2.5–4.0		2.8 2.5–3.6		3.1 2.6–4.2		3.2 2.6–4.1	
Outcome, n/%								
Resolved, no switch	3315	72.6	1454	74.5	846	72.2	1015	70.2
Ongoing, no switch	253	5.5	108	5.5	72	6.1	73	5.0
Resolved, switched	902	19.7	355	18.2	224	19.1	323	22.3
Ongoing, switched	41	0.9	16	0.8	8	0.7	17	1.2
Died, no switch	33	0.7	11	0.6	11	0.9	11	0.8
Died, switched	25	0.5	8	0.4	10	0.9	7	0.5
Cause of death, n/%								
advanced HIV / AIDS	15	25.9	5	26.3	7	33.3	3	16.7
Non-AIDS malignancies	13	22.4	3	15.8	5	23.8	5	27.8
Cardiovascular disease	3	5.2	.	.	.	.	3	16.7
Non-AIDS infection	3	5.2	2	10.5	.	.	1	5.6
Liver disease	.	.	.	.	.	.	.	.
Lung disease	2	3.4	1	5.3	1	4.8	.	.
Non-natural death	2	3.4	1	5.3	.	.	1	5.6
Alcohol and substance use	2	3.4	1	5.3	1	4.8	.	.
Other causes	6	10.3	3	15.8	2	9.5	1	5.6
Unknown	9	15.5	2	10.5	3	14.3	4	22.2

Legend: *MSM = men who have sex with men; TG = transgender people; PY = person years; ART = antiretroviral therapy; VL = viral load.*

Figure 3.12: Number and percentage of genotypic resistance tests detecting an increase in the resistance score to at least one antiretroviral agent stratified by maximum viral load measured and by the number of consecutive viral load measurements above 200 c/ml during an episode of loss of viral suppression while continuing ART.



Immunological response

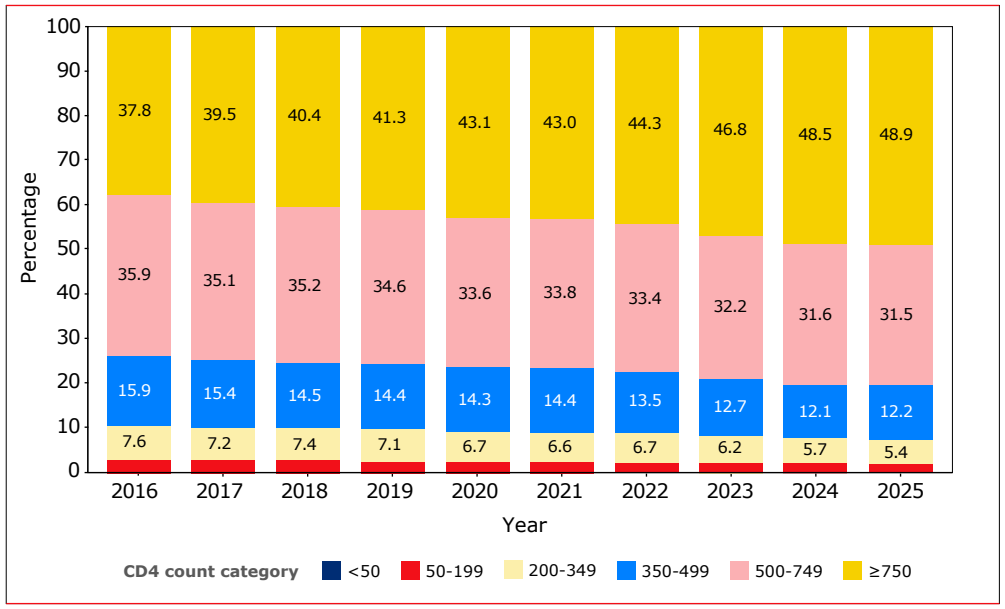
After initiation of ART, most people get durably suppressed plasma HIV RNA to levels below <50 c/ml, and this is accompanied by recovery of the CD4 count. Failure to durably suppress HIV replication is associated with poorer recovery of the CD4 count[18,19]. In case of frequent and/or prolonged loss of viral suppression, HIV disease progression can develop with a significant decrease of the CD4 count and the occurrence of opportunistic diseases. In people with prolonged viral suppression, CD4 recovery is the norm, but in a minority it remains protracted and/or incomplete, with the CD4 count plateauing below 350 cells/mm^3. This is a situation reported to be associated with an increased risk of progression to AIDS and development of non-AIDS-defining diseases[20]. Median CD4 counts in men without HIV are on average approximately 830 cells/mm^3 and around 1000 cells/mm^3 in women, but this varies according to factors such as age, ethnicity, and smoking behaviour[21,22]. The level of recovery of the immune system is strongly correlated to the risk for adverse health outcomes, i.e. morbidity and mortality because of AIDS-defining and other clinical events (also see Chapter 6)[23-27].

For people with a low-to-moderate CD4 count (below 350 cells/mm^3), CD4 count testing is recommended at least twice a year. When a person has a CD4 count above 350 cells/mm^3, the testing frequency may be reduced. For each individual, we obtained the last measured CD4 count in each calendar year, and used last-observation-carried-forward to impute missing values using the CD4 counts measured during the previous years.

Trends in the CD4 distribution

Of all individuals who were on ART in the period 2016-2025, CD4 count data are shown in Figure 3.13. The percentage of individuals on ART with a normalised CD4 count (i.e. with a CD4 count ≥500 cells/mm3) increased from 73.7% in 2016 to 80.4% in 2025. The percentage of individuals on ART with CD4 counts below 350 cells/mm^3 slowly continued to decrease from 10.4% in 2016 to 7.3% in 2025. These favourable changes in the distribution of the CD4 count in the treated population are the consequence of 1) the current guidelines recommending ART initiation as soon as possible after HIV diagnosis and irrespective of the CD4 count, 2) a more pronounced immune recovery with longer ART use, 3) increasing virological suppression rates, and 4) attrition through the higher mortality rates in individuals with low CD4 counts.

Figure 3.13: Last available CD4 count of the population on ART by calendar year.



Immunological response 5 years after ART initiation (2016–2021)

The distribution of pre-ART CD4 counts in ART-naïve individuals initiating first-line ART has remained fairly constant in the period between 2016 and 2025 (*Figure 3.14*). In 2025, 25.3% of individuals initiating ART had a CD4 count below 200 cells/mm^3, and another 20.2% had a CD4 count between 200 and <350 cells/mm^3. This distribution closely resembles the CD4 counts at HIV diagnosis as the large majority of individuals are initiating ART shortly after diagnosis (see *Figure 3.1A&B* as well as Chapter 1).

We also assessed the immunological response in individuals who started first-line ART in 2016-2020 to allow for a potential duration of follow-up of 5 years. The level of viral suppression after initiating ART was not taken into account in this analysis, but is generally very high (see *Table 3.3* and *Figure 3.11*). Nor were temporary treatment interruptions taken into account. The changes in the CD4 count distribution following ART initiation are visualized in Figure 3.15A. Whereas at the initiation of ART 26.2% of individuals had a CD4 count below 200 cells/mm^3 and 18.7% had a CD4 count between 200 and <350 cells/mm^3, these proportions had decreased after 5 years of ART to 1.9% with a CD4 count below 200 cells/mm^3 and 6.3% between 200 and <350 cells/mm^3.

The speed and magnitude of the changes of the CD4 count after ART initiation strongly depend on the pre-ART CD4 count. The 'heatmap' in *Figure 3.15B* shows the 5-year evolution of the CD4 count distribution stratified by the baseline CD4 count. The CD4 count distributions in all pre-ART CD4 count strata show favourable changes over time, but fail to converge even after 5 years of ART. Virtually all individuals who initiate ART while in the higher CD4 count strata remain in these higher strata, or increase their CD4 counts even further. The vast majority of individuals who initiate ART in the lower CD4 count strata have reached the higher CD4 count strata after 5 years of ART: only 11.7% of individuals who initiate ART with a CD4 below 50 remain below 200 after 5 years of ART, and only 3.4% of individuals who initiate ART with a CD4 between 50 and <200 remain below 200 after 5 years of ART. A limitation of this analysis is that attrition because of increased mortality in those who fail to increase their CD4 count is not taken into account.

Figure 3.14: The pre-ART CD4 count in ART-naïve individuals initiating first-line ART by calendar year.

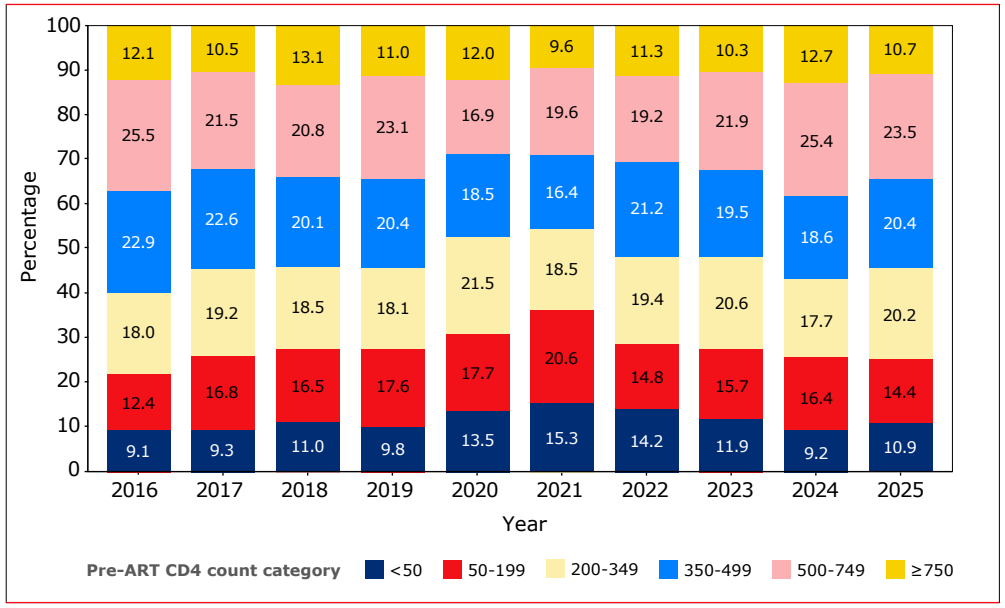
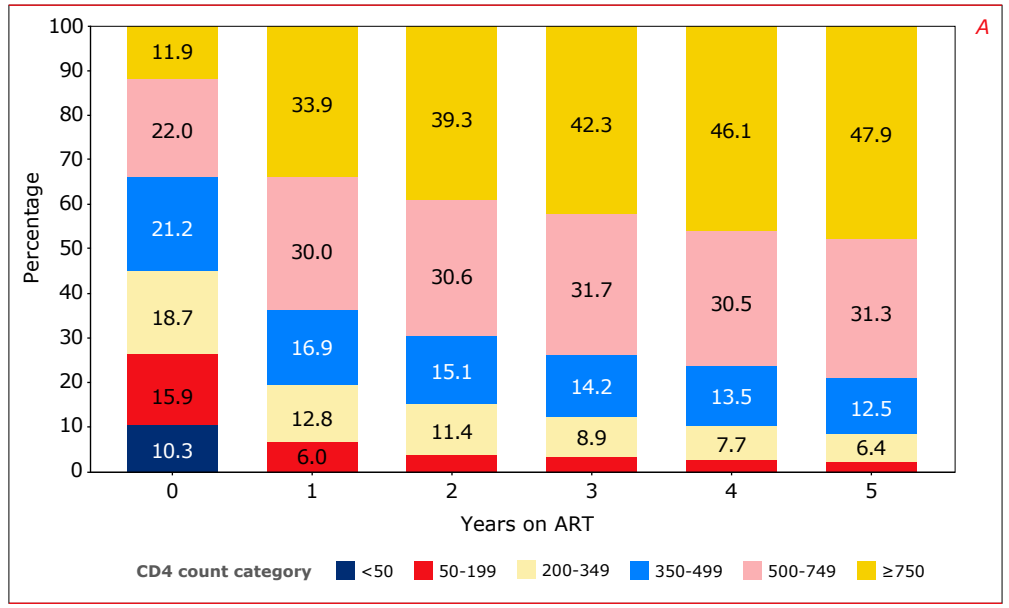


Figure 3.15A&B: Changes in CD4 count distribution over 5 years following the start of antiretroviral therapy (ART) in 2016-2020 (A) and stratified for the last measured CD4 count prior to start of ART (B). Column percentages add up to 100%.



B

CD4 count category	<50						50-199					
750+		0.6	1.7	2.3	4.6	8.7		2.3	4.7	7.4	11.3	12.9
500-749		5.0	10.1	18.5	19.6	23.3		16.4	24.1	29.5	31.5	34.0
350-499		15.7	27.7	27.8	31.4	26.5		28.7	29.0	31.2	31.1	33.0
200-349		39.8	37.2	33.0	31.1	29.7		38.2	35.1	26.6	21.8	16.7
50-199		36.2	21.8	17.3	11.8	10.8	100	13.9	6.7	4.8	3.9	3.1
<50	100	2.8	1.7	1.1	1.4	0.9		0.5	0.4	0.6	0.4	0.4

CD4 count category	200-349						350-499					
750+		13.1	20.6	23.4	28.5	33.2		34.1	42.6	47.0	51.9	54.6
500-749		42.7	46.6	49.6	48.7	47.3		43.6	42.1	41.5	38.9	37.9
350-499		29.8	22.1	19.8	17.1	15.8	100	21.3	14.2	10.0	8.0	6.5
200-349	100	13.8	10.3	6.6	5.2	3.2		0.9	0.8	1.1	1.1	0.8
50-199		0.6	0.4	0.4	0.5	0.5		0.1	0.0	0.3	0.1	0.1
<50		0.0	0.0	0.1	0.0	0.0		0.0	0.3	0.1	0.0	0.0

CD4 count category	500-749						750+					
750+		57.5	64.9	69.8	72.1	71.8	100	93.4	92.6	91.4	94.2	91.8
500-749	100	39.7	32.2	27.0	24.7	25.7		6.3	7.4	8.1	5.3	7.7
350-499		2.6	2.7	2.7	2.4	1.8		0.2	0.0	0.5	0.5	0.5
200-349		0.0	0.1	0.3	0.4	0.3		0.0	0.0	0.0	0.0	0.0
50-199		0.1	0.1	0.1	0.3	0.4		0.0	0.0	0.0	0.0	0.0
<50		0.0	0.0	0.1	0.1	0.0		0.0	0.0	0.0	0.0	0.0

0 1 2 3 4 5 0 1 2 3 4 5

References

1. Cole SR, Hernán MA, Robins JM, et al. Effect of highly active antiretroviral therapy on time to acquired immunodeficiency syndrome or death using marginal structural models. American journal of epidemiology 2003; 158(7):687-94.
2. Rodger AJ, Cambiano V, Bruun T, et al. Sexual activity without condoms and risk of HIV transmission in serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. JAMA 2016; 316(2): 171-81.
3. EACS. EACS Guidelines, version 12.0. October 2023. http://www.europeanaidsclinicalsociety.org/guid/index.html?b=annex&p=3.
4. Shilaih M, Marzel A, Yang WL, et al. Genotypic resistance tests sequences reveal the role of marginalized populations in HIV-1 transmission in Switzerland. Scientific reports 2016; 6(May): 27580-.
5. DHHS. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. September 2024. https://clinicalinfo.hiv.gov/sites/default/files/guidelines/documents/adult-adolescent-arv/guidelines-adult-adolescent-arv.pdf.
6. WHO. World Health Organisation Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection; 2016.
7. Ryom L, Boesecke C, Bracchi M, et al. Highlights of the 2017 European AIDS Clinical Society (EACS) Guidelines for the treatment of adult HIV-positive persons version 9.0. HIV medicine 2018; 19(5): 309-15.
8. NVHB. Richtlijn HIV - Nederlandse Vereniging van HIV Behandelaren (NVHB). 2024. https://richtlijnhiv.nvhb.nl/index.php/Inhoud.
9. Grinsztejn B, Hosseinipour MC, Ribaudo HJ, et al. Effects of early versus delayed initiation of antiretroviral treatment on clinical outcomes of HIV-1 infection: Results from the phase 3 HPTN 052 randomised controlled trial. The Lancet Infectious Diseases 2014; 14(4): 281-90.
10. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 Infection with Early Antiretroviral Therapy. New England Journal of Medicine 2011; 365(6): 493-505.
11. Prevention Access Campaign. Consensus Statement: Risk of sexual transmission of HIV from a person living with HIV who has an undetectable viral load - Messaging Primer & Consensus Statement. https://www.preventionaccess.org/consensus (accessed November 14, 2019.
12. Nederlandse Vereniging van HIVB. Het risico om hiv over te dragen is verwaarloosbaar klein indien de infectie goed behandeld wordt. 2017. http://nvhb.nl/2017/05/03/wetenschappelijk-onderzoek-toont-aan-dat-het-risico-om-hiv-over-te-dragen-verwaarloosbaar-klein-is-indien-de-infectie-goed-behandeld-wordt/.

13. Quinn TC, Wawer MJ, Sewankambo N, et al. Viral load and heterosexual transmission of human immunodeficiency virus type 1. Rakai Project Study Group. The New England journal of medicine 2000; 342(13): 921-9.
14. Tovanabutra S, Robison V, Wongtrakul J, et al. Male viral load and heterosexual transmission of HIV-1 subtype E in northern Thailand. Journal of Acquired Immune Deficiency Syndromes 2002; 29(3): 275-83.
15. Reynolds SJ, Makumbi F, Nakigozi G, et al. HIV-1 transmission among HIV-1 discordant couples before and after the introduction of antiretroviral therapy. AIDS 2011; 25(4): 473-7.
16. Raboud JM, Rae S, Woods R, et al. Consecutive rebounds in plasma viral load are associated with virological failure at 52 weeks among HIV-infected patients. AIDS (London, England) 2002; 16(12): 1627-32.
17. Boender TS, Smit C, Sighem Av, et al. AIDS Therapy Evaluation in the Netherlands (ATHENA) national observational HIV cohort: cohort profile. BMJ open 2018; 8(9): e022516-e.
18. Hughes RA, Sterne JAC, Walsh J, et al. Long-term trends in CD4 cell counts and impact of viral failure in individuals starting antiretroviral therapy: UK Collaborative HIV Cohort (CHIC) study. HIV Medicine 2011; 12(10): 583-93.
19. Gras L, Kesselring AM, Griffin JT, et al. CD4 cell counts of 800 cells/mm^3 or greater after 7 years of highly active antiretroviral therapy are feasible in most patients starting with 350 cells/mm^3 or greater. Journal of Acquired Immune Deficiency Syndromes 2007; 45(2): 183-92.
20. van Lelyveld SF, Gras L, Kesselring A, et al. Long-term complications in patients with poor immunological recovery despite virological successful HAART in Dutch ATHENA cohort. AIDS 2012; 26(4): 465-74.
21. Tsegaye A, Messele T, Tilahun T, et al. Immunohematological reference ranges for adult Ethiopians. Clin Diagn Lab Immunol 1999; 6(3): 410-4.
22. Gras L, May M, Ryder LP, et al. Determinants of Restoration of CD4 and CD8 Cell Counts and Their Ratio in HIV-1-Positive Individuals with Sustained Virological Suppression on Antiretroviral Therapy. Journal of Acquired Immune Deficiency Syndromes 2019; 80(3): 292-300.
23. Effros RB, Fletcher CV, Gebo K, et al. Aging and Infectious Diseases: Workshop on HIV Infection and Aging: What Is Known and Future Research Directions. Clinical Infectious Diseases 2008; 47(4): 542-53.
24. Baker JV, Peng G, Rapkin J, et al. CD4+ count and risk of non-AIDS diseases following initial treatment for HIV infection. AIDS 2008; 22(7): 841-8.
25. Baker JV, Peng G, Rapkin J, et al. Poor initial CD4+ recovery with antiretroviral therapy prolongs immune depletion and increases risk for AIDS and non-AIDS diseases. JAIDS Journal of Acquired Immune Deficiency Syndromes 2008; 48(5): 541-6.
26. Antiretroviral Therapy Cohort C. Life expectancy of individuals on combination antiretroviral therapy in high-income countries: a collaborative analysis of 14 cohort studies. The Lancet 2008; 372(9635): 293-9.
27. Lanoy E, May M, Mocroft A, et al. Prognosis of patients treated with cART from 36 months after initiation, according to current and previous CD4 cell count and plasma HIV-1 RNA measurements. AIDS 2009; 23(16): 2199-208.

Appendix Table 3.1: *Frequency of and reasons for discontinuation / modification of various ART regimen in the period 2016–2025.*

						Stop reasons (n & rate per 1,000PY)											
	Exposure (PY)	Total episodes (n)	Ongoing episodes (n)	Failure		Toxicity		Patient choice		Simplification		Prevention		Pregnancy		Other reasons	
Calendar year				n	rate	n	rate	n	rate	n	rate	n	rate	n	rate	n	rate
INSTI + NRTI																	
TAF/FTC/BIC	21072	7834	4892	68	3.2	1256	59.6	669	31.7	345	16.4	152	7.2	58	2.8	394	18.7
TDF/FTC/DTG	7603	4308	1216	52	6.8	794	104.4	355	46.7	1303	171.4	246	32.4	40	5.3	302	39.7
ABC/3TC/DTG	22571	6382	1247	66	2.9	1761	78.0	687	30.4	1318	58.4	770	34.1	88	3.9	445	19.7
3TC/DTG	13723	5497	4460	56	4.1	457	33.3	159	11.6	153	11.1	25	1.8	37	2.7	150	10.9
TAF/FTC/DTG	4145	1451	465	23	5.5	248	59.8	133	32.1	408	98.4	36	8.7	20	4.8	118	28.5
TDF/3TC/DTG	306	464	88	2	6.5	23	75.0	10	32.6	131	427.4	8	26.1	2	6.5	200	652.5
TAF/FTC/EVG/b	20283	4956	1763	77	3.8	1009	49.7	465	22.9	630	31.1	608	30.0	73	3.6	331	16.3
TDF/FTC/EVG/b	6250	2331	365	27	4.3	553	88.5	214	34.2	590	94.4	388	62.1	20	3.2	174	27.8
TDF/FTC/RAL	1665	802	94	13	7.8	152	91.3	74	44.4	295	177.1	57	34.2	34	20.4	83	49.8
Other INSTI+NRTI	1833	673	148	14	7.6	122	66.6	51	27.8	218	118.9	39	21.3	10	5.5	71	38.7
NNRTI + NRTI																	
TDF/3TC/DOR	8738	3637	2366	47	5.4	614	70.3	204	23.3	143	16.4	73	8.4	21	2.4	169	19.3
TDF/FTC/EFV	14374	3958	791	65	4.5	1623	112.9	213	14.8	439	30.5	389	27.1	20	1.4	418	29.1
TAF/FTC/RPV	7865	2021	932	32	4.1	345	43.9	112	14.2	254	32.3	138	17.5	16	2.0	192	24.4
TDF/FTC/RPV	6641	2322	305	42	6.3	544	81.9	164	24.7	552	83.1	388	58.4	26	3.9	301	45.3
TAF/FTC/NVP	5581	1255	680	19	3.4	234	41.9	49	8.8	135	24.2	45	8.1	2	0.4	91	16.3
TDF/FTC/NVP	10656	2733	639	50	4.7	658	61.7	171	16.0	696	65.3	353	33.1	5	0.5	161	15.1
ABC/3TC/NVP	3224	668	138	22	6.8	128	39.7	43	13.3	125	38.8	163	50.6	4	1.2	45	14.0
Other NNRTI+NRTI	3199	1361	263	21	6.6	348	108.8	61	19.1	388	121.3	110	34.4	6	1.9	164	51.3
PI + NRTI																	
TAF/FTC/DRV/b	9060	3016	1378	50	5.5	533	58.8	374	41.3	264	29.1	192	21.2	48	5.3	177	19.5
TDF/FTC/DRV/b	5979	3049	256	57	9.5	531	88.8	400	66.9	1270	212.4	254	42.5	94	15.7	187	31.3
TDF/FTC/ATV/b	2778	1293	73	23	8.3	256	92.2	138	49.7	528	190.1	137	49.3	42	15.1	96	34.6
TDF/FTC/LPV/b	278	200	9	4	14.4	33	118.7	30	107.9	81	291.4	14	50.4	11	39.6	18	64.7
Other PI+NRTI	3406	1528	137	30	8.8	282	82.8	151	44.3	558	163.8	179	52.6	50	14.7	141	41.4
2 anchor-drugs																	
DTG/DRV/b	2880	837	393	14	4.9	113	39.2	110	38.2	98	34.0	45	15.6	6	2.1	58	20.1
DTG/RPV	845	321	171	6	7.1	46	54.4	23	27.2	35	41.4	13	15.4	2	2.4	25	29.6
CAB/RPV LA	2460	1157	899	29	11.8	90	36.6	28	11.4	6	2.4	15	6.1	3	1.2	87	35.4
2 anchors w/wo NRTI	4098	2132	370	75	18.3	297	72.5	172	42.0	849	207.2	131	32.0	23	5.6	215	52.5

Legend: *PY = person years of exposure; 3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LA = long acting; LPV = lopinavir; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

Appendix Table 3.1: Frequency of and reasons for discontinuation / modification of various ART regimen in the period 2016–2025.

						Stop reasons (n & rate per 1,000PY)											
	Exposure (PY)	Total episodes (n)	Ongoing episodes (n)	Failure		Toxicity		Patient choice		Simplification		Prevention		Pregnancy		Other reasons	
Calendar year				n	rate	n	rate	n	rate	n	rate	n	rate	n	rate	n	rate
INSTI + NRTI																	
TAF/FTC/BIC	21072	7834	4892	68	3.2	1256	59.6	669	31.7	345	16.4	152	7.2	58	2.8	394	18.7
TDF/FTC/DTG	7603	4308	1216	52	6.8	794	104.4	355	46.7	1303	171.4	246	32.4	40	5.3	302	39.7
ABC/3TC/DTG	22571	6382	1247	66	2.9	1761	78.0	687	30.4	1318	58.4	770	34.1	88	3.9	445	19.7
3TC/DTG	13723	5497	4460	56	4.1	457	33.3	159	11.6	153	11.1	25	1.8	37	2.7	150	10.9
TAF/FTC/DTG	4145	1451	465	23	5.5	248	59.8	133	32.1	408	98.4	36	8.7	20	4.8	118	28.5
TDF/3TC/DTG	306	464	88	2	6.5	23	75.0	10	32.6	131	427.4	8	26.1	2	6.5	200	652.5
TAF/FTC/EVG/b	20283	4956	1763	77	3.8	1009	49.7	465	22.9	630	31.1	608	30.0	73	3.6	331	16.3
TDF/FTC/EVG/b	6250	2331	365	27	4.3	553	88.5	214	34.2	590	94.4	388	62.1	20	3.2	174	27.8
TDF/FTC/RAL	1665	802	94	13	7.8	152	91.3	74	44.4	295	177.1	57	34.2	34	20.4	83	49.8
Other INSTI+NRTI	1833	673	148	14	7.6	122	66.6	51	27.8	218	118.9	39	21.3	10	5.5	71	38.7
NNRTI + NRTI																	
TDF/3TC/DOR	8738	3637	2366	47	5.4	614	70.3	204	23.3	143	16.4	73	8.4	21	2.4	169	19.3
TDF/FTC/EFV	14374	3958	791	65	4.5	1623	112.9	213	14.8	439	30.5	389	27.1	20	1.4	418	29.1
TAF/FTC/RPV	7865	2021	932	32	4.1	345	43.9	112	14.2	254	32.3	138	17.5	16	2.0	192	24.4
TDF/FTC/RPV	6641	2322	305	42	6.3	544	81.9	164	24.7	552	83.1	388	58.4	26	3.9	301	45.3
TAF/FTC/NVP	5581	1255	680	19	3.4	234	41.9	49	8.8	135	24.2	45	8.1	2	0.4	91	16.3
TDF/FTC/NVP	10656	2733	639	50	4.7	658	61.7	171	16.0	696	65.3	353	33.1	5	0.5	161	15.1
ABC/3TC/NVP	3224	668	138	22	6.8	128	39.7	43	13.3	125	38.8	163	50.6	4	1.2	45	14.0
Other NNRTI+NRTI	3199	1361	263	21	6.6	348	108.8	61	19.1	388	121.3	110	34.4	6	1.9	164	51.3
PI + NRTI																	
TAF/FTC/DRV/b	9060	3016	1378	50	5.5	533	58.8	374	41.3	264	29.1	192	21.2	48	5.3	177	19.5
TDF/FTC/DRV/b	5979	3049	256	57	9.5	531	88.8	400	66.9	1270	212.4	254	42.5	94	15.7	187	31.3
TDF/FTC/ATV/b	2778	1293	73	23	8.3	256	92.2	138	49.7	528	190.1	137	49.3	42	15.1	96	34.6
TDF/FTC/LPV/b	278	200	9	4	14.4	33	118.7	30	107.9	81	291.4	14	50.4	11	39.6	18	64.7
Other PI+NRTI	3406	1528	137	30	8.8	282	82.8	151	44.3	558	163.8	179	52.6	50	14.7	141	41.4
2 anchor-drugs																	
DTG/DRV/b	2880	837	393	14	4.9	113	39.2	110	38.2	98	34.0	45	15.6	6	2.1	58	20.1
DTG/RPV	845	321	171	6	7.1	46	54.4	23	27.2	35	41.4	13	15.4	2	2.4	25	29.6
CAB/RPV LA	2460	1157	899	29	11.8	90	36.6	28	11.4	6	2.4	15	6.1	3	1.2	87	35.4
2 anchors w/wo NRTI	4098	2132	370	75	18.3	297	72.5	172	42.0	849	207.2	131	32.0	23	5.6	215	52.5

Legend: *PY = person years of exposure; 3TC = lamivudine; b = boosted (cobicistat or ritonavir); ABC = abacavir; ART = antiretroviral therapy; ATV = atazanavir; BIC = bictegravir; CAB = cabotegravir; DOR = doravirine; DRV = darunavir; DTG = dolutegravir; EFV = efavirenz; EVG = elvitegravir; FTC = emtricitabine; LA = long acting; LPV = lopinavir; NVP = nevirapine; PI = protease inhibitor; RAL = raltegravir; RPV = rilpivirine; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; NRTI = nucleoside analogue reverse transcriptase inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; INSTI = integrase inhibitor.*

Appendix Table 3.2: *Virological treatment response in 2016–2025 in people who started ART at least months earlier.*

	Total population	Viral load categories (c/ml)											
		<50		50–199		200–999		1,000–9,999		10,000+		ART interrupted	
	N	N	%	N	%	N	%	N	%	N	%	N	%
Calendar year													
2016	18,728	17,444	93.14	473	2.53	144	0.77	111	0.59	199	1.06	357	1.91
2017	19,421	18,061	93.00	569	2.93	158	0.81	80	0.41	185	0.95	368	1.89
2018	20,115	18,909	94.00	438	2.18	157	0.78	99	0.49	162	0.81	350	1.74
2019	20,732	19,494	94.03	497	2.40	162	0.78	88	0.42	160	0.77	331	1.60
2020	21,146	20,071	94.92	442	2.09	144	0.68	66	0.31	105	0.50	318	1.50
2021	21,374	20,329	95.11	419	1.96	135	0.63	60	0.28	133	0.62	298	1.39
2022	21,930	20,765	94.69	493	2.25	140	0.64	92	0.42	157	0.72	283	1.29
2023	22,418	21,336	95.17	438	1.95	136	0.61	90	0.40	146	0.65	272	1.21
2024	22,815	21,705	95.13	500	2.19	149	0.65	77	0.34	142	0.62	242	1.06
2025	23,014	21,896	95.14	553	2.40	167	0.73	78	0.34	161	0.70	159	0.69