HIV/AIDS in Austria

47th Report of the Austrian HIV Cohort Study

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in Austria

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1 Introduction

At the end of the year 2001, representatives of 5 Austrian HIV treatment centres (AKH Vienna, Penzing Hospital Vienna, Kepler Universitätsklinikum Med Campus III Linz, LKH Innsbruck and LKH Graz II West) have founded the **„Austrian HIV Cohort Study (AHIVCOS)“**. In 2008, two more centres (LKH Salzburg and LKH Klagenfurt), in 2016 Favoriten Hospital Vienna and in 2018 LKH Feldkirch joined the AHIVCOS. The responsibility for the medical and scientific coordination lies with Robert Zangerle from the Medical University of Innsbruck.

Aims of Austrian cohort study are:

1) Optimization of patient management
2) HIV surveillance
3) Research projects

A special software, the *"HIV Patient Management System (HIP)"* is used in all centres and has replaced the previous *HIV data base* in 2005. The input of data is (was) done peripherally in the HIV treatment centres which consistently use the data base for clinical care. The input of laboratory findings is mostly done electronically. Apart from nurses and doctors, additional professional groups are involved in data entry in some centres (social workers, psychologists). Before data can be merged, the cohort participants are made anonymous. Therefore, it is cumbersome to identify cohort participants who are/were treated in more than just one treatment centre. This cannot be done by the use of personal data such as initials, birthday or postal code, but with HIV specific data (date of the HIV test, CD4 cell counts etc.).

***HIV Patient Management System*:**

Designed as a client-server application, the *HIP* stores its data in a persistent SQL database. The software is based on the model driven architecture paradigm and has been implemented with Microsoft .NET technology. The company DI Heinz Appoyer (now called *network vita*) was entrusted with the development of the *HIP*. The required hardware is provided by the local IT departments in the centres. In terms of data protection the programme fully complies with the Austrian data protection act (DSG 2000, valid since 1.1.2000). Access to the data base in the centres is restricted to authorized users only.

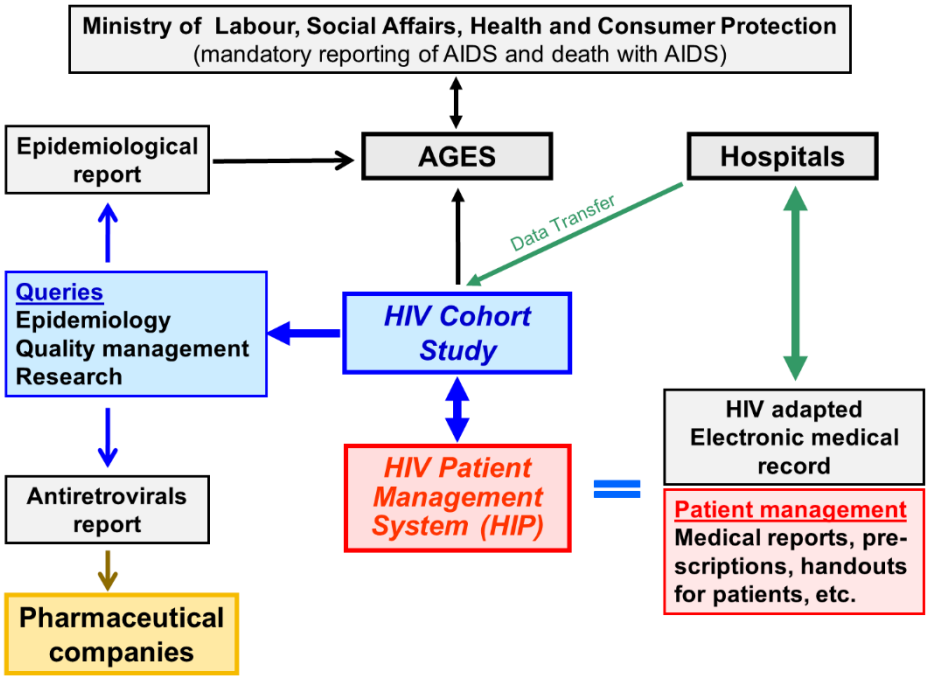
On the one hand, the *HIP* fulfils complex tasks for the clinical management of HIV infected patients, and on the other hand it allows queries and analyses to be performed by the users without restrictions. However, to allow both individual patient management and scientific queries is an enormous challenge which scientific HIV cohorts in other countries have not had to deal with. In Austria, there was no acceptance for a purely scientific data base. While for the clinical patient management the focus is on readability of diagnoses and therapies, creation of medical reports, prescriptions (trade names!), print-out of results etc., scientific queries need precise coding and categorization. Furthermore, the optimization of individual patient management requires an ongoing adjustment to the progress of information technology, whereas purely scientific data bases do not have such technological renewal pressure.

Special challenges for the *HIV Patient Management System* are:

- Checking of plausibility of the data after entry in the database
- Meeting the requirements of both clinical patient management and scientific database
- Weak/ overburdened infrastructure in HIV treatment centres

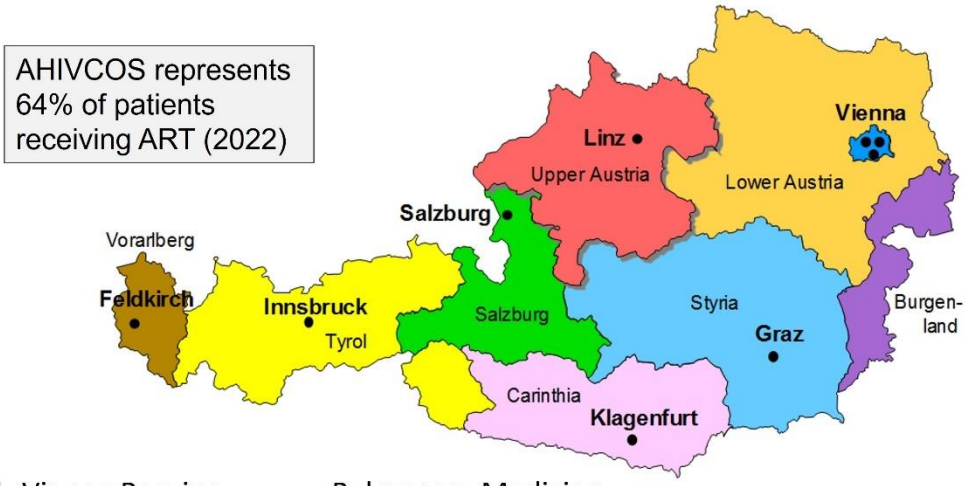
2 Organization of the Austrian HIV cohort study

The organization and further development of the HIV cohort study will stay complex, because some goals of the *Austrian HIV Cohort Study* are also of interest to health authorities and/ or institutions. The Federal Ministry of Social Affairs, Health, Care and Consumer Protection (BMSGPK, Department VII/A/11, Dr.in Sigrid Kiermayr) is in charge of HIV, whereas some agenda of this responsibility has been shifted to the Agency for Health and Food Safety (AGES). In contrast, patient care has to be provided by the different federal states, and the social insurance companies bear the costs of the HIV medication. The IT departments in the hospitals have to provide the IT hardware as well as the service/ data security. Because of the support of BMSGPK and AGES, the collaboration between the *Austrian HIV Cohort Study* and the hospitals, especially with the local IT departments (e. g. interfaces between HIP and local IT systems) is legitimized. For IT departments, HIP as an "isolated application" is seen as an additional liability. On the other hand, hospitals have also an interest in the *HIV Patient Management System* because tasks of quality management and standardization of care can be managed more efficiently by using HIP. The establishment of the *HIV Patient Management System* is a big advance in the management of patients with HIV/AIDS („Good Chronic Disease Practice").



The development of the *HIV Patient Management System* incorporated the international standard format, the HIV Cohorts Data Exchange Protocol (HICDEP), so that data merging with networks of cohorts like ART-CC, EuroSIDA and RESPOND are greatly facilitated.

Centres of the Austrian HIV Cohort Study



Vienna Penzing	Pulmonary Medicine
Vienna AKH	Dermatovenereology
Vienna Favoriten	Infectious Diseases
Graz	Infectious Diseases
Linz	Dermatovenereology
Salzburg	Oncology/Infectious Diseases
Klagenfurt	Oncology
Innsbruck	Dermatovenereology
Feldkirch	Oncology/Infectious Diseases

3 Funding

The Austrian HIV Cohort Study (AHIVCOS) is supported by the public health sector (AGES, by order of the Federal Ministry of Health), the participating hospitals (routine maintenance of the *HIV Patient Management System ("HIP"),* the partners in the pharmaceutical industry (all relevant companies providing HIV drugs – GILEAD, GSK & ViiV and MSD) and international cohort collaboration RESPOND, which provides the largest single financial contribution.

4 Cohort participants

4.1 Definition of Cohort participants

The Austrian HIV Cohort Study has gained approval of the ethical committees of the HIV treatment centres. With this the Austrian HIV Cohort Study has been ready to join the international network of cohorts like ART-CC, CASCADE, COHERE and RESPOND.

Inclusion criteria:

- Patients living with HIV infection

Exclusion criteria:

- Physician's decision
- Patient withholds consent

Frequency of the monitoring („Follow-up"):
Cohort participants will be examined and findings/ results documented at regular visits (at least semianually), therefore no additional costs will arise.

Minimal dataset:

- Last negative, first positive HIV test, seroconversion illness, AIDS diagnoses, all cases of death
- First contact with the HIV centre
- Age, sex, mode of transmission of HIV
- CD4 count, HIV RNA, co-infections and co-morbidities
- Resistances to antiretroviral drugs
- Antiretroviral therapies (past and present)
- Co-morbidities
- Co-medication

Merger of data:

- Only indirectly personal data according to the data protection act
- Semiannual (March and September)

4.2 Recruitment and follow-up of cohort participants

So far, 11490 HIV infected patients providing 133774.26 years of follow-up have been recruited into the cohort study. We assume that there were more than 2966 deaths, but data entry from patients with loss of follow-up or last contact a long time ago is incomplete. Most centres do not have enough resources to enter data retrospectively.

Cumulative number of all cohort participants

	Penzing Vienna	AKH Vienna	Favoriten Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
01.09.2024	2821	3456	319	1323	605	1556	173	884	353	**11490**

Last contact with HIV treatment centre and alive or not known to be dead				
	Follow-up within the last 12 months	Living/moved to care abroad	Lost to follow-up	**Total**
Penzing Vienna	822	101	711	**1634**
AKH Vienna	1419	428	926	**2773**
Favoriten Vienna	218	10	78	**306**
Linz	721	70	119	**910**
Salzburg	345	54	154	**553**
Innsbruck	762	269	89	**1120**
Feldkirch	136	18	10	**164**
Graz	493	34	221	**748**
Klagenfurt	256	11	49	**316**
Total	**5172**	**995**	**2357**	**8524**

	Death		
	Death within the last 12 months	Death since more than 12 months	**Total**
Penzing Vienna	21	1166	**1187**
AKH Vienna	12	671	**683**
Favoriten Vienna	0	13	**13**
Linz	3	410	**413**
Salzburg	0	52	**52**
Innsbruck	10	426	**436**
Feldkirch	0	9	**9**
Graz	7	129	**136**
Klagenfurt	2	35	**37**
Total	**55**	**2911**	**2966**

Risk factors for no follow-up within the last 12 months

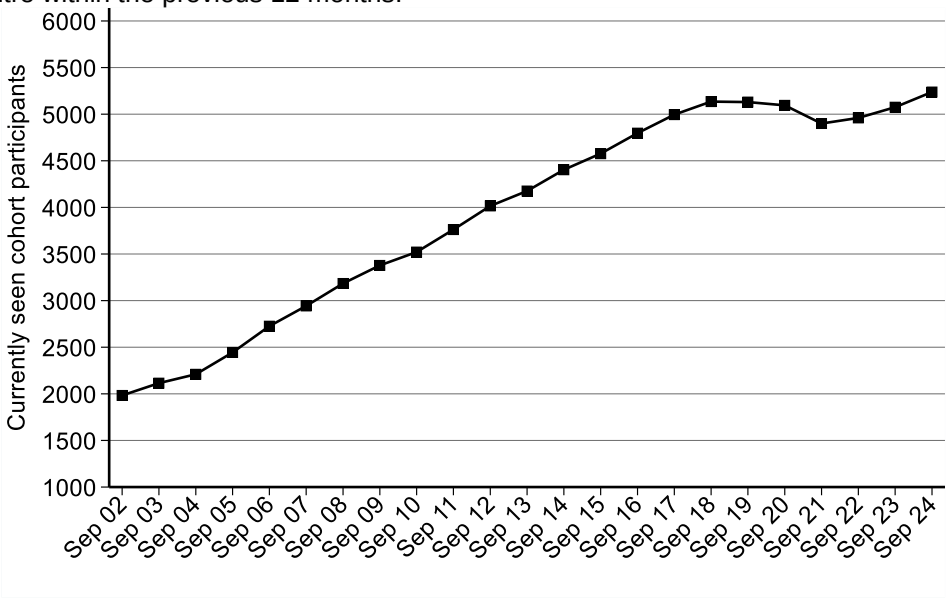
Persons with residency abroad were excluded from this analysis.

All centres	Frequencies		%	Univariable logistic Regression			Multivariable logistic Regression		
Variable	2357	7529	31.31%	**OR**	**(95%CI)**	**p-value**	**OR**	**(95%CI)**	**p-value**
Demographic characteristics									
Age at last contact									
< 30	414	612	67.65%	10.80	[8.89,13.12]	<0.001	9.43	[7.65,11.64]	<0.001
30-50	1450	3878	37.39%	3.08	[2.75,3.46]	<0.001	2.82	[2.49,3.20]	<0.001
> 50	493	3039	16.22%	1.00		.	1.00		.
HIV transmission category									
Male IDU	234	656	35.67%	1.09	[0.91,1.29]	0.348	0.95	[0.78,1.14]	0.573
Female IDU	107	298	35.91%	1.10	[0.86,1.41]	0.456	1.05	[0.80,1.37]	0.721
Male hetero	311	1271	24.47%	0.63	[0.55,0.73]	<0.001	0.80	[0.68,0.94]	0.008
Female hetero	342	1379	24.80%	0.65	[0.56,0.74]	<0.001	0.68	[0.58,0.80]	<0.001
Other	211	516	40.89%	1.36	[1.12,1.64]	0.001	1.12	[0.90,1.40]	0.304
MSM	1152	3409	33.79%	1.00		.	1.00		.
Population size of residence area									
Vienna	1476	3393	43.50%	2.99	[2.70,3.31]	<0.001	2.84	[2.55,3.17]	<0.001
Missing	45	52	86.54%	24.98	[11.22,55.58]	<0.001	11.02	[4.68,26.10]	<0.001
Outside Vienna	836	4084	20.47%	1.00		.	1.00		.
Nationality									
High prevalence	257	693	37.09%	1.38	[1.17,1.63]	<0.001	1.32	[1.09,1.61]	0.006
Low prevalence	491	1603	30.63%	1.04	[0.92,1.17]	0.565	0.79	[0.69,0.91]	0.001
Missing	71	85	83.53%	11.90	[6.69,21.18]	<0.001	6.40	[3.42,12.06]	<0.001
Austria	1538	5148	29.88%	1.00		.	1.00		.
Stage of disease									
AIDS									
Yes	368	1526	24.12%	0.64	[0.56,0.73]	<0.001	0.85	[0.74,0.98]	0.026
No	1989	6003	33.13%	1.00		.	1.00		.

4.3 Patients currently in care

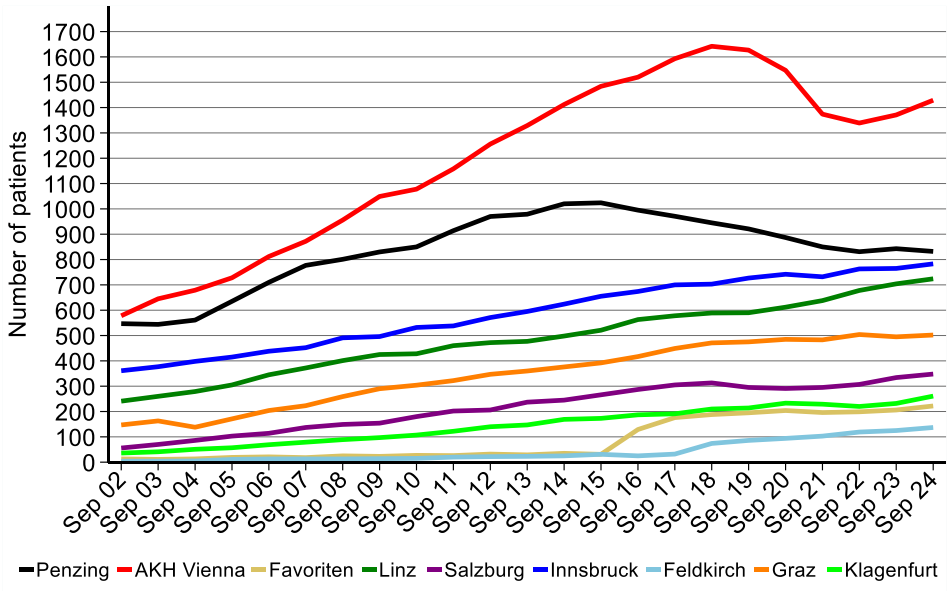
4.3.1 Overall (12 months)

Patients were seen as currently in care when they had at least one contact to an HIV centre within the previous 12 months.



Number of patients currently in care

	Penzing Vienna	AKH Vienna	Favoriten Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
01.09.2024	832	1429	222	724	348	783	137	502	261	**5238**

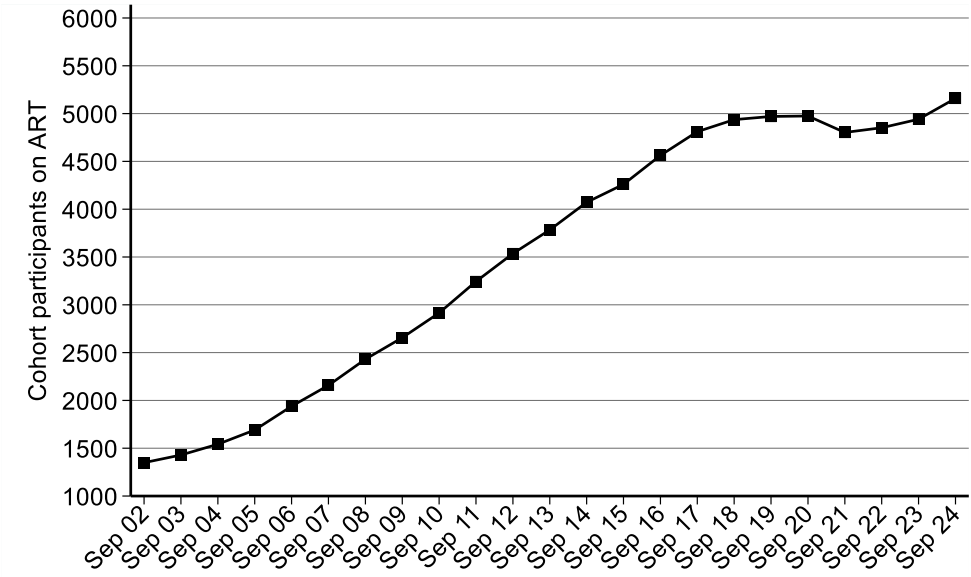


Number of currently seen patients by residence

	HIV-centre									
	Penzing Vienna	AKH Vienna	Favoriten Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	**Total**
Burgenland	21	32	8	0	0	3	0	23	0	**87**
Carinthia	0	0	0	3	6	7	0	14	251	**281**
Lower Austria	182	277	24	48	1	2	0	3	0	**537**
Upper Austria	2	5	0	647	33	3	0	1	0	**691**
Salzburg	1	1	1	6	263	32	0	1	0	**305**
Styria	3	8	2	6	8	3	0	452	5	**487**
Tyrol	0	0	0	1	3	593	0	1	0	**598**
Vorarlberg	0	0	0	1	0	111	136	0	0	**248**
Vienna	620	1098	183	10	1	9	0	4	2	**1927**
Foreign/missing	3	8	4	2	33	20	1	3	3	**77**
Total	**832**	**1429**	**222**	**724**	**348**	**783**	**137**	**502**	**261**	**5238**

4.3.2 Number of patients currently on antiretroviral therapy

5159 patients (98.5%) were on antiretroviral therapy in the 9 HIV treatment centres. Of the 79 patients not on treatment 45 had received antiretroviral treatment at an earlier point in time (women who were on ART to prevent mother-to-child transmission, patients who received transient ART during/ after the acute HIV infection, etc.).



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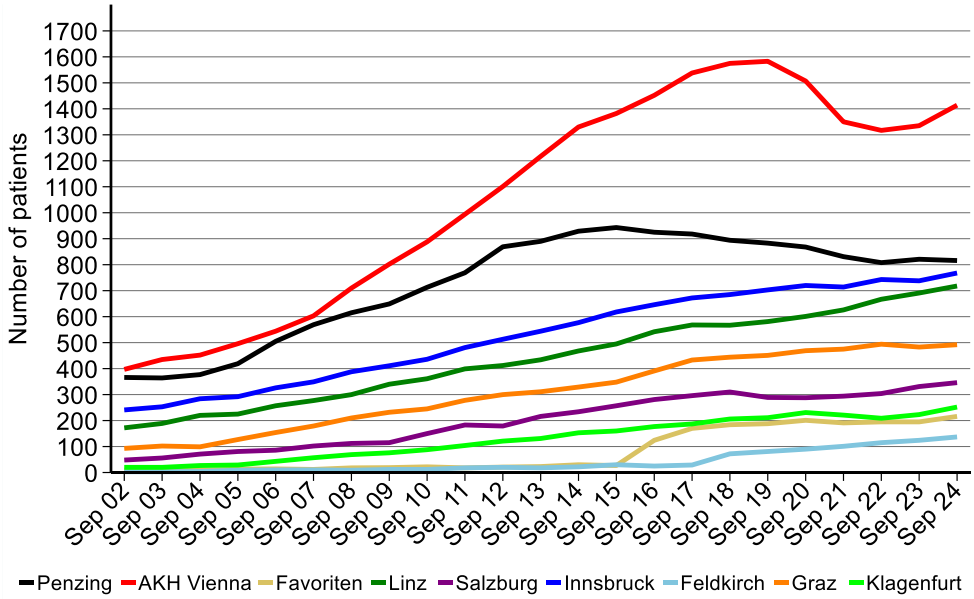
Number of participants currently on antiretroviral therapy

	Penzing Vienna	AKH Vienna	Favoriten Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
01.09.2024	816	1414	216	718	346	768	137	492	252	**5159**



Number of participants currently on antiretroviral therapy by area of residence

	HIV-centre									
	Penzing Vienna	AKH Vienna	Favoriten Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	**Total**
Burgenland	21	32	7	0	0	3	0	23	0	**86**
Carinthia	0	0	0	3	6	7	0	14	243	**273**
Lower Austria	179	275	24	48	1	2	0	3	0	**532**
Upper Austria	2	5	0	641	33	3	0	1	0	**685**
Salzburg	1	1	1	6	263	31	0	1	0	**304**
Styria	3	8	2	6	8	3	0	442	4	**476**
Tyrol	0	0	0	1	3	582	0	1	0	**587**
Vorarlberg	0	0	0	1	0	109	136	0	0	**246**
Vienna	607	1088	178	10	1	9	0	4	2	**1899**
Foreign/missing	3	5	4	2	31	19	1	3	3	**71**
Total	**816**	**1414**	**216**	**718**	**346**	**768**	**137**	**492**	**252**	**5159**

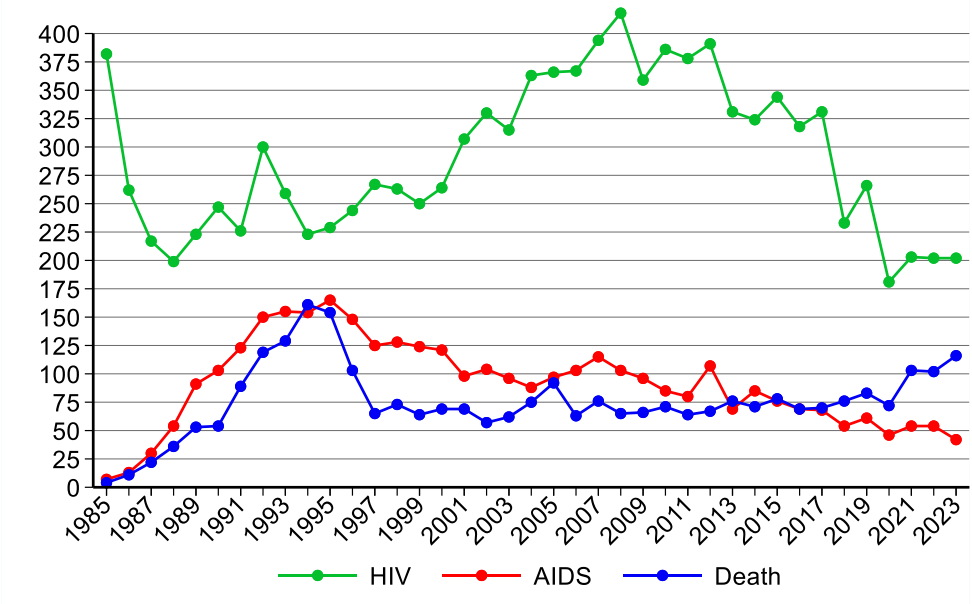
4.3.3 How many persons living with HIV (PLHIV) are there in Austria?

The Dachverband der Sozialversicherungsträger recorded 7768 persons in Austria receiving ART in 2022. According to the ECDC modelling tool 8 (chapter 10.4.2) the proportion of PLHIV on ART in 2022 is estimated to be between 86.5% and 92.2%. Thus, the estimate for PLHIV in Austria ranges from 8400 to 9000 for end of 2022.

The number of PLHIV analysed completely by the modelling tool of ECDC reveals 7596 PLHIV within AHIVCOS for the end of 2022 (a delay of one year for the estimate is caused by the ascertainment of deaths). AHIVCOS captures 64% of all PLHIV receiving ART. Assuming that AHIVCOS is representative for Austria, the overall estimate for PLHIV therefore sums up to 11 860, which is an overestimate, since the ascertainment of out-migration, persons who left the country is very incomplete (e.g. migrant workers from other European countries mainly in the tourism industry, rejection of asylum application or voluntary return to home country).

5 HIV/AIDS Surveillance in Austria

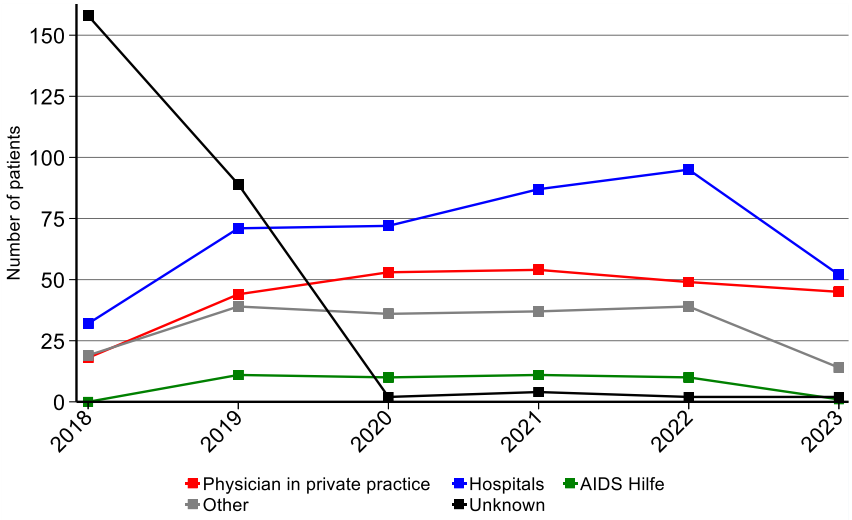
5.1 HIV, AIDS and Death in AHIVCOS per calendar year



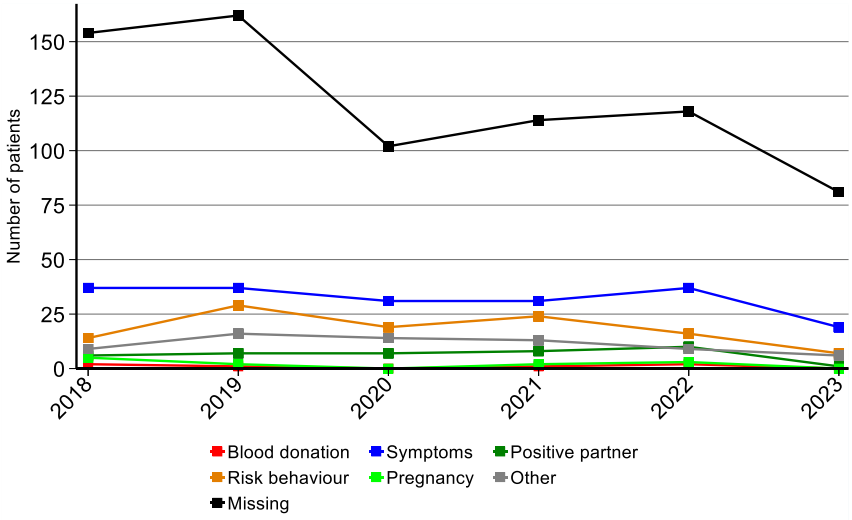
Year	HIV	AIDS	DEATH	Year	HIV	AIDS	DEATH
1985	382	7	4	2005	366	97	92
1986	262	13	11	2006	367	103	63
1987	217	30	22	2007	394	115	76
1988	199	54	36	2008	418	103	65
1989	223	91	53	2009	359	96	66
1990	247	103	54	2010	386	85	71
1991	226	123	89	2011	378	80	64
1992	300	150	119	2012	391	107	67
1993	259	155	129	2013	331	69	76
1994	223	154	161	2014	324	85	71
1995	229	165	154	2015	344	76	78
1996	244	148	103	2016	318	69	69
1997	267	125	65	2017	331	68	70
1998	263	128	73	2018	233	54	76
1999	250	124	64	2019	266	61	83
2000	264	121	69	2020	181	46	72
2001	307	98	69	2021	203	54	103
2002	330	104	57	2022	202	54	102
2003	315	96	62	2023	202	42	116
2004	363	88	75	2024	126	23	17
				Total	**11490**	**3564**	**2966**

5.1.1 Who initiated, offered and performed the HIV test?

Who initiated, offered and performed the HIV test for HIV-positive individuals entering the Austrian HIV cohort study in recent years? Data to answer this questions is very incomplete, however the treatment centres in Linz, Salzburg, Innsbruck and Graz provide important findings.

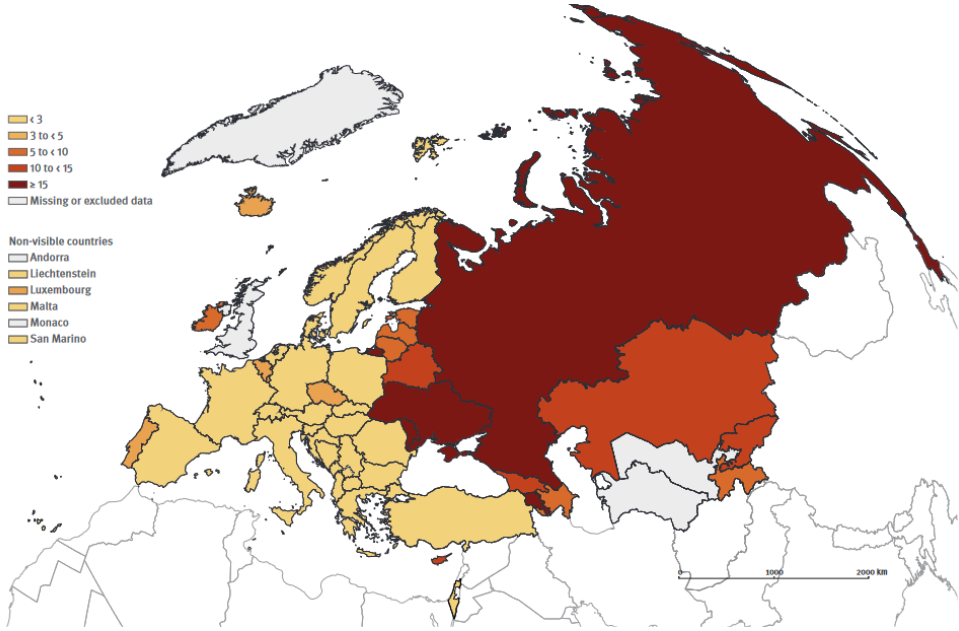


Reason for HIV test

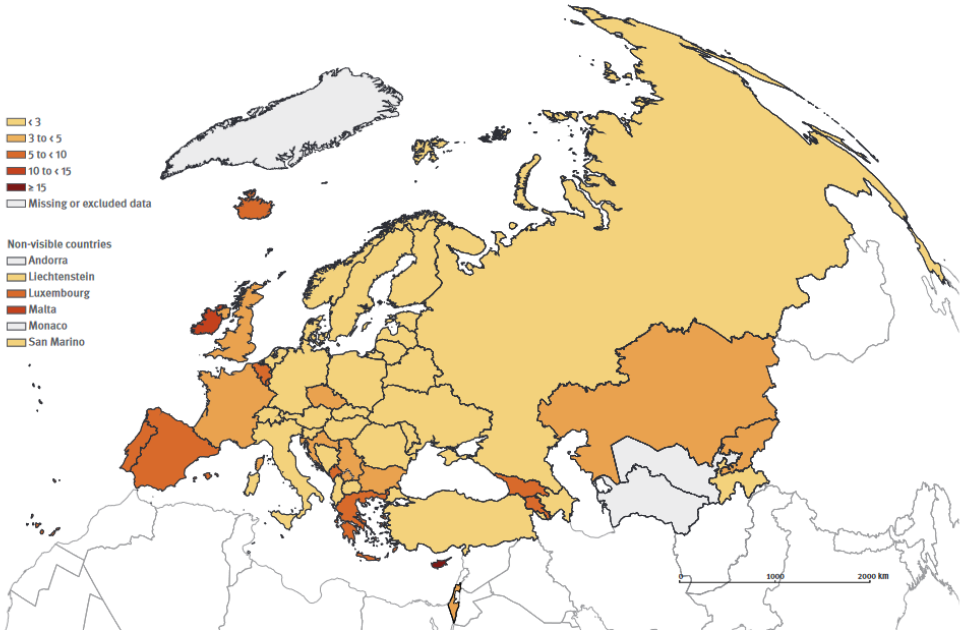


5.2 General overview (ECDC data)

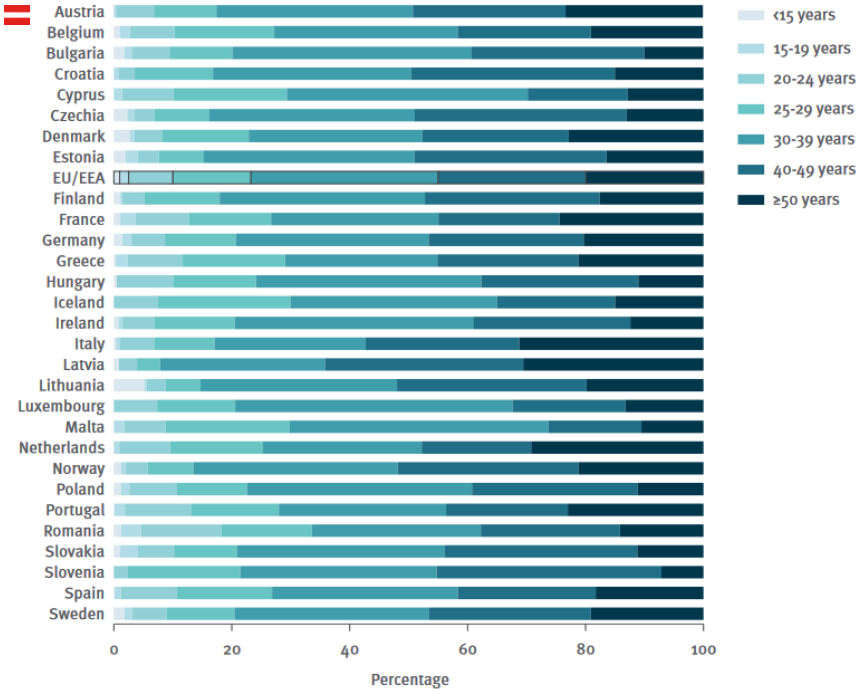
HIV diagnoses acquired through heterosexual transmission per 100 000 population, 2022



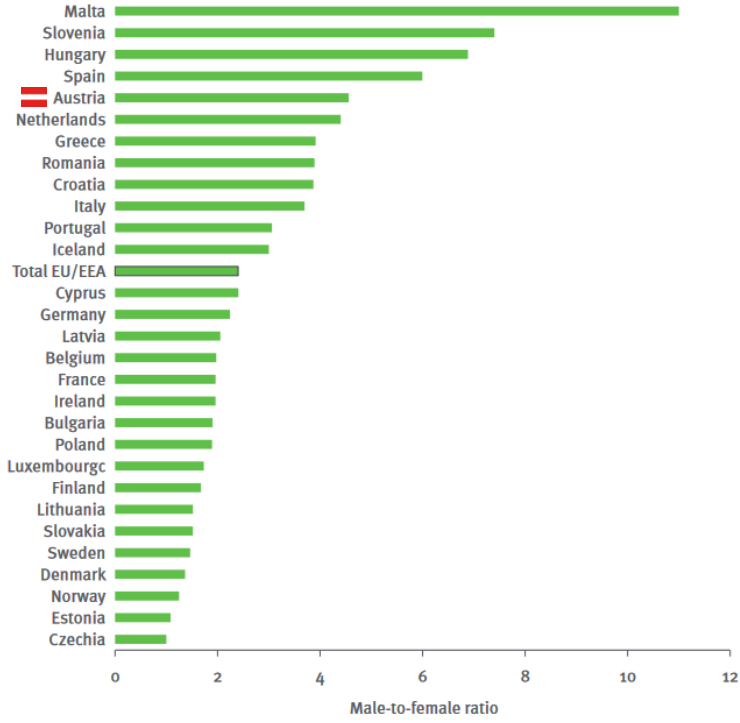
HIV diagnoses in men who have sex with men per 100 000 male population, 2022



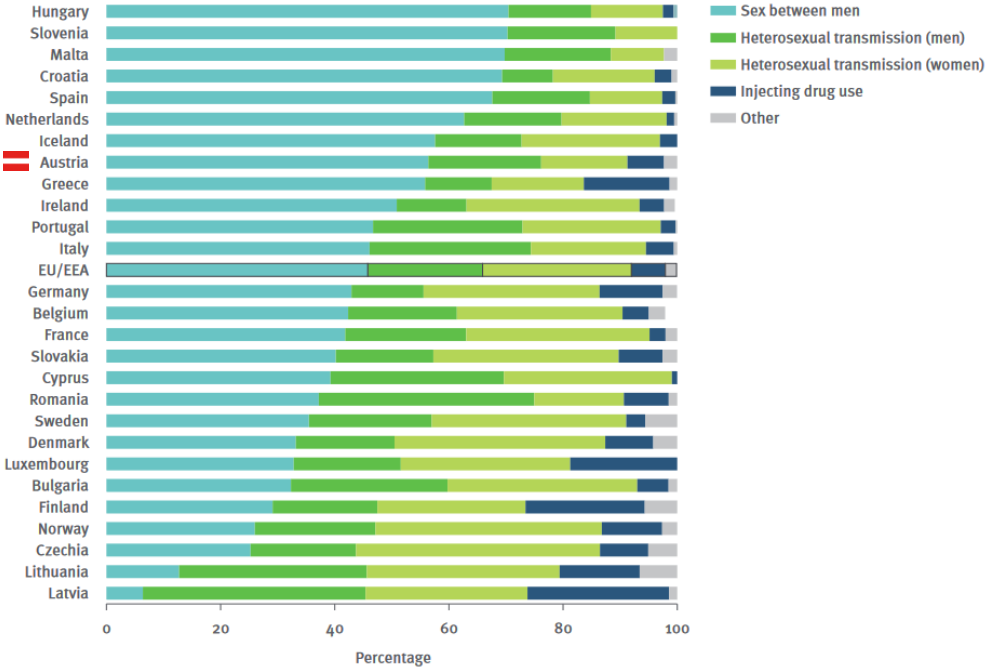
Percentage of new HIV diagnoses, by age group and country, EU/EEA, 2022 (n=22 830)



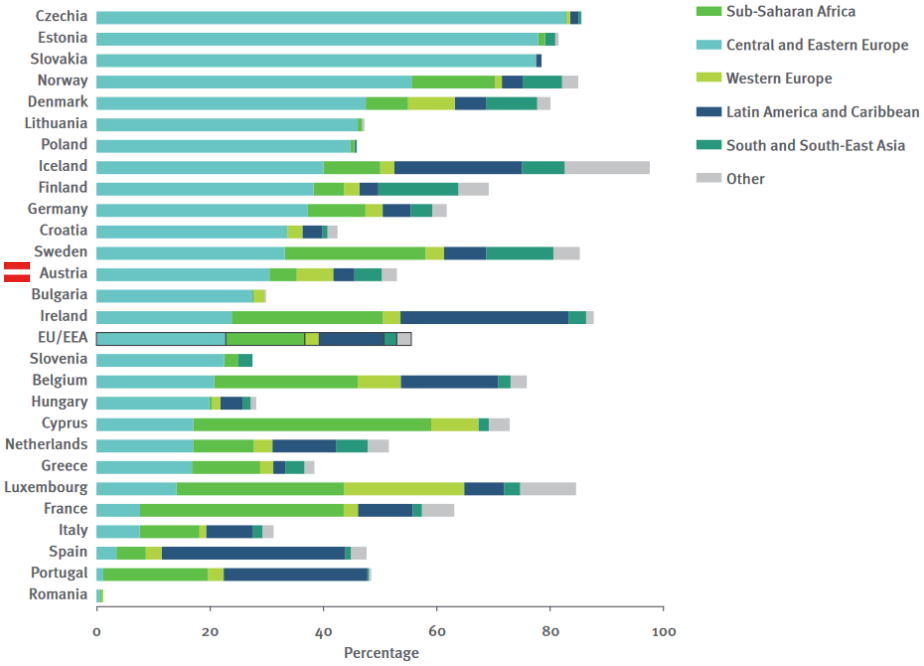
Male-to-female ratio in new HIV diagnoses, by country, EU/EEA, 2022 (n=22 790)



Percentage of new HIV diagnoses with known mode of transmission, by transmission route and country, EU/EEA, 2022 (n=16 718)



Percentage of new HIV diagnoses among migrants out of all reported cases with known information on region of origin, by country, EU/EEA, 2022 (n=20 016)



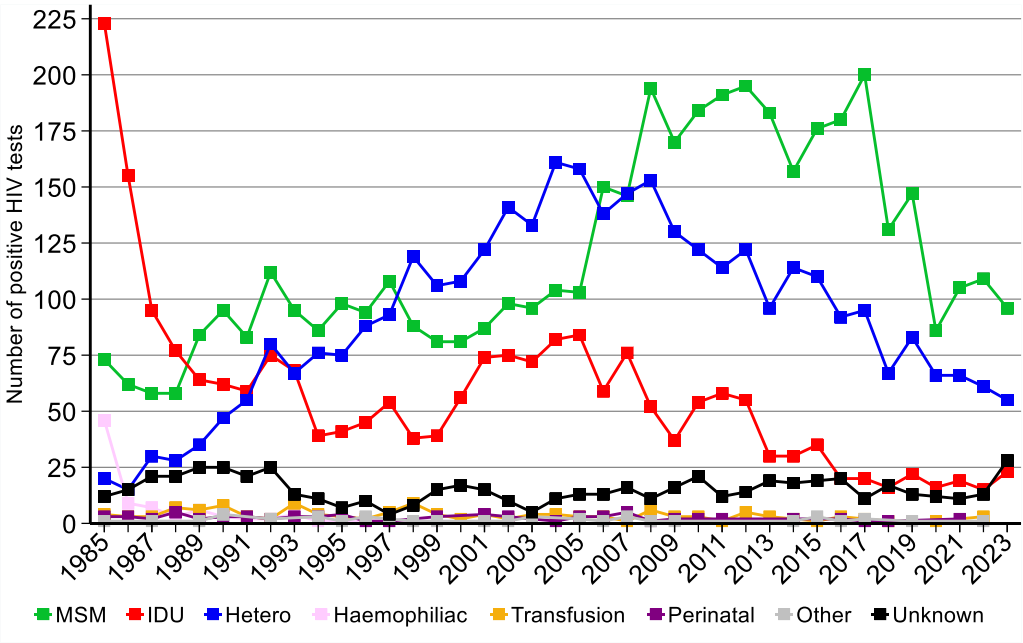
5.3 Mode of transmission

5.3.1 Transgender

There are 20 transgender women in the Austrian HIV Cohort Study.
Two of them died and median age at diagnosis is 30.7. Fifteen are Austrian nationality. Fifteen had a visit in the last 12 months. Median age of those with a follow up in the last 12 months is 47.1 (mean 47.0).

If gender and transmission are combined, transgender persons are put in the group Other or *excluded* from the analyses.

5.3.2 All modes of transmission

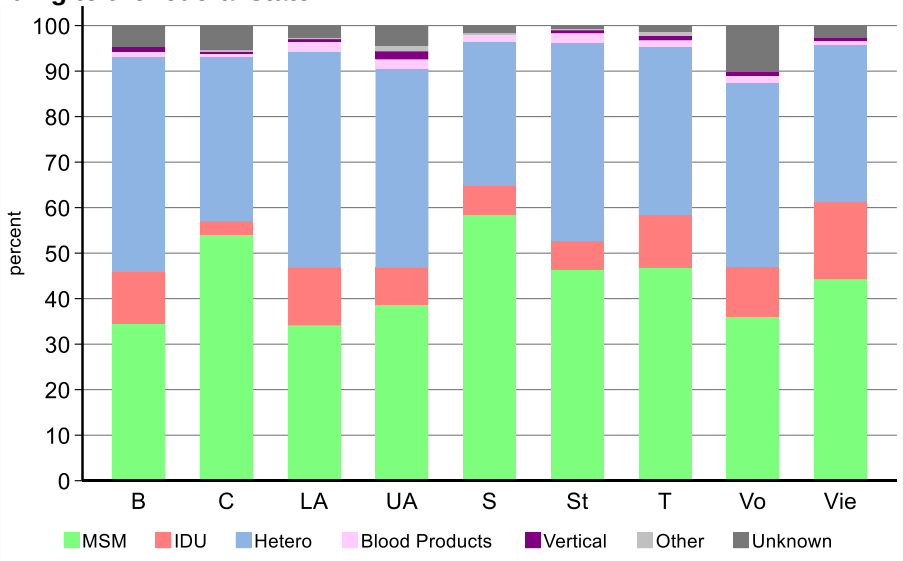


The abbreviation MSM is used for „Men who have sex with men". IDU means „Injecting Drug Use". The category IDU also includes men who are both MSM and IDU. The category "blood products" includes cohort participants who have received coagulation compounds or blood transfusions. Among the patients with a follow-up in the last 12 months, 38.65% have been infected through heterosexual contacts, 43.87% through homosexual contacts and 11.85% through the injection of drugs.

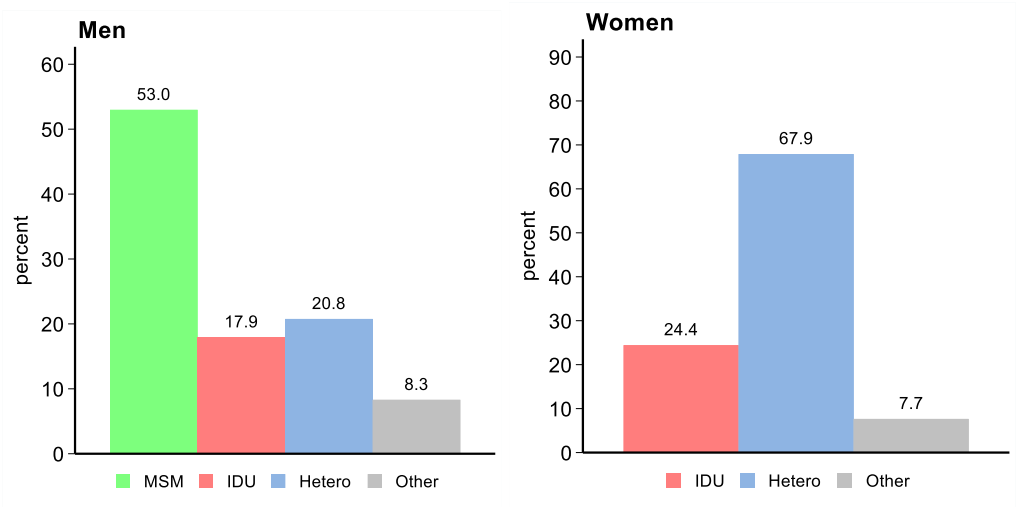
	BMSGPK	AHIVCOS											
						Heterosexually							
Year	Total	MSM		IDU		infected		Others		Total	Women		
1998	313	88	33.46%	38	14.45%	119	45.25%	18	6.84%	263	60	22.81%	
1999	339	81	32.40%	39	15.60%	106	42.40%	24	9.60%	250	69	27.60%	
2000	428	81	30.68%	56	21.21%	108	40.91%	19	7.20%	264	77	29.17%	
2001	402	87	28.34%	74	24.10%	122	39.74%	24	7.82%	307	74	24.10%	
2002	442	98	29.70%	75	22.73%	141	42.73%	16	4.85%	330	92	27.88%	
2003	423	96	30.48%	72	22.86%	133	42.22%	14	4.44%	315	96	30.48%	
2004	470	104	28.65%	82	22.59%	161	44.35%	16	4.41%	363	110	30.30%	
2005	453	103	28.14%	84	22.95%	158	43.17%	21	5.74%	366	100	27.32%	
2006	435	150	40.87%	59	16.08%	138	37.60%	20	5.45%	367	89	24.25%	
2007	515	146	37.06%	76	19.29%	147	37.31%	25	6.35%	394	92	23.35%	
2008	505	194	46.41%	52	12.44%	153	36.60%	19	4.55%	418	98	23.44%	
2009	507	170	47.35%	37	10.31%	130	36.21%	22	6.13%	359	79	22.01%	
2010	487	184	47.67%	54	13.99%	122	31.61%	26	6.74%	386	76	19.69%	
2011	525	191	50.53%	58	15.34%	114	30.16%	15	3.97%	378	79	20.90%	
2012	523	195	49.87%	55	14.07%	122	31.20%	19	4.86%	391	80	20.46%	
2013	481	183	55.29%	30	9.06%	96	29.00%	22	6.65%	331	53	16.01%	
2014	403	157	48.46%	30	9.26%	114	35.19%	23	7.10%	324	73	22.53%	
2015	428	176	51.16%	35	10.17%	110	31.98%	23	6.69%	344	48	13.95%	
2016	447	180	56.60%	20	6.29%	92	28.93%	26	8.18%	318	55	17.30%	
2017	510	200	60.42%	20	6.04%	95	28.70%	16	4.83%	331	56	16.92%	
2018	323 / 74*	131	56.22%	16	6.87%	67	28.76%	19	8.15%	233	40	17.17%	
2019	336 / 94*	147	55.26%	22	8.27%	83	31.20%	14	5.26%	266	41	15.41%	
2020	283 / 49*	86	47.51%	16	8.84%	66	36.46%	13	7.18%	181	32	17.68%	
2021	310 / 66*	105	51.72%	19	9.36%	66	32.51%	13	6.40%	203	33	16.26%	
2022	395 / 78*	109	53.96%	15	7.43%	61	30.20%	17	8.42%	202	36	17.82%	
2023	341 / 60*	96	47.52%	23	11.39%	55	27.23%	28	13.86%	202	38	18.81%	
2024		49	38.89%	13	10.32%	44	34.92%	20	15.87%	126	27	21.43%	

*second number tested anonymously since 2018

Transmission category in participants with follow-up within the last 12 months according to the federal state

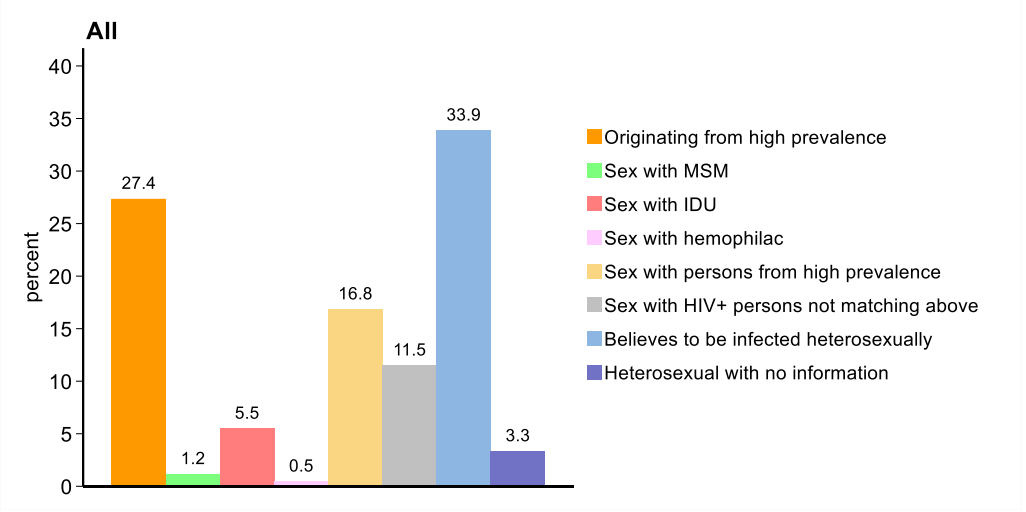


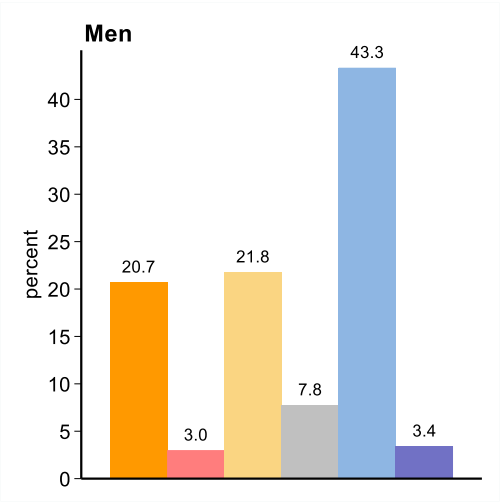
5.3.3 Categories of transmission

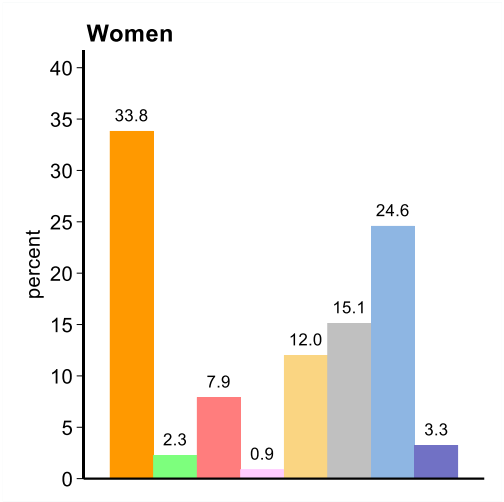


5.3.3.1 Categories of heterosexually acquired infections

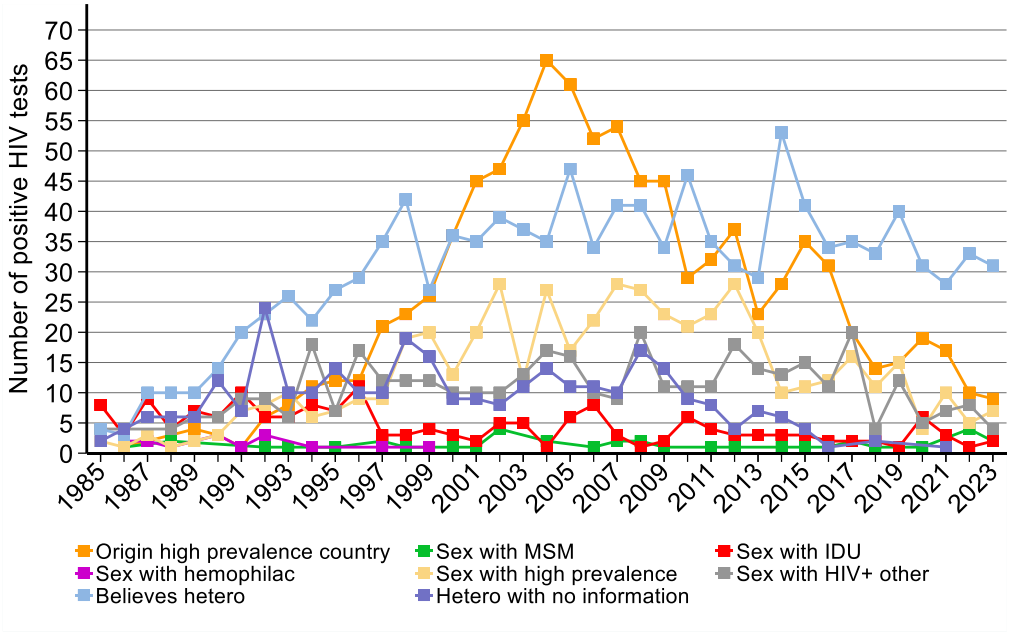
Transgender persons are excluded from the following analysis.
Because of missing data, the HIV treatment centre Penzing Vienna has also been excluded from some analyses.







Sub-categories of heterosexually acquired infections

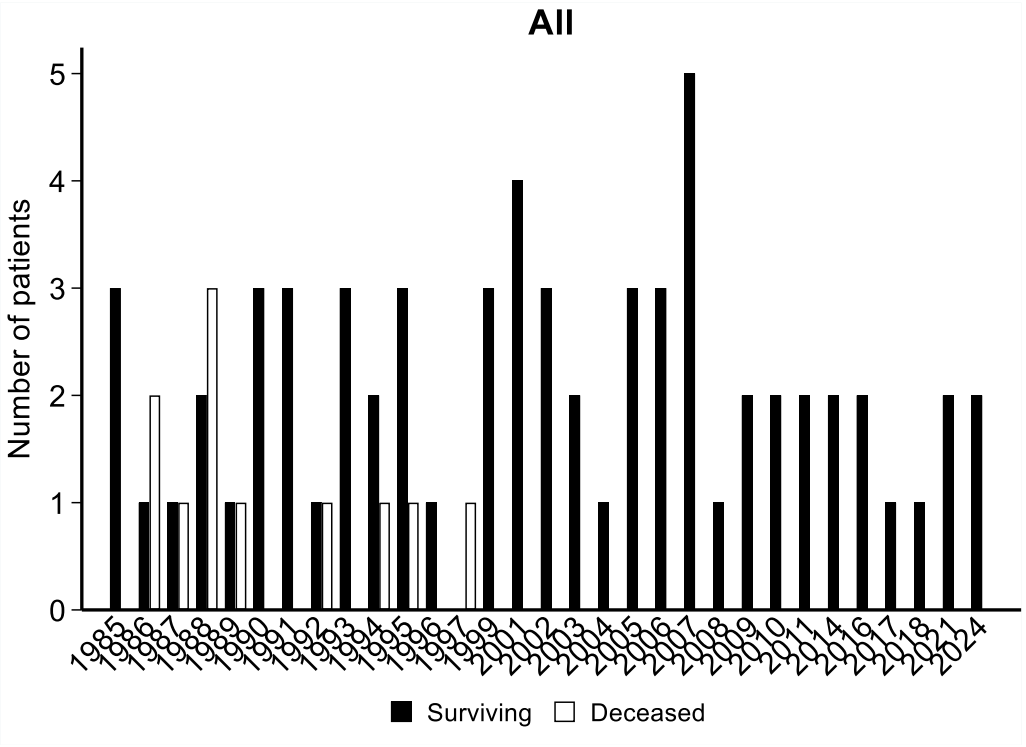


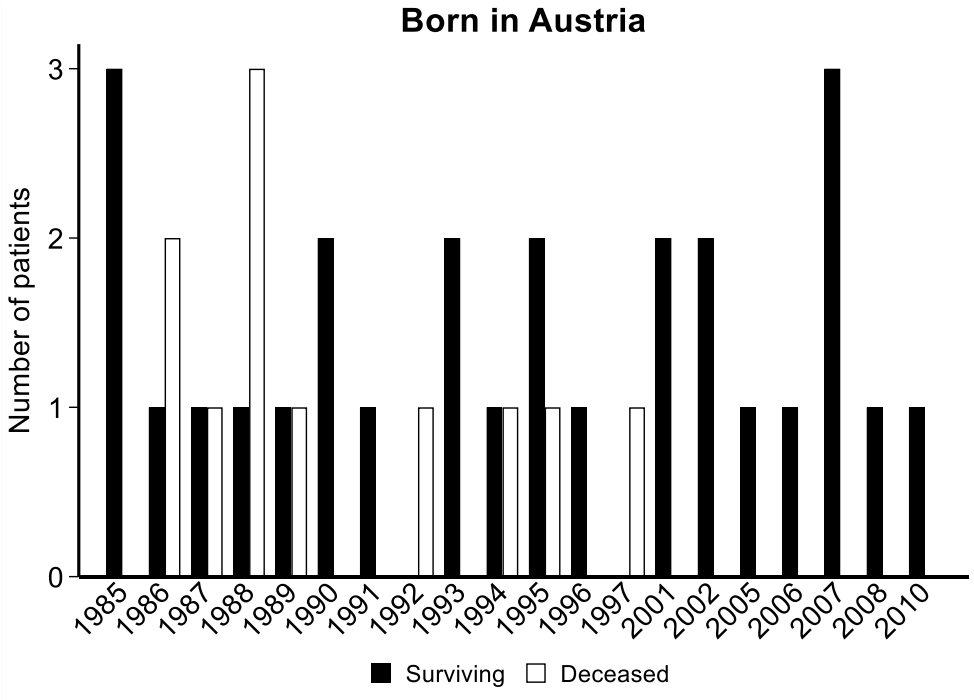
5.3.4 Mother-to-child-transmission

Nowadays, mother-to-child-transmission is the only route of HIV transmission amongst children. All HIV infected children in Austria are followed in paediatric HIV treatment centres, therefore the data presented here are related to patients who have also been in care by the adult HIV treatment centres. Obviously, these data are incomplete.

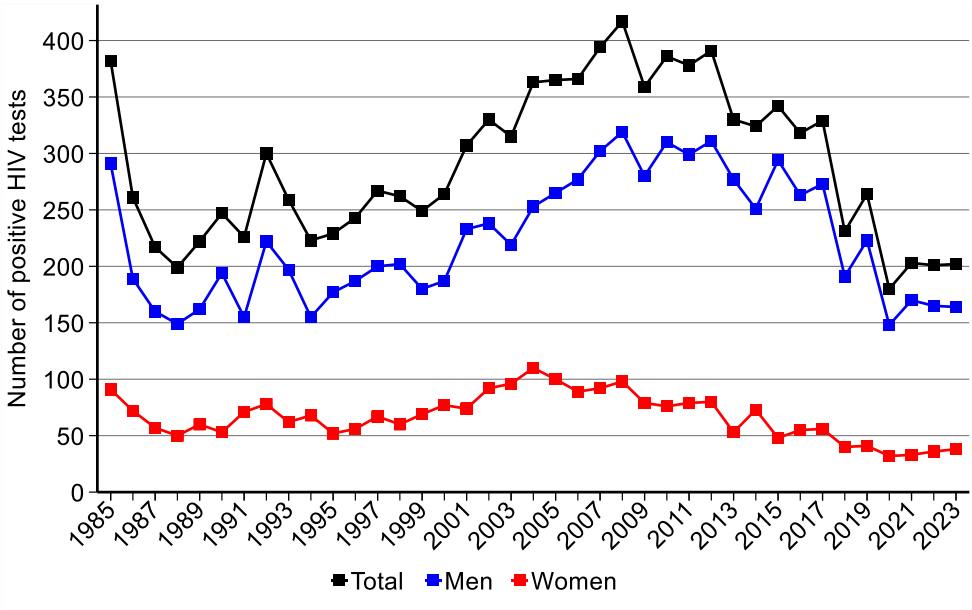
	Living participants		Deceased participants	Total
	<18 years	>18 years		
Burgenland	0	2	0	2
Carinthia	0	1	0	1
Lower Austria	1	5	0	6
Upper Austria	1	11	1	13
Salzburg	1	0	0	1
Styria	0	4	0	4
Tyrol	2	4	4	10
Vorarlberg	1	1	3	5
Vienna	5	17	3	25
Missing residency	0	1	0	1
Foreign	3	5	0	8
Total	14	51	11	76

In January 2010, routine HIV testing in pregnancy was introduced in Austria. The HIV test is part of the mother-child booklet (*Mutter-Kind-Pass*). In order to be eligible for childcare allowance *(Kinderbetreuungsgeld)* you must have the first ten examinations stipulated in the mother-child booklet done correctly and obtain proof of it. Recently, at least two
transmissions of mother-to-child in Austria have been linked to counselling with HIV denialists.


All
Number of patients
0
1
2
3
4
5
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1999
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2014
2016
2017
2018
2021
2024
Surviving
Deceased

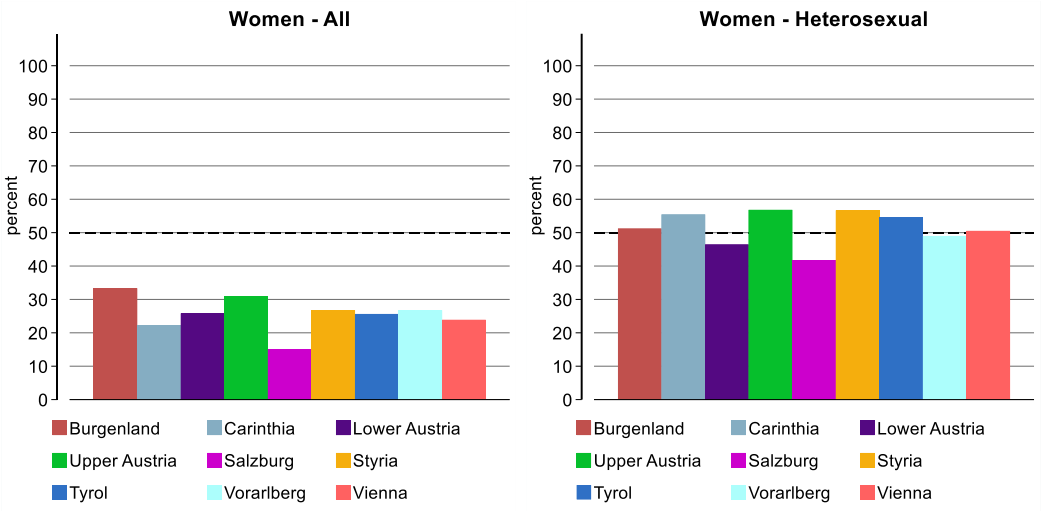

Born in Austria
Number of patients
0
1
2
3
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
2001
2002
2005
2006
2007
2008
2010
Surviving
Deceased

5.4 HIV diagnoses by sex



25.1% of the patients with a follow-up within the last 12 months are female. The rate is highest in Burgenland (33.4%) and Upper Austria (31.0%).
In the subgroup of heterosexually acquired infections, the rate of the women is 51.9%. It is highest in Upper Austria (56.8%), Styria (56.7%) and Carinthia (55.5%).

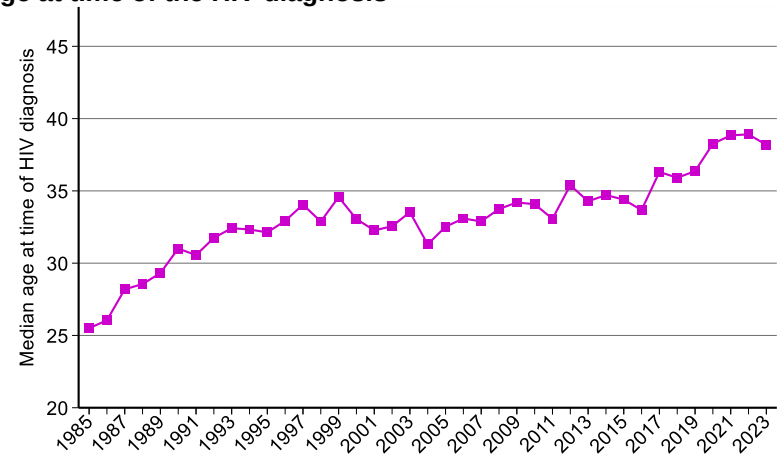
Proportion of women in participants with a follow-up in the last 12 months according to federal states

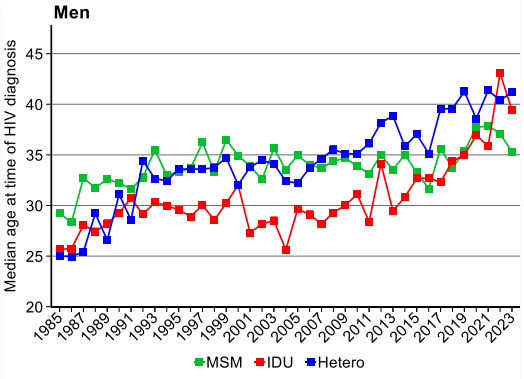


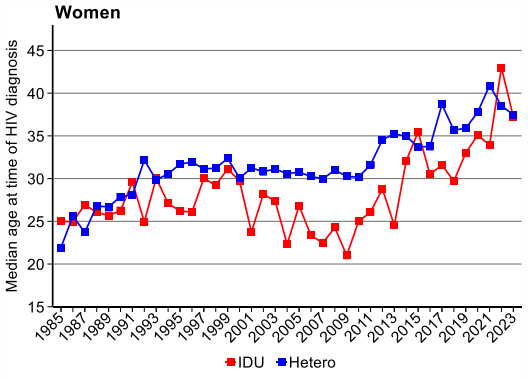
5.5 Age

5.5.1 Age at time of HIV diagnosis

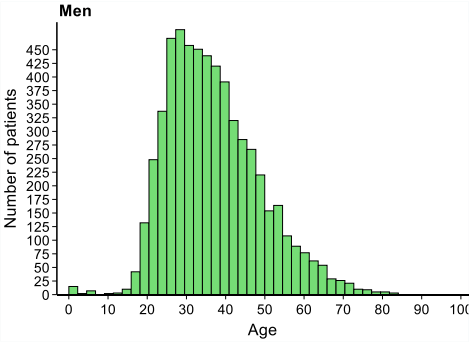
Median age at time of the HIV diagnosis

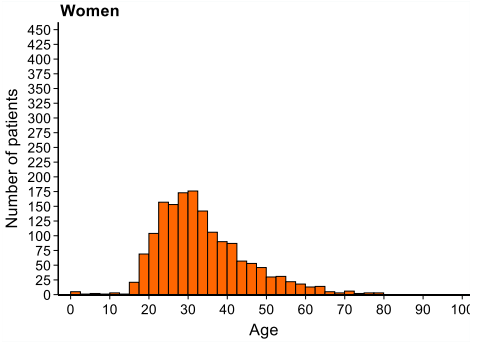


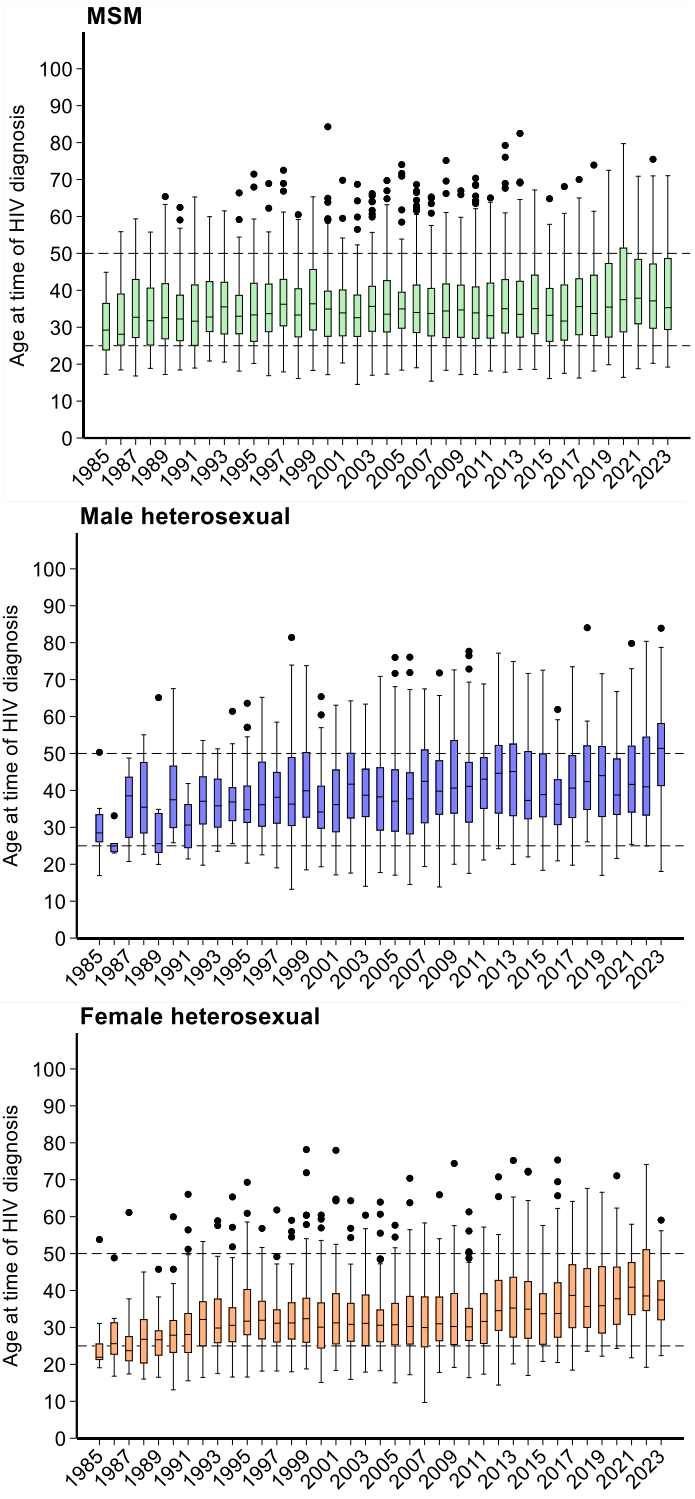




Age at time of the HIV diagnosis

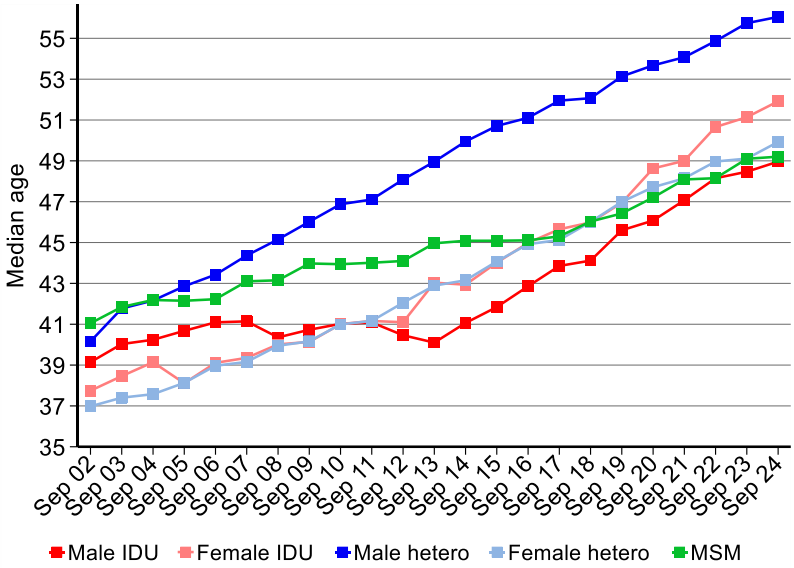




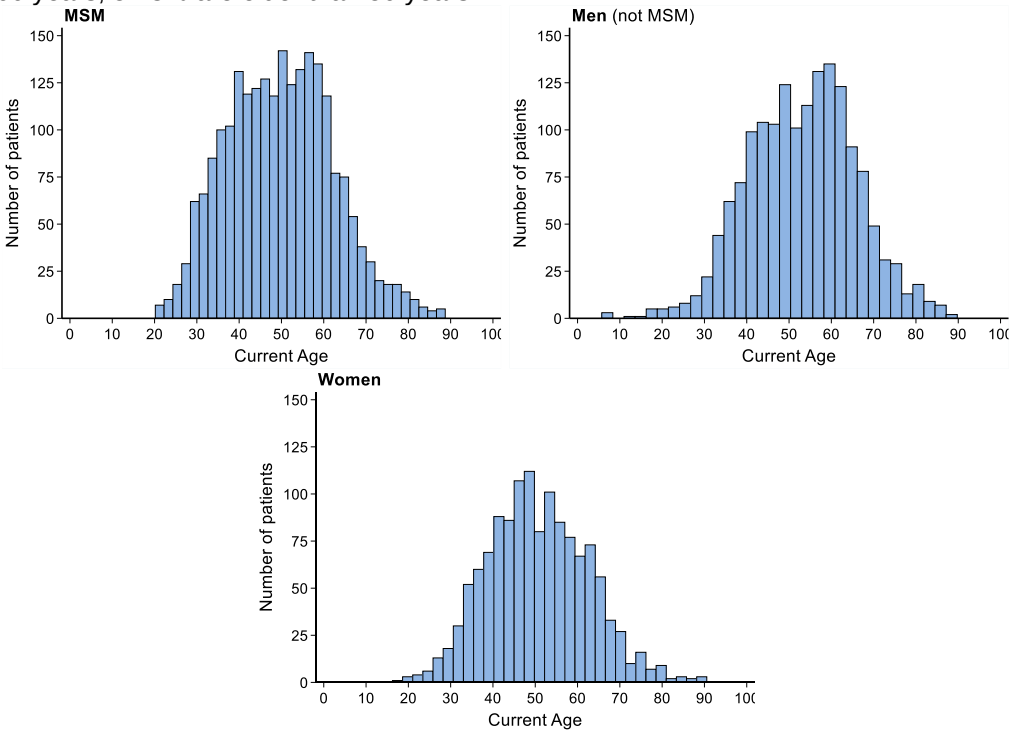

MSM
Male heterosexual
Female heterosexual
Age at time of HIV diagnosis
0
10
20
30
40
50
60
70
80
90
100
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023

5.5.2 Age of patients currently in care

Overall, median age increased from 39.2 in September 2002 to 50.8 in September 2024. In MSM, median age increased from 41.0 in September 2002 to 49.2 in September 2024, in men (not MSM) from 39.9 to 53.2 and in women from 37.1 to 49.8.



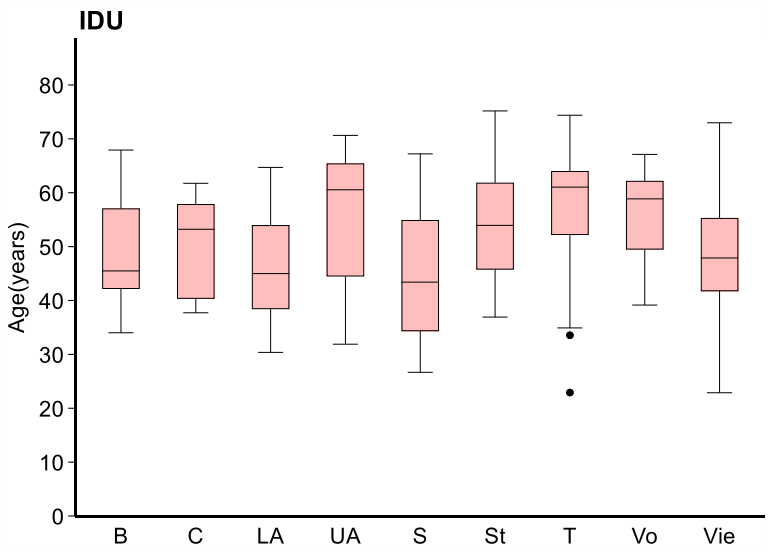
Median and average age are 50.8 and 51.0 years, respectively. 24.6% are older than 60 years, 52.3% are older than 50 years.



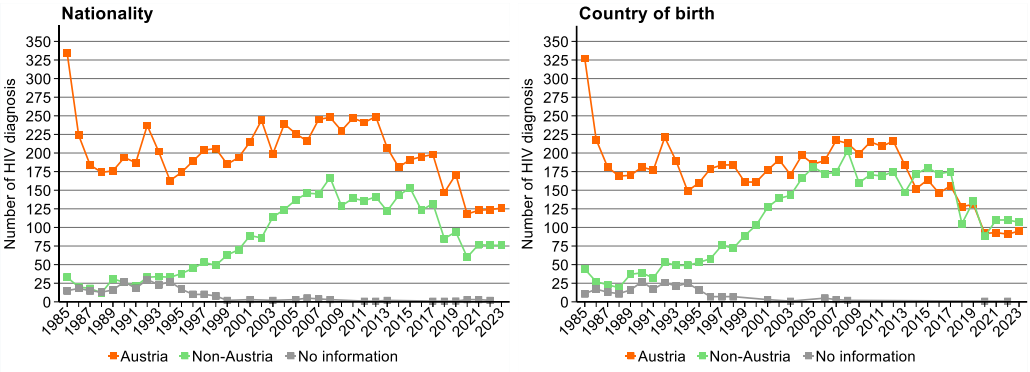
Age across the federal states: follow-up in the last 12 months

Federal state	Median Age years	≥50 years	≥60 years	≥75 years
Burgenland	52.2	58.6	29.9	3.4
Carinthia	51.4	55.6	23.7	1.8
Lower Austria	53.6	59.3	30.2	5.8
Upper Austria	50.4	50.7	27.5	3.6
Salzburg	50.0	50.2	22.6	3.0
Styria	50.4	50.5	22.0	2.7
Tyrol	53.5	58.2	27.6	3.6
Vorarlberg	52.0	54.3	25.1	4.9
Vienna	49.5	48.7	22.0	2.9
Total	**50.8**	**52.3**	**24.6**	**3.4**

Age in Injecting Drug Users according to federal states



5.6 Nationality and country of birth

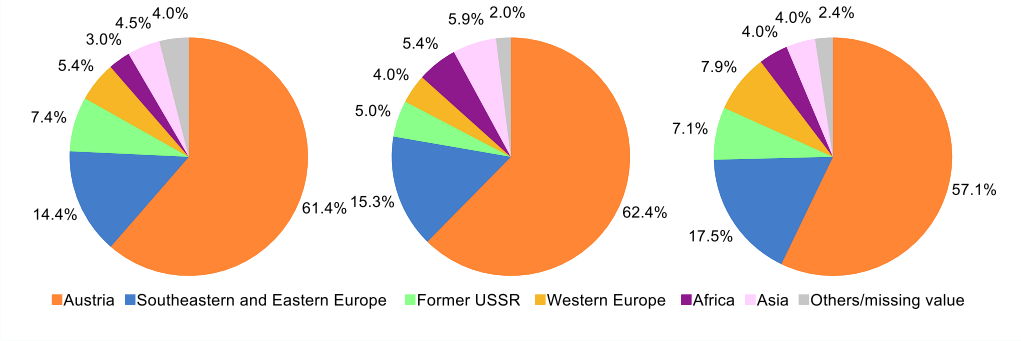


5.6.1 Overview

	BMSGPK	AHIVCOS								
Year	Total	Austria		Low prevalence countries		High prevalence countries		Missing value		Total
1998	313	206	78.33%	31	11.79%	18	6.84%	8	3.04%	263
1999	339	185	74.00%	43	17.20%	20	8.00%	2	0.80%	250
2000	428	194	73.48%	38	14.39%	32	12.12%	0	0.00%	264
2001	402	215	70.03%	50	16.29%	39	12.70%	3	0.98%	307
2002	442	244	73.94%	51	15.45%	35	10.61%	0	0.00%	330
2003	423	199	63.17%	62	19.68%	52	16.51%	2	0.63%	315
2004	470	239	65.84%	66	18.18%	58	15.98%	0	0.00%	363
2005	453	226	61.75%	63	17.21%	74	20.22%	3	0.82%	366
2006	435	216	58.86%	84	22.89%	62	16.89%	5	1.36%	367
2007	515	245	62.18%	82	20.81%	63	15.99%	4	1.02%	394
2008	505	248	59.33%	112	26.79%	55	13.16%	3	0.72%	418
2009	507	230	64.07%	81	22.56%	48	13.37%	0	0.00%	359
2010	487	247	63.99%	106	27.46%	33	8.55%	0	0.00%	386
2011	525	241	63.76%	106	28.04%	30	7.94%	1	0.26%	378
2012	523	249	63.68%	104	26.60%	37	9.46%	1	0.26%	391
2013	481	207	62.54%	99	29.91%	23	6.95%	2	0.60%	331
2014	403	181	55.86%	107	33.02%	36	11.11%	0	0.00%	324
2015	428	191	55.52%	115	33.43%	38	11.05%	0	0.00%	344
2016	447	195	61.32%	95	29.87%	28	8.81%	0	0.00%	318
2017	510	198	59.82%	114	34.44%	18	5.44%	1	0.30%	331
2018	323 / 74*	147	63.09%	75	32.19%	10	4.29%	1	0.43%	233
2019	336 / 94*	171	64.29%	79	29.70%	15	5.64%	1	0.38%	266
2020	283 / 49*	118	65.19%	52	28.73%	8	4.42%	3	1.66%	181
2021	310 / 66*	123	60.59%	67	33.00%	10	4.93%	3	1.48%	203
2022	395 / 78*	124	61.39%	69	34.16%	7	3.47%	2	0.99%	202
2023	341 / 60*	126	62.38%	66	32.67%	10	4.95%	0	0.00%	202
2024		72	57.14%	46	36.51%	7	5.56%	1	0.79%	126

* second number tested anonymously since 2018

5.6.2 Nationality: HIV diagnoses between 2022 and 2024

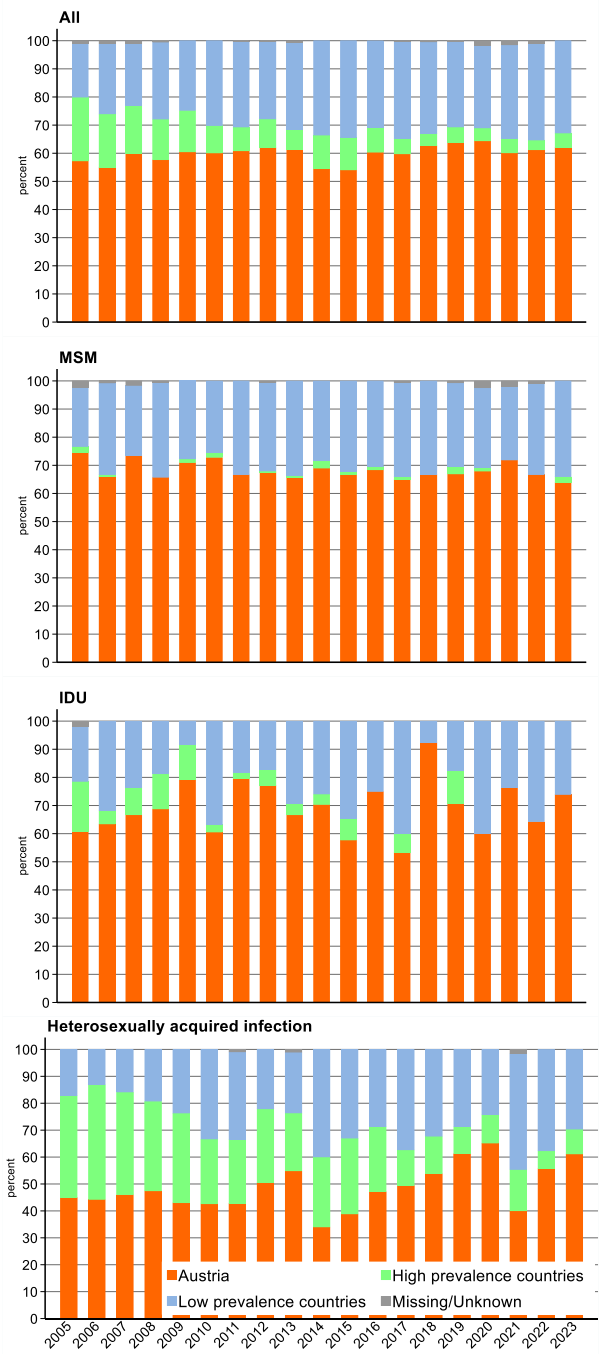


HIV diagnosis 2022 N=202	
Afghanistan	3
Austria	124
Bosnia and Herzegovina	2
Brazil	4
Bulgaria	1
Cameroon	2
Canada	1
Colombia	1
Croatia	3
Czech Republic	1
Egypt	1
France	1
Georgia	1
Occupied Palestinian Territory	1
Greece	2
Hungary	3
Iran	3
Italy	4
Kenya	1
Poland	3
Portugal	1
Romania	6
Russian Federation	2
Serbia	4
Slovakia	3
Slovenia	1
Somalia	1
South Africa	1
Spain	1
Switzerland	2
Syrian Arab Republic	1
Thailand	1
Turkey	2
Ukraine	12
Unknown	2

HIV diagnosis 2023 N=202	
Afghanistan	4
Azerbaijan	1
Argentina	1
Austria	126
Bosnia and Herzegovina	5
Bulgaria	2
Cameroon	2
China	2
Colombia	1
Cote d'Ivoire	2
Democratic Republic of the Congo	1
Dominican Republic	1
Ethiopia	1
France	1
Germany	4
Ghana	1
Indonesia	2
Italy	1
Republic of Moldova	1
Nigeria	2
Pakistan	1
Poland	2
Portugal	1
Romania	9
Russian Federation	1
Serbia	1
Slovakia	1
Slovenia	1
Somalia	2
Switzerland	1
Syrian Arab Republic	3
Turkey	8
Ukraine	7
The former Yugoslav Republic of Macedonia	2
Venezuela	1

HIV diagnosis 2024 N=126	
Afghanistan	2
Austria	72
Bosnia and Herzegovina	1
Brazil	2
Croatia	2
Czech Republic	1
France	1
Germany	6
Greece	1
Hungary	3
India	1
Italy	1
Kenya	1
Nigeria	2
Poland	1
Romania	7
Russian Federation	2
Serbia	1
Slovakia	2
Slovenia	1
Spain	1
Syrian Arab Republic	1
Thailand	1
Tunisia	1
Turkey	3
Ukraine	7
United Republic of Tanzania	1
Unknown	1

5.6.3 Nationality



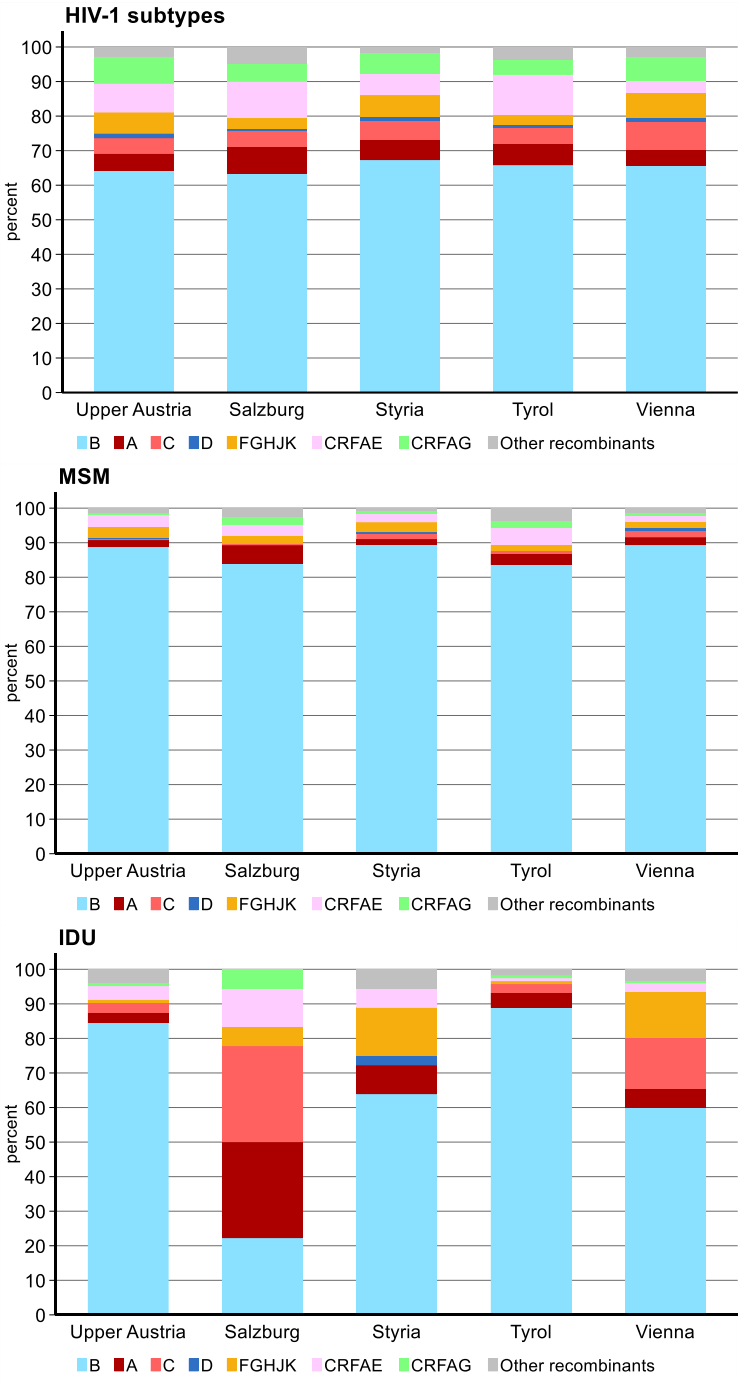
Low prevalence countries are countries with an HIV infection rate of adults <1%, high prevalence countries are countries with an HIV infection rate of adults ≥1%.

5.6.4 Refugees from Ukraine (after March 1st 2022)

Center	Men	Women	Children	ART	Total
Penzing	7	11	0	17	18
AKH Vienna	14	22	1	35	37
Favoriten	6	5	0	10	11
Linz	7	18	2	26	27
Salzburg	3	4	0	7	7
Innsbruck	4	8	3	15	15
Feldkirch	2	3	0	5	5
Graz	4	14	0	17	18
Klagenfurt	1	4	0	5	5
Total	**48**	**89**	**6**	**137**	**143**

5.7 HIV-1 subtypes

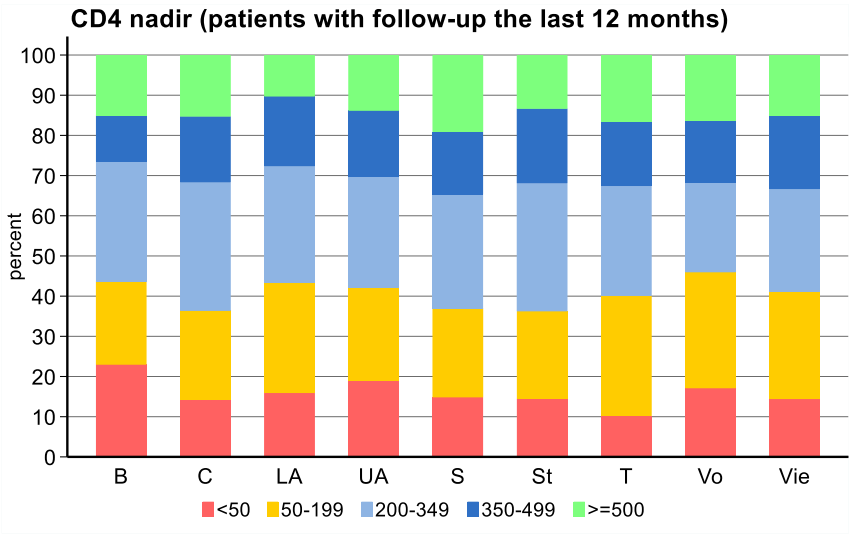
Subtypes were determined by genotypic resistance testing of Reverse Transcriptase and Protease according to Stanford database. Overall 3995 subtypes were available.



5.8 Stage of HIV disease

5.8.1 Lowest ever measured CD4 cell count

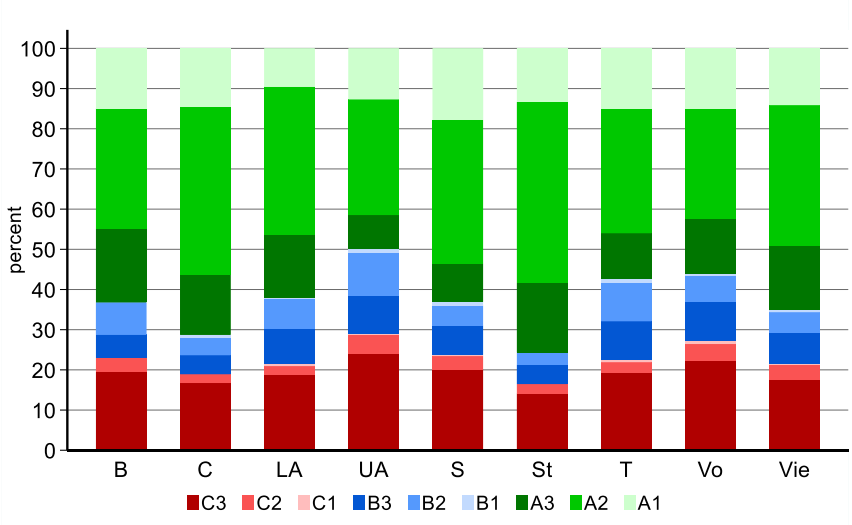
The median of the lowest CD4 cell count ever measured („CD4 nadir“) in the patients with follow-up in the last 12 months is 246/µl.



5.8.2 Proportion of Patients with AIDS

The classification of the HIV infection according to CDC puts patients in one of three clinical categories (A, B, C) and one of three CD4 cell count categories (1, 2, 3).

CD4 count		**A** Asymptomatic	**B** Non-AIDS defining conditions	**C** AIDS
1	≥ 500/µl	**A1**	**B1**	**C1**
2	200-499/µl	**A2**	**B2**	**C2**
3	< 200/µl	**A3**	**B3**	**C3**



5.9 „Elite-controllers“ and „viremia-controllers“

Median time from HIV-1 infection to death in untreated patients is estimated to be approximately 10-12 years. However, there is considerable variation in survival time between patients. A small number of patients remain asymptomatic for many years and maintain high CD4 cell counts or low plasma HIV RNA levels, or both, without antiretroviral therapy. Patients able to maintain high CD4 counts have been called “long-term non-progressors”, whilst those with low viral loads have been called “HIV controllers” or “elite controllers”. Viremic controllers have low but readily measurable virus loads. Elite controllers suppress HIV to extremely low levels, measurable only by sensitive laboratory techniques.

Being ART naïve	**HIV-infected up to 10 years N=1751**		**HIV-infected for over 10 years N=3421**	
	N	**%**	**N**	**%**
HIV RNA ≤ 50 copies/ml	11	0.63%	7	0.20%
HIV RNA < 400 copies/ml	11	0.63%	8	0.23%
CD4 > 500 cells/µl	2	0.11%	7	0.20%
CD4 > 500 cells/µl and HIV RNA ≤ 50 copies/ml	2	0.11%	2	0.06%
CD4 > 500 cells/µl and HIV RNA < 400 copies/ml	2	0.11%	3	0.09%

6 Diagnosis of HIV and presentation to an HIV centre

6.1 Presentation to an HIV centre

Austria has one of the highest rates of HIV tests in Europe (more than 75 tests per year per 1000 population). Nevertheless, a substantial portion of the patients (>40%) are diagnosed late (CD4 cell count <350/µl).

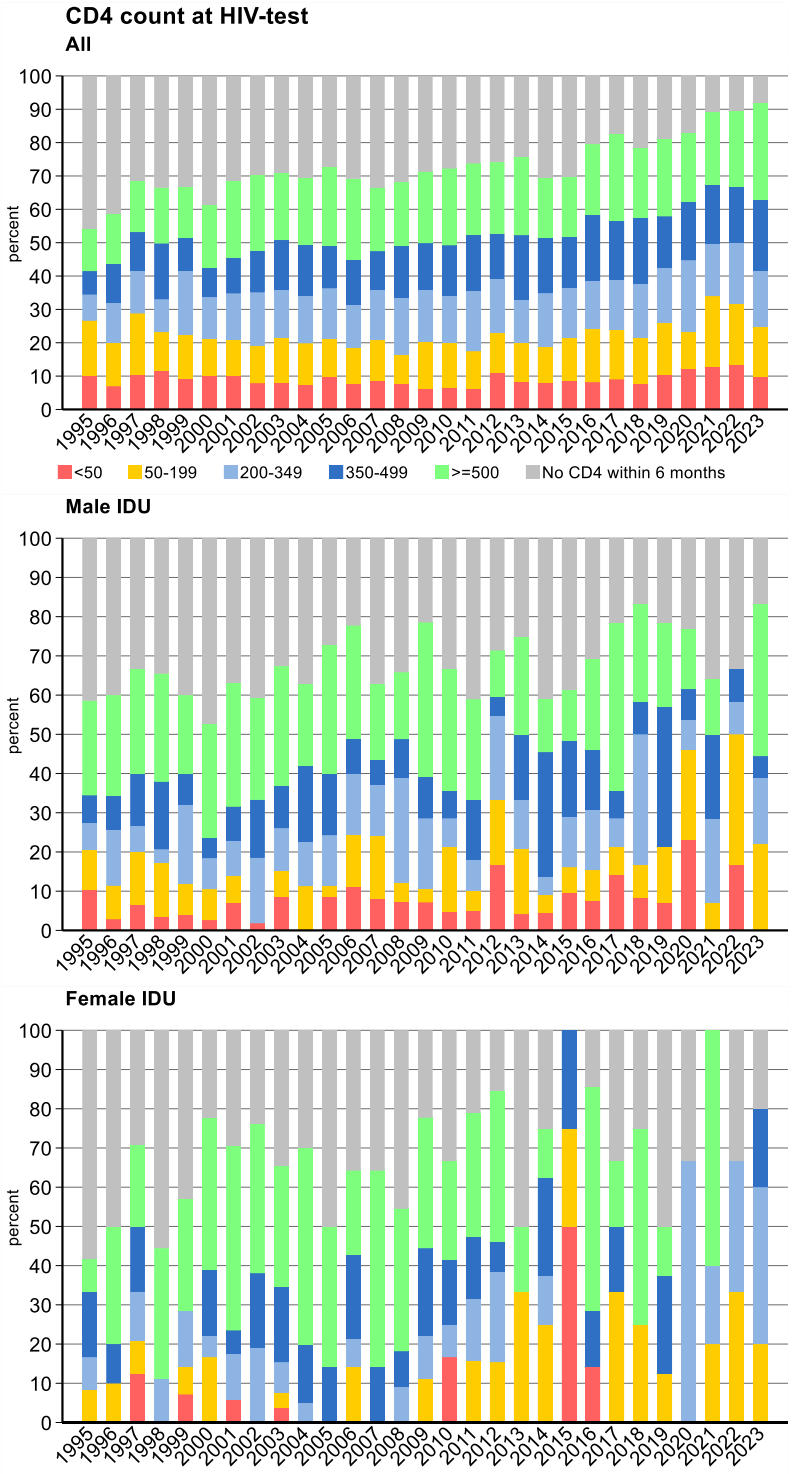
Year of HIV diagnosis	Time between HIV test and first CD4 cell count measurement in months						First CD4 cell count (all patients, 475 missing)		
	All Patients			IDU					
	N	Median	90 Per	N	Median	90 Per	Median	Quartiles	
1985	342	64.5	181.1	199	50.1	133.4	313.5	119.0	545.0
1990	228	18.6	107.3	59	5.3	62.2	255.0	50.0	529.0
1995	219	2.6	101.2	39	4.2	101.4	240.0	88.0	480.0
2000	257	1.1	135.8	56	2.3	92.0	361.0	158.0	566.0
2005	359	0.7	104.1	84	1.2	71.4	354.0	165.0	538.0
2006	356	0.8	77.4	59	1.1	51.1	371.5	195.5	581.5
2007	383	0.7	82.9	75	2.0	82.9	332.0	160.0	575.0
2008	407	0.8	84.9	52	1.6	84.9	398.0	228.0	570.0
2009	347	0.6	78.2	37	0.7	38.1	344.0	197.0	565.0
2010	376	0.6	72.0	54	0.7	69.5	392.5	199.5	632.0
2011	367	0.6	57.7	56	1.5	38.8	380.0	221.0	570.0
2012	385	0.6	48.0	55	1.0	45.9	365.0	169.0	578.0
2013	321	0.5	43.6	29	1.5	40.9	404.0	210.0	629.0
2014	313	0.7	48.0	30	1.8	51.8	384.0	203.0	586.0
2015	327	0.5	36.0	35	1.6	38.5	382.0	178.0	571.0
2016	306	0.5	17.3	19	0.7	70.3	373.5	164.0	583.0
2017	321	0.4	30.2	20	1.3	30.6	391.0	196.0	582.0
2018	228	0.4	42.0	15	0.6	38.9	386.5	216.0	625.0
2019	263	0.4	27.2	22	1.9	36.0	369.0	169.0	588.0
2020	178	0.4	15.1	16	2.0	33.4	358.0	198.0	555.0
2021	201	0.4	5.5	18	0.6	34.9	306.0	108.0	515.0
2022	199	0.4	5.3	15	0.8	12.0	322.0	126.0	530.0
2023	197	0.4	3.3	22	0.7	8.3	376.0	186.0	563.0
2024	111	0.3	1.0	12	0.3	1.0	293.0	140.0	529.0

6.1.1 Definitions

“Early” diagnosis or **„recent“ infection** is defined as: acute HIV infection (westernblot pattern or antigen/HIV RNA combined with clinical presentation) or documented seroconversion with negative HIV test not more than 3 years before the first positive test.

“Late” diagnosis is defined as: CD4 cell count below 350 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis

“Advanced” diagnosis is defined as: CD4 cell count below 200 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis


CD4 count at HIV-test
All
percent
100
90
80
70
60
50
40
30
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
<50
50-199
200-349
350-499
>=500
No CD4 within 6 months
Male IDU
percent
100
90
80
70
60
50
40
30
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Female IDU
percent
100
90
80
70
60
50
40
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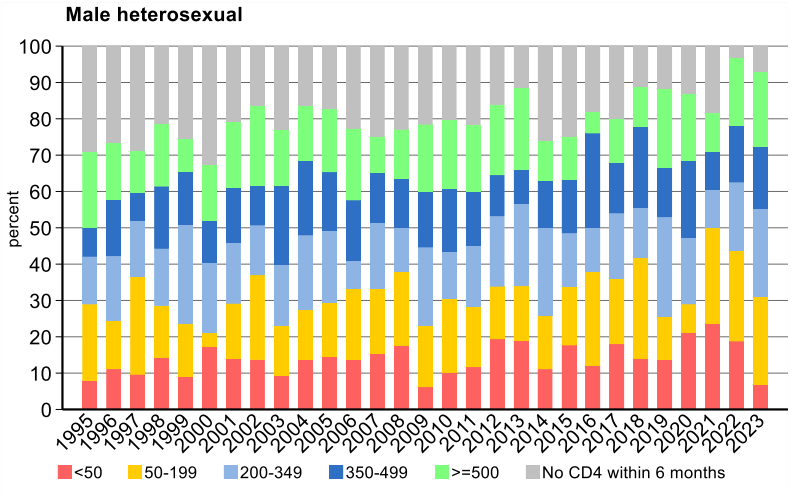
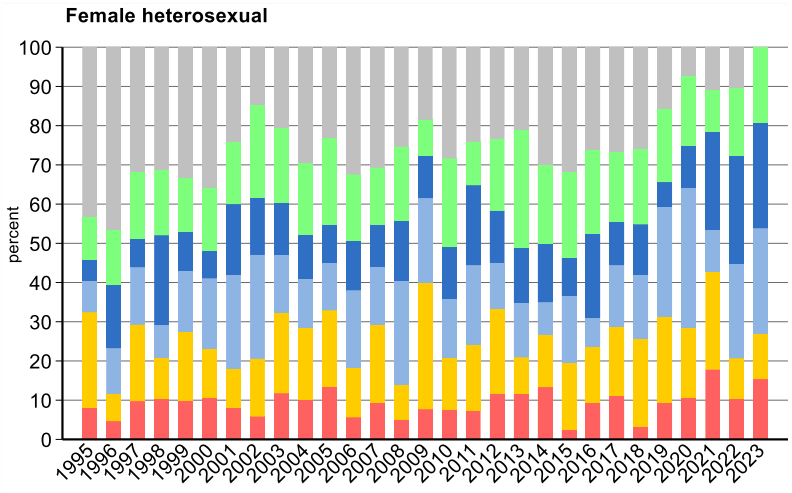
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023


Male heterosexual
percent
100
90
80
70
60
50
40
30
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
<50
50-199
200-349
350-499
>=500
No CD4 within 6 months


Female heterosexual
percent
100
90
80
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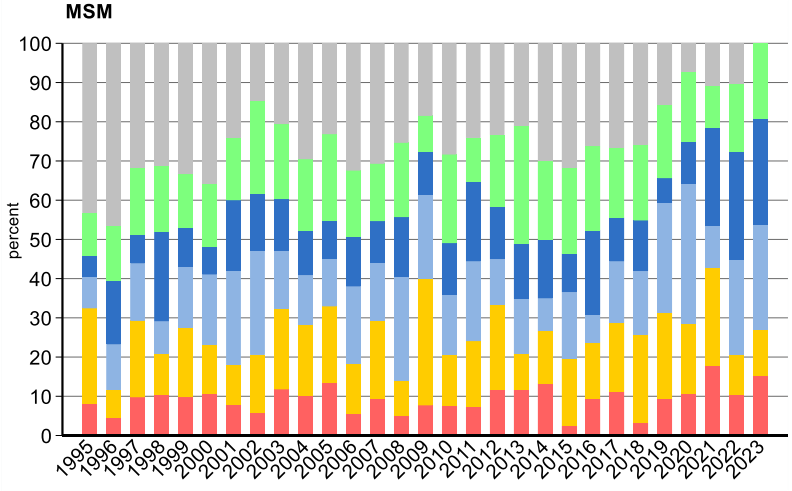
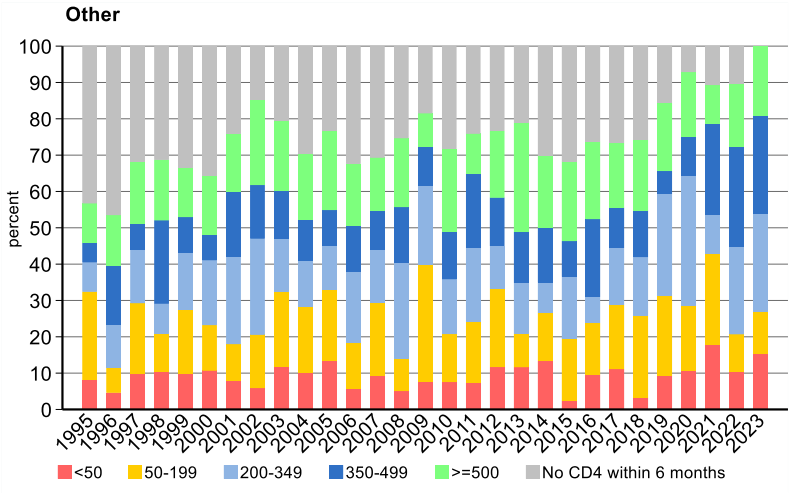
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023


MSM
percent
100
90
80
70
60
50
40
30
20
10
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023


Other
100
90
80
70
60
50
40
30
20
10
0
percent
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
<50
50-199
200-349
350-499
>=500
No CD4 within 6 months

6.1.2 Factors associated with an „early“ diagnosis in patients diagnosed since 2001

“Early” diagnosis or „recent“ infection is defined as: acute HIV infection (westernblot pattern or antigen/HIV RNA combined with clinical presentation) or documented seroconversion with negative HIV test not more than 3 years before the first positive test.

All centres	1213	7435	16.31%	**Univariable logistic Regression**			**Multivariable logistic Regression**		
	Frequencies		**%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	491	2549	19.26%	1.84	[1.47,2.29]	<0.001	1.81	[1.43,2.30]	<0.001
30-50 years	611	3921	15.58%	1.42	[1.14,1.76]	0.001	1.35	[1.08,1.69]	0.010
≥ 50	111	965	11.50%	1.00		.	1.00		.
HIV transmission category									
Male IDU	145	785	18.47%	0.79	[0.65,0.96]	0.019	0.77	[0.62,0.95]	0.013
Female IDU	67	252	26.59%	1.26	[0.94,1.69]	0.119	1.06	[0.78,1.43]	0.721
Male heterosexual	126	1350	9.33%	0.36	[0.29,0.44]	<0.001	0.41	[0.33,0.50]	<0.001
Female heterosexual	114	1237	9.22%	0.35	[0.29,0.44]	<0.001	0.41	[0.33,0.51]	<0.001
Other	19	486	3.91%	0.14	[0.09,0.23]	<0.001	0.17	[0.10,0.27]	<0.001
MSM	742	3325	22.32%	1.00		.	1.00		.
Federal state									
Carinthia	29	319	9.09%	0.58	[0.39,0.86]	0.006			
Upper Austria	125	672	18.60%	1.32	[1.06,1.64]	0.012			
Salzburg	92	413	22.28%	1.66	[1.29,2.13]	0.000			
Styria	93	649	14.33%	0.97	[0.76,1.23]	0.785			
Tyrol	147	499	29.46%	2.41	[1.94,3.00]	<0.001			
Other federal states	189	1036	18.24%	1.29	[1.07,1.55]	0.007			
Missing	0	6	0.00%	1.00	[1.00,1.00]	.			
Foreign countries	86	776	11.08%	0.72	[0.56,0.92]	0.009			
Vienna	452	3065	14.75%	1.00		.			
Population size of area of residence									
Missing value									
< 100 000	544	2999	18.14%	1.33	[1.17,1.53]	<0.001	1.65	[1.43,1.90]	<0.001
≥ 100 000	189	1006	18.79%	1.39	[1.16,1.68]	<0.001	1.76	[1.44,2.14]	<0.001
> 1 million	473	3321	14.24%	1.00		.	1.00		.
Nationality									
Missing value	3	36	8.33%	0.36	[0.11,1.17]	0.090	0.43	[0.13,1.43]	0.167
Low prevalence countries	227	1951	11.64%	0.52	[0.44,0.61]	<0.001	0.52	[0.45,0.62]	<0.001
High prevalence countries	42	796	5.28%	0.22	[0.16,0.30]	<0.001	0.32	[0.23,0.45]	<0.001
Austria	941	4652	20.23%	1.00		.	1.00		.
Calendar period of HIV test									
2005-2008	261	1545	16.89%	0.98	[0.81,1.20]	0.878	0.96	[0.79,1.18]	0.722
2009-2012	301	1514	19.88%	1.20	[0.99,1.46]	0.059	1.09	[0.89,1.33]	0.397
2013-2016	201	1317	15.26%	0.87	[0.71,1.07]	0.198	0.78	[0.63,0.98]	0.030
≥ 2017	225	1744	12.90%	0.72	[0.59,0.88]	0.001	0.65	[0.52,0.80]	<0.001
2001-2004	225	1315	17.11%	1.00		.	1.00		.

6.1.3 Factors associated with a „late“ diagnosis in patients diagnosed since 2001

“Late” diagnosis is defined as: CD4 cell count below 350 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis

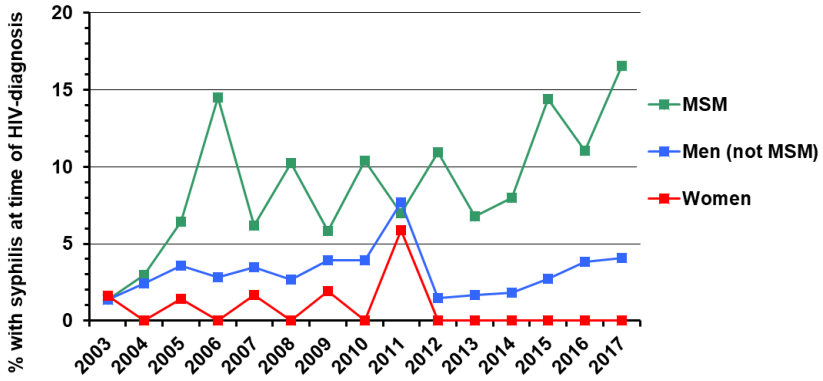
All centres	3132	7435	42.13%	**Univariable logistic Regression**			**Multivariable logistic Regression**		
	Frequencies		**%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	781	2549	30.64%	0.31	[0.27,0.36]	<0.001	0.32	[0.27,0.38]	<0.001
30-50 years	1784	3921	45.50%	0.59	[0.51,0.68]	<0.001	0.61	[0.53,0.71]	<0.001
≥ 50	567	965	58.76%	1.00		.	1.00		.
HIV transmission category									
Male IDU	327	785	41.66%	1.42	[1.21,1.66]	<0.001	1.55	[1.32,1.83]	<0.001
Female IDU	66	252	26.19%	0.70	[0.53,0.94]	0.017	0.87	[0.65,1.18]	0.378
Male heterosexual	755	1350	55.93%	2.52	[2.21,2.86]	<0.001	2.01	[1.75,2.31]	<0.001
Female heterosexual	629	1237	50.85%	2.05	[1.80,2.34]	<0.001	1.88	[1.63,2.18]	<0.001
Other	240	486	49.38%	1.93	[1.60,2.34]	<0.001	1.76	[1.44,2.15]	<0.001
MSM	1115	3325	33.53%	1.00		.	1.00		.
Federal state									
Carinthia	149	319	46.71%	1.27	[1.00,1.60]	0.046			
Upper Austria	304	672	45.24%	1.19	[1.01,1.41]	0.040			
Salzburg	164	413	39.71%	0.95	[0.77,1.17]	0.640			
Styria	289	649	44.53%	1.16	[0.98,1.38]	0.090			
Tyrol	190	499	38.08%	0.89	[0.73,1.08]	0.231			
Other federal states	470	1036	45.37%	1.20	[1.04,1.38]	0.012			
Missing	1	6	16.67%	0.29	[0.03,2.48]	0.257			
Foreign countries	311	776	40.08%	0.97	[0.82,1.13]	0.672			
Vienna	1254	3065	40.91%	1.00		.			
Population size of area of residence									
Missing value									
< 100 000	1325	2999	44.18%	1.14	[1.03,1.26]	0.010	1.00	[0.90,1.11]	0.964
≥ 100 000	414	1006	41.15%	1.01	[0.87,1.16]	0.909	0.90	[0.78,1.05]	0.191
> 1 million	1360	3321	40.95%	1.00		.	1.00		.
Nationality									
Missing/Unknown	9	36	25.00%	0.48	[0.22,1.02]	0.056	0.50	[0.23,1.08]	0.079
Low prevalence countries	764	1951	39.16%	0.92	[0.83,1.03]	0.147	1.01	[0.90,1.13]	0.877
High prevalence countries	448	796	56.28%	1.85	[1.59,2.15]	<0.001	1.61	[1.35,1.91]	<0.001
Austria	1911	4652	41.08%	1.00		.	1.00		.
Calendar period of HIV test									
2005-2008	664	1545	42.98%	1.01	[0.87,1.17]	0.897	1.02	[0.88,1.19]	0.780
2009-2012	620	1514	40.95%	0.93	[0.80,1.08]	0.337	0.98	[0.84,1.15]	0.796
2013-2016	526	1317	39.94%	0.89	[0.76,1.04]	0.145	0.93	[0.79,1.10]	0.389
≥ 2017	760	1744	43.58%	1.03	[0.90,1.20]	0.642	1.03	[0.88,1.20]	0.703
2001-2004	562	1315	42.74%	1.00		.	1.00		.

7 Co-infections

7.1 Syphilis

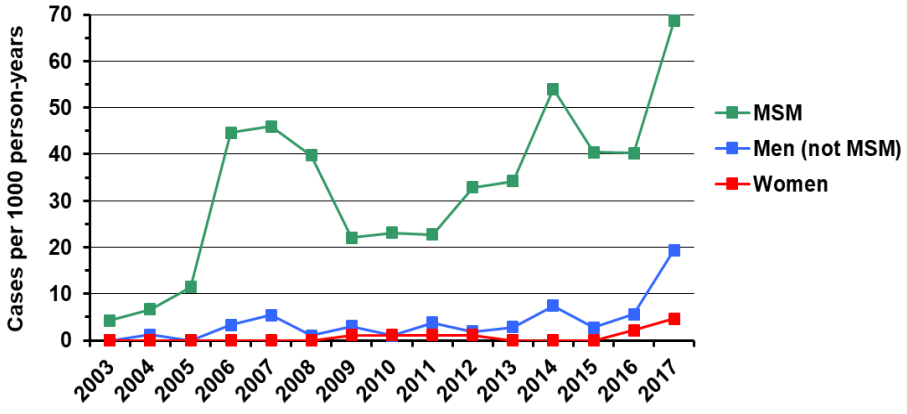
Syphilis can persist for several years when it is not treated, and reinfection with syphilis is possible because there is no protective immunity.
Until 2018 distinct diagnoses of syphilis have been used to define prevalence and incidence of syphilis. However, this approach has shortcomings (heterogenous use of definitions of diagnosis, e.g. also documentation of several bouts as one diagnosis) so that future analysis has to be based on serology. Repeated syphilis episodes as a reported positive nontreponemal and treponemal test following a syphilis episode and subsequent ≥4-fold titer reduction or negativity in nontreponemal testing and a consecutive ≥4-fold titer increase with a titer value of at least 8 in nontreponemal testing. This transformation will be introduced in summer 2024.

7.1.1 Syphilis at time of HIV diagnosis

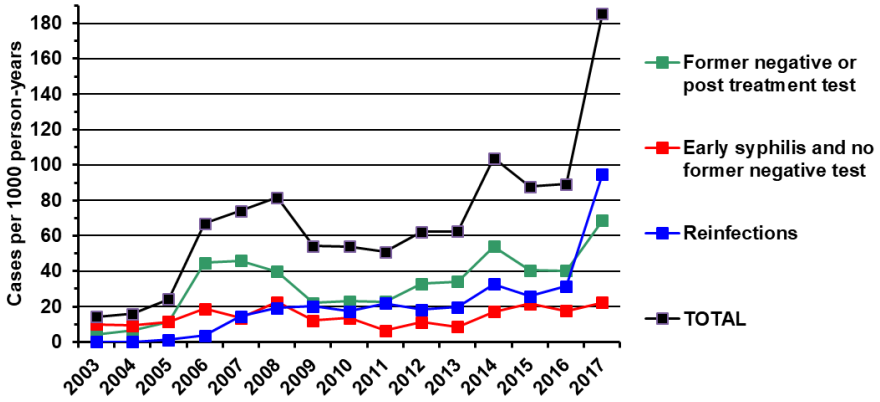


7.1.2 „Recent“ syphilis infections: Incidence

This analysis only includes new “recent” syphilis infections defined as follows: patients with a former syphilis result that was either negative or a status post treatment and who now presented with active syphilis (= new „recent“ syphilis infections).

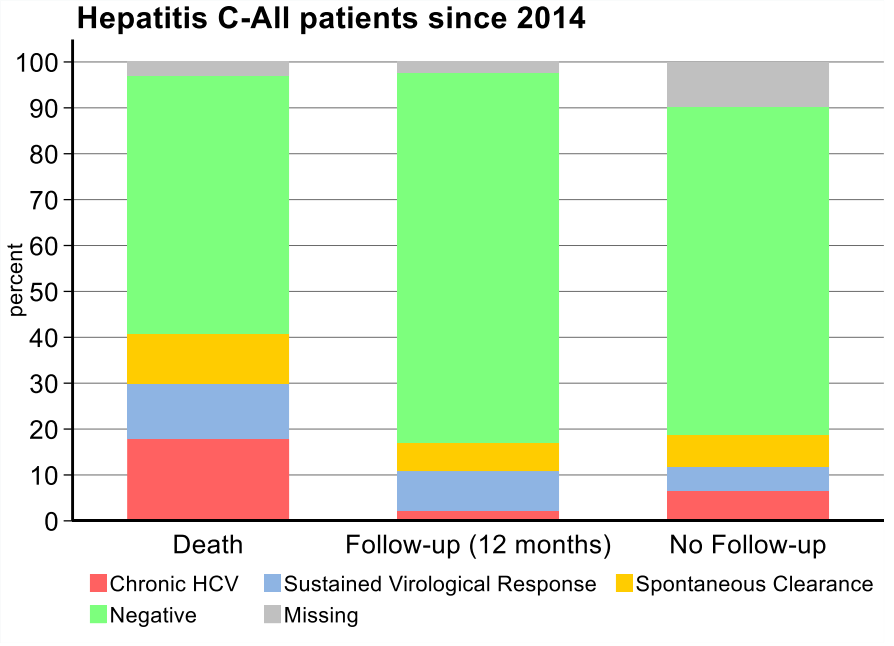


7.1.3 Incident cases of syphilis among HIV-infected MSM



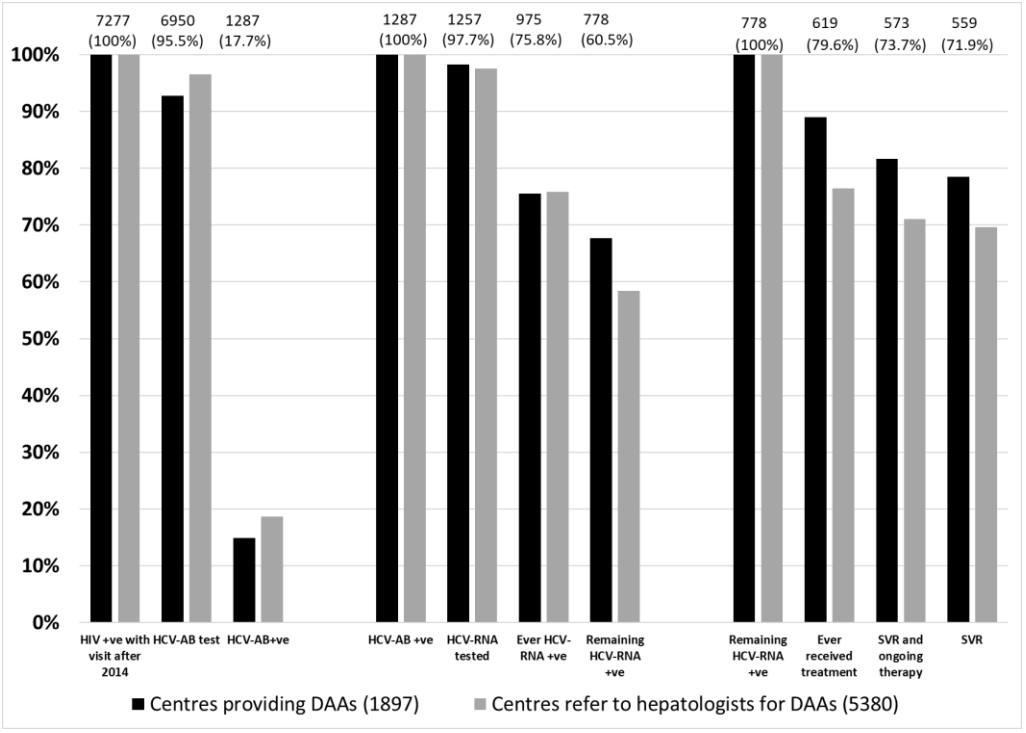
7.2 Hepatitis C

HCV co-infection was defined by a positive result on a qualitative or quantitative RNA test result.



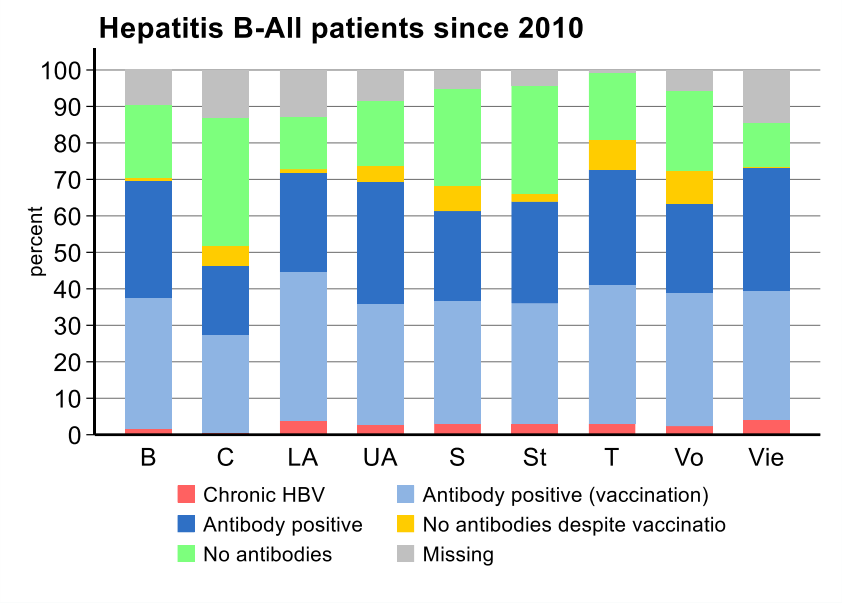
7.2.1 Cascade of Care in patients seen since January 1st 2014 and alive after January 1st 2023

Stage	Definition
Stage1: anti-HCV +ve	Either anti-HCV positive test, HCV-RNA positive test, HCV genotyped or received HCV treatment before index date
Stage 2: HCV-RNA tested	Either HCV-RNA tested, HCV genotyped or received HCV treatment before index date
Stage 3: Ever HCV-RNA +ve	Either HCV-RNA positive test, received HCV treatment or HCV genotyped before index date
Stage 4: Remaining HCV-RNA +ve	HCV-RNA ever positive and no spontaneous clearance
Stage 5: Ever received treatment	Started HCV treatment on or before index date
Stage 6: Cured (SVR) and ongoing therapy	HCV-RNA test after completing treatment (HCV-RNA test data included for duration of FU to allow for assessment of SVR); Ongoing therapy if still on treatment or end of therapy less than 12 weeks before 01.09.2023
Stage 8: Cured (SVR)	HCV-RNA negative test at least 12 or 24 weeks post-treatment (for IFN-free and IFN-based therapy, respectively)



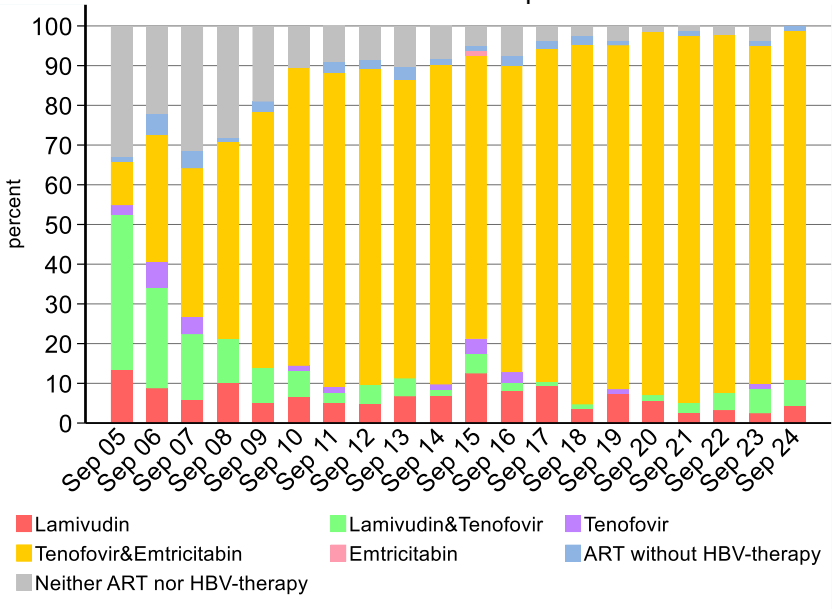
7.3 Hepatitis B in patients seen since January 1st 2010

Chronic HBV was defined by a positive result on a hepatitis B surface antigen (HBsAg) test or by a positive HBV DNA test result.



Therapy for hepatitis B (patients currently in care)

Current guidelines recommend the use of tenofovir and emtricitabine or tenofovir and lamivudine as the NRTI-backbones in cART combinations for HBV-HIV co-infected patients. Most of the HBV-HIV co-infected patients in care at one of the Austrian HIV treatment centres received an NRTI-backbone to help control the HBV infection.



8 Transmission of drug resistant HIV (data: 03/2024)

8.1 Abstract

Prevalence of Transmitted Drug Resistance is Stabilising at a Low Rate in Austria

Objective: To determine the prevalence of transmitted drug resistance (TDR), temporal trends in resistance, and predictors for TDR.
Method: Newly diagnosed patients from 2003 to December 2023 from nine centres were analyzed. Mutations were judged as resistant according to Bennett et al. (WHO 2009 mutation list). For patients with acute or recent infection the year of infection was obtained by the date of primary HIV infection or the median point in time between negative and positive HIV test. For patients with chronic infection the rate of resistance was plotted against the year of the HIV diagnosis.
Results: Overall 3998 of 6606 patients had an amplifiable resistance test. The overall prevalence of TDR was 7.0 (282 of 3998 patients; 95% CI: 6.3%-7.9%). The prevalence of NRTI resistance was 2.9% (2.5%-3.5%), the prevalence of NNRTI resistance was 3.0% (2.5%-3.5%), and the prevalence of PI resistance was 1.7% (1.3%-2.2%). The relative risk of TDR in men who have sex with men compared to heterosexual contacts was 1.5 (95% CI: 1.1-1.9). The prevalence rate of TDR in the 1159 patients with acute/recent infection was 7.6% (65 of 860 patients; 6.0%-9.5%). One patient (0.1%) showed TDR against 3 drug classes (K70R; K103N; L90M). The prevalence rate of TDR in the 5423 patients with chronic infection was 6.4% (217 of 3381 patients; 5.6%-7.3%).
Conclusions: The prevalence of TDR among newly diagnosed patients was found to be stabilizing. No difficult to treat cases of TDR has been observed.

8.2 Introduction

Number of cohort participants:
Only patients with HIV diagnosis between 2003-2023 have been analyzed because extensive documentation of resistance testing started at this time.

HIV test	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
until 2003	1578	1194	38	612	124	824	14	238	66	**4688**
2003-2023	1227	2190	263	690	458	720	149	636	273	**6606**

The rate of transmission of drug resistant HIV („percent with resistance“) corresponds to the number of patients with resistance mutations in relation to the number of patients with a genotypic resistance test before antiretroviral therapy. For this, the genomes of the reverse transcriptase (RT) and the protease (P) were sequenced. The resistance mutations have been classified according to Bennett DE et al. Drug resistance mutations for surveillance of transmitted HIV-1 drug-resistance: 2009 update. PLoS One 2009;4(3):e4724.
Patients were either analysed according to the time of the infection („recent infection“), or, if this was not known, patients were analysed according to the year of the HIV diagnosis

The following codons and amino acids were classified as resistance:

Reverse Transkriptase				Protease	
NRTI		NNRTI			
M41	L	L100	I	L23	I
K65	R	K101	E, P	L24	I
D67	N, G, E	K103	N, S	D30	N
T69	D, ins	V106	M, A	V32	I
K70	R, E	V179	F	M46	I, L
L74	V, I	Y181	C, I, V	I47	V, A
V75	T, M, A, S	Y188	L, H, C	G48	V, M
F77	L	G190	A, S, E	I50	V, L
Y115	F	P225	H	F53	L, Y
F116	Y	M230	L	I54	V, L, M, A, T, S
Q151	M			G73	S, T, C, A
M184	V, I			L76	V
L210	W			V82	A, T, F, S, C, M, L
T215	Y, F, I, S, C, D, V, E			N83	D
K219	Q, E, N, R			I84	V, A, C
				I85	V
				N88	D, S
				L90	M

8.3 Number of patients with “recent”or chronic HIV infection

	Number of HIV diagnoses	"Recent" infections	Unknown time of infection
Year	Year of HIV diagnosis	Year of HIV infection	Year of HIV diagnosis
2001	-	2	-
2002	-	22	-
2003	313	61	261
2004	359	64	287
2005	364	77	295
2006	364	57	302
2007	391	83	318
2008	415	66	337
2009	358	68	292
2010	386	97	300
2011	376	98	274
2012	386	63	314
2013	331	66	257
2014	321	46	268
2015	340	48	303
2016	312	54	261
2017	330	52	262
2018	231	44	193
2019	261	31	226
2020	177	27	155
2021	200	19	175
2022	197	23	172
2023	194	15	171
Total	**6606**	**1183**	**5423**

8.4 „Recent" infection (time of infection known or estimated)

„Recent" infection means:

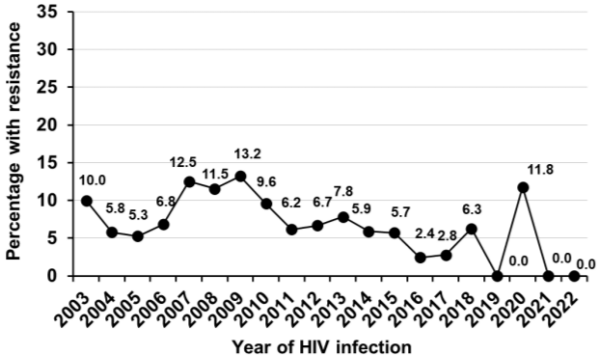
- Acute HIV infection (westernblot pattern or antigen/HIV RNA with clinical symptoms)
- Documented seroconversion with a negative HIV test not more than 3 years before the first positive test

Calculation of the time of infection (year of the HIV infection):

- Time point of the acute HIV infection or
- Midpoint between last negative and first positive HIV test

	Number of "recent" HIV infections	Available resistance tests before ART	Any resistance
Year of "recent" HIV infection			
2003	61	50	5
2004	64	52	3
2005	77	57	3
2006	57	44	3
2007	83	64	8
2008	66	52	6
2009	68	53	7
2010	97	73	7
2011	98	81	5
2012	63	45	3
2013	66	51	4
2014	46	34	2
2015	48	35	2
2016	54	41	1
2017	52	36	1
2018	44	32	2
2019	31	16	-
2020	27	17	2
2021	19	11	-
2022	23	11	-
2023	15	5	1
Sex/ mode of transmission			
MSM	752	564	50
Male IDU	116	82	3
Female IDU	48	30	3
Male heterosexual	115	90	6
Female heterosexual	104	84	3
Other	24	10	-
Total	**1159**	**860**	**65**

Overall rate of transmitted drug resistance in recent infection was 7.6% (65 of 860).



The year 2023 is not shown in the graph, as because of the definition of recent infection only a limited number of patients can be defined.

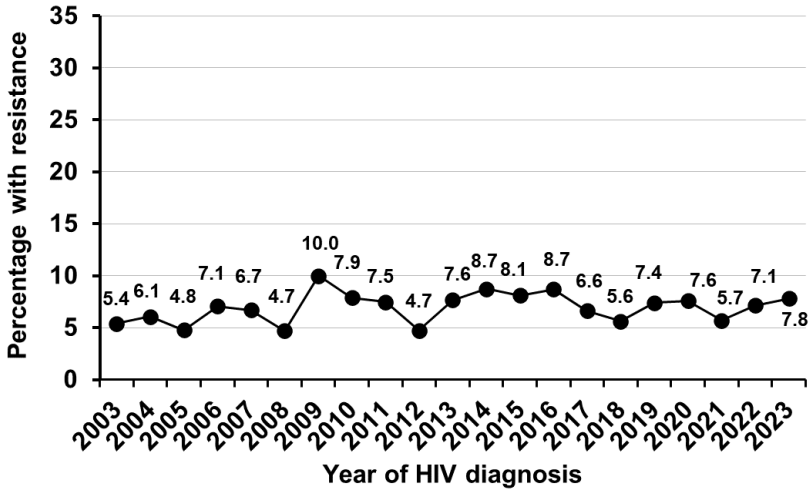
Transmission of drug resistant HIV according to the time of the "recent" HIV infection, residence, mode of transmission, sex, age
"Recent" infections

	Number of HIV infections	Available resistance tests	Wild type	Resistance to							
				Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of HIV infection											
2003	61	50	45	5	4	1	-	-	-	-	-
2004	64	52	49	3	-	3	-	-	-	-	-
2005	77	57	54	3	1	2	-	-	-	-	-
2006	57	44	41	3	1	2	-	-	-	-	-
2007	83	64	56	8	4	4	3	1	2	1	1
2008	66	52	46	6	3	1	3	1	-	-	-
2009	68	53	46	7	2	3	4	1	-	1	-
2010	97	73	66	7	1	5	1	-	-	-	-
2011	98	81	76	5	1	4	1	-	-	1	-
2012	63	45	42	3	3	-	-	-	-	-	-
2013	66	51	47	4	1	2	1	-	-	-	-
2014	46	34	32	2	2	-	-	-	-	-	-
2015	48	35	33	2	1	1	-	-	-	-	-
2016	54	41	40	1	-	1	-	-	-	-	-
2017	52	36	35	1	-	-	1	-	-	-	-
2018	44	32	30	2	-	1	1	-	-	-	-
2019	31	16	16	-	-	-	-	-	-	-	-
2020	27	17	15	2	-	2	-	-	-	-	-
2021	19	11	11	-	-	-	-	-	-	-	-
2022	23	11	11	-	-	-	-	-	-	-	-
2023	15	5	4	1	-	1	-	-	-	-	-
Population size of area of residence											
Rural areas	511	393	365	28	10	16	6	1	1	3	1
Capital cities	186	145	132	13	3	5	6	1	-	-	-
Vienna	456	320	296	24	11	12	3	1	1	-	-
Missing value	6	2	2	-	-	-	-	-	-	-	-
Sex/ mode of transmission											
MSM	752	564	514	50	18	25	14	3	2	3	1
Male IDU	116	82	79	3	2	1	-	-	-	-	-
Female IDU	48	30	27	3	-	3	-	-	-	-	-
Male heterosexual	115	90	84	6	2	3	1	-	-	-	-
Female heterosexual	104	84	81	3	2	1	-	-	-	-	-
Others	24	10	10	-	-	-	-	-	-	-	-
Age at time of HIV-test											
< 35 years	666	482	436	46	16	25	8	1	1	1	-
≥ 35 years	493	378	359	19	8	8	7	2	1	2	1
Total	**1159**	**860**	**795**	**65**	**24**	**33**	**15**	**3**	**2**	**3**	**1**

Younger patients (<35 years) had a higher risk for transmitted resistance (OR=2.1, 95% CI: 1.2-3.8).

8.5 Unknown time of infection (not “recent”)

	Number of HIV diagnoses	Available resistance tests before ART	Any resistance
Year of HIV diagnosis			
2003	261	148	8
2004	287	181	11
2005	295	188	9
2006	302	184	13
2007	318	194	13
2008	337	191	9
2009	292	190	19
2010	300	190	15
2011	274	174	13
2012	314	190	9
2013	257	157	12
2014	268	149	13
2015	303	173	14
2016	261	161	14
2017	262	151	10
2018	193	107	6
2019	226	108	8
2020	155	66	5
2021	175	88	5
2022	172	84	6
2023	171	64	5
Mode of transmission			
MSM	2309	1383	113
Male IDU	535	318	12
Female IDU	152	86	7
Male heterosexual	1057	642	30
Female heterosexual	983	574	43
Other	387	135	12
Total	**5423**	**3138**	**217**



Transmission of drug resistant HIV according to the time of the HIV diagnosis, residence, mode of transmission, gender and age
Not-"recent" infections

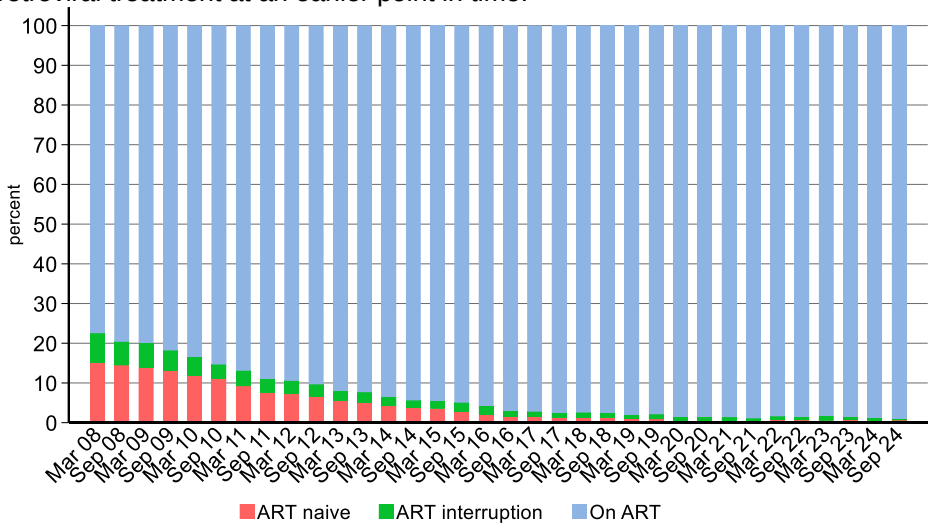
	Number of HIV diagnoses	Available resistance tests	Wild type	Resistance to							
				Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of HIV diagnosis											
2003	261	148	140	8	4	3	1	-	-	-	-
2004	287	181	170	11	6	2	4	1	-	-	-
2005	295	188	179	9	7	1	4	3	-	-	-
2006	302	184	171	13	6	2	5	-	-	-	-
2007	318	194	181	13	8	2	3	-	-	-	-
2008	337	191	182	9	4	2	3	-	-	-	-
2009	292	190	171	19	7	4	9	-	1	-	-
2010	300	190	175	15	4	8	4	1	-	-	-
2011	274	174	161	13	3	6	4	-	-	-	-
2012	314	190	181	9	7	2	1	-	1	-	-
2013	257	157	145	12	7	5	-	-	-	-	-
2014	268	149	136	13	3	6	4	-	-	-	-
2015	303	173	159	14	5	6	4	-	-	1	-
2016	261	161	147	14	3	10	1	-	-	-	-
2017	262	151	141	10	4	6	-	-	-	-	-
2018	193	107	101	6	4	1	2	1	-	-	-
2019	226	108	100	8	2	5	1	-	-	-	-
2020	155	66	61	5	2	4	-	-	1	-	-
2021	175	88	83	5	2	3	-	-	-	-	-
2022	172	84	78	6	1	3	2	-	-	-	-
2023	171	64	59	5	4	4	1	1	3	1	1
Population size of area of residence											
Rural areas	2178	1305	1210	95	42	33	21	-	1	-	-
Capital cities	717	498	461	37	12	20	9	-	4	-	-
Vienna	2451	1317	1235	82	38	31	22	7	1	2	1
Missing value	77	18	15	3	1	1	1	-	-	-	-
Sex/ mode of transmission											
MSM	2309	1383	1270	113	44	45	29	3	-	2	1
Male IDU	535	318	306	12	4	8	1	-	1	-	-
Female IDU	152	86	79	7	2	4	1	-	1	-	-
Male heterosexual	1057	642	612	30	14	8	10	1	1	-	-
Female heterosexual	983	574	531	43	25	14	10	3	3	-	-
Others	387	135	123	12	4	6	2	-	-	-	-
Age at time of HIV-test											
< 35 years	2711	1469	1355	114	49	49	26	7	3	1	1
≥ 35 years	2712	1669	1566	103	44	36	27	-	3	1	-
Total	**5423**	**3138**	**2921**	**217**	**93**	**85**	**53**	**7**	**6**	**2**	**1**

Men who had been infected through intravenous drug use (OR=0.4, 95% CI: 0.2-0.8) or heterosexually (OR=0.6, 95% CI: 0.4-0.9) had a lower risk of transmitted resistance, younger patients (<35 years) had a slightly higher risk (OR=1.4, 95 %-CI: 1.03–1.8).

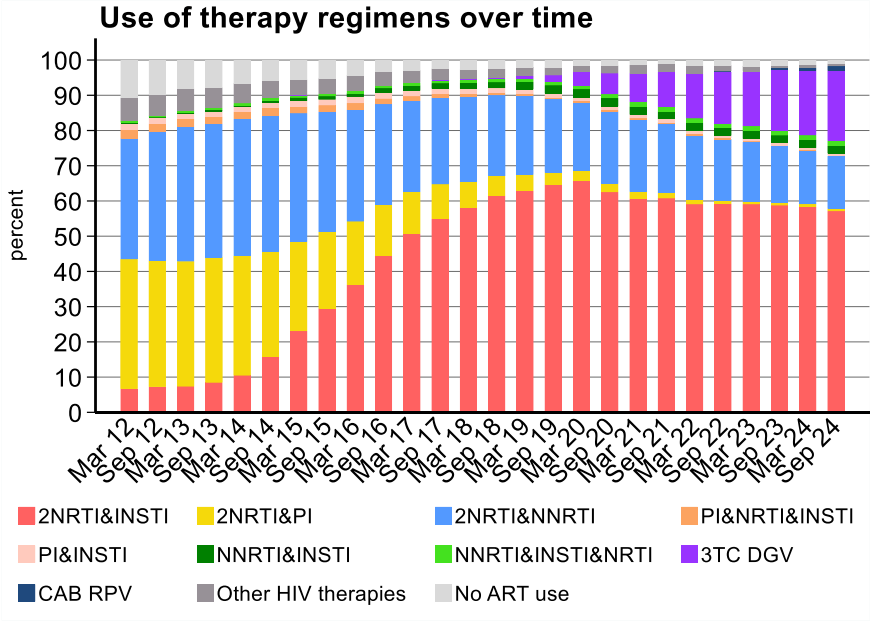
9 Antiretroviral therapy (ART)

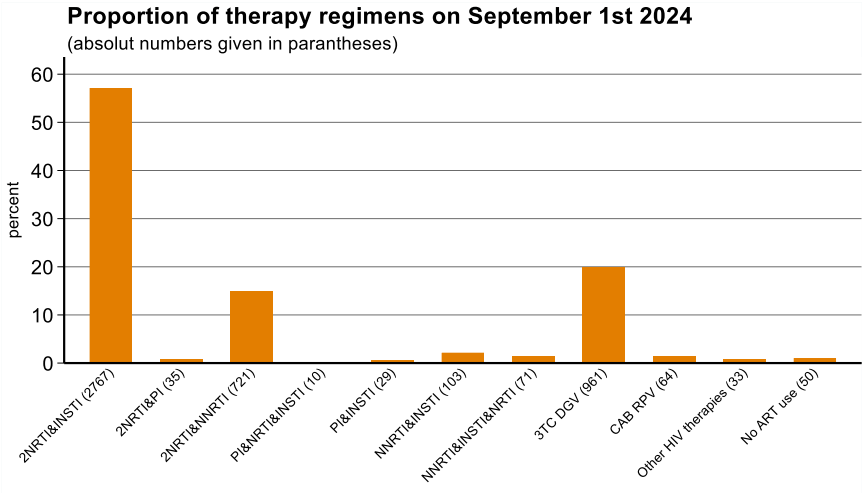
9.1 Patients currently in care regarding treatment status

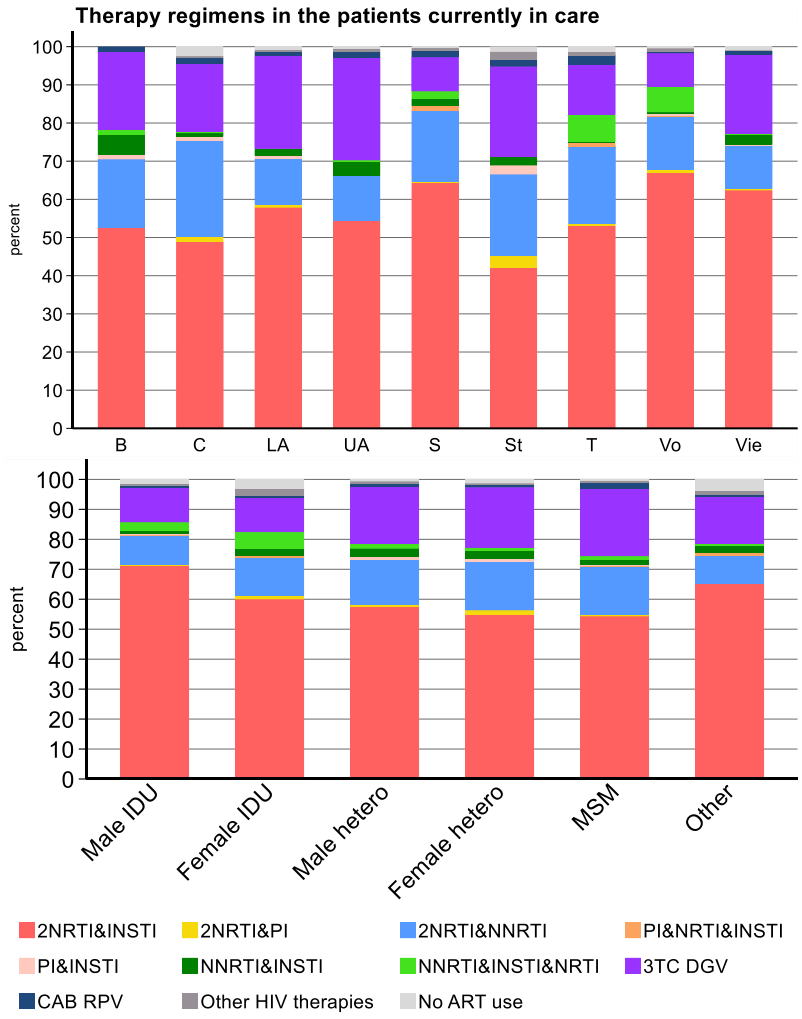
Overall, 4844 persons were currently in care at a hospital-based HIV treatment centre (currently in care, those who had a visit within the last 6 months). On September 1st, 2024, 4794 (99.0%) patients were on antiretroviral therapy in the 9 HIV treatment centres. Of the 50 patients not on treatment on September 1st, 2024, 21 had received antiretroviral treatment at an earlier point in time.



9.2 Regimens of antiretroviral therapy

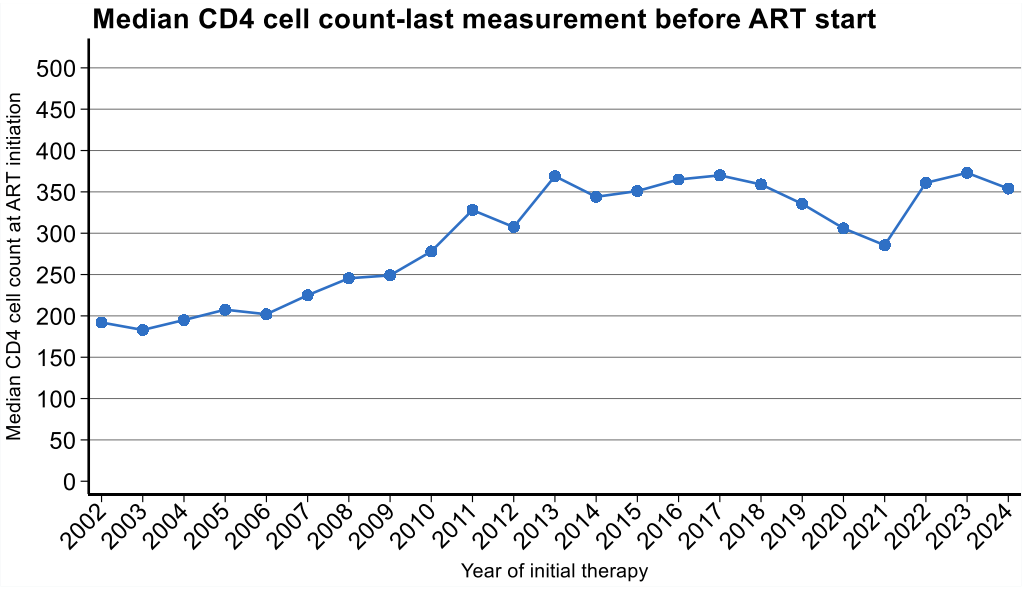



Proportion of therapy regimens on September 1st 2024
(absolut numbers given in parantheses)
percent
60
50
40
30
20
10
0
2NRTI&INSTI (2767)
2NRTI&PI (35)
2NRTI&NNRTI (721)
PI&NRTI&INSTI (10)
PI&INSTI (29)
NNRTI&INSTI (103)
NNRTI&INSTI&NRTI (71)
3TC DGV (961)
CAB RPV (64)
Other HIV therapies (33)
No ART use (50)

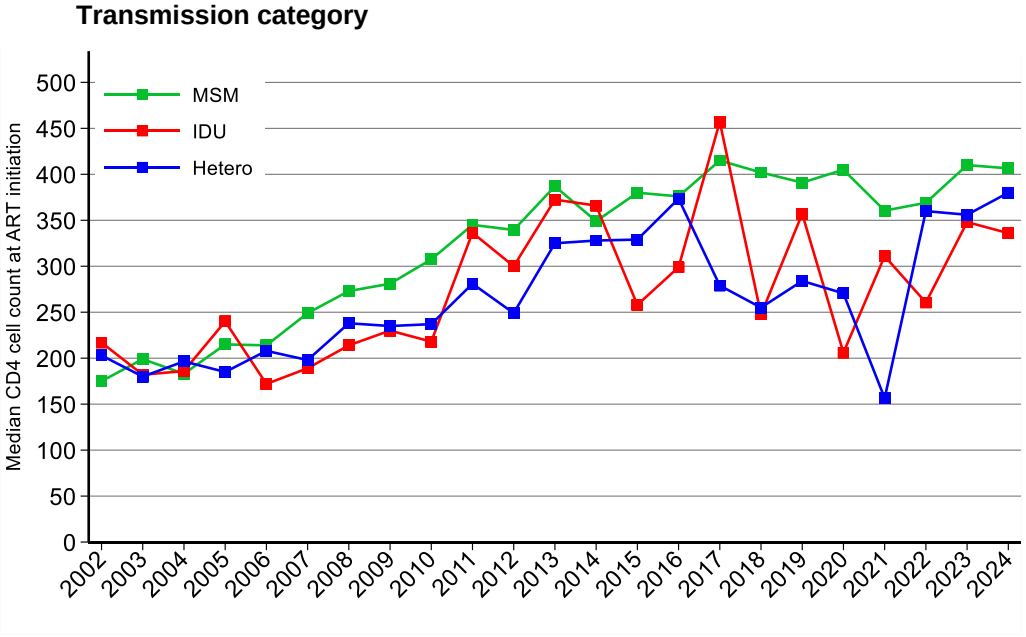

Therapy regimens in the patients currently in care
percent
100
90
80
70
60
50
40
30
20
10
0
B
C
LA
UA
S
St
T
Vo
Vie
Male IDU
Female IDU
Male hetero
Female hetero
MSM
Other
2NRTI&INSTI
2NRTI&PI
2NRTI&NNRTI
PI&NRTI&INSTI
PI&INSTI
NNRTI&INSTI
NNRTI&INSTI&NRTI
3TC DGV
CAB RPV
Other HIV therapies
No ART use

9.3 CD4 cell counts at initiation of ART

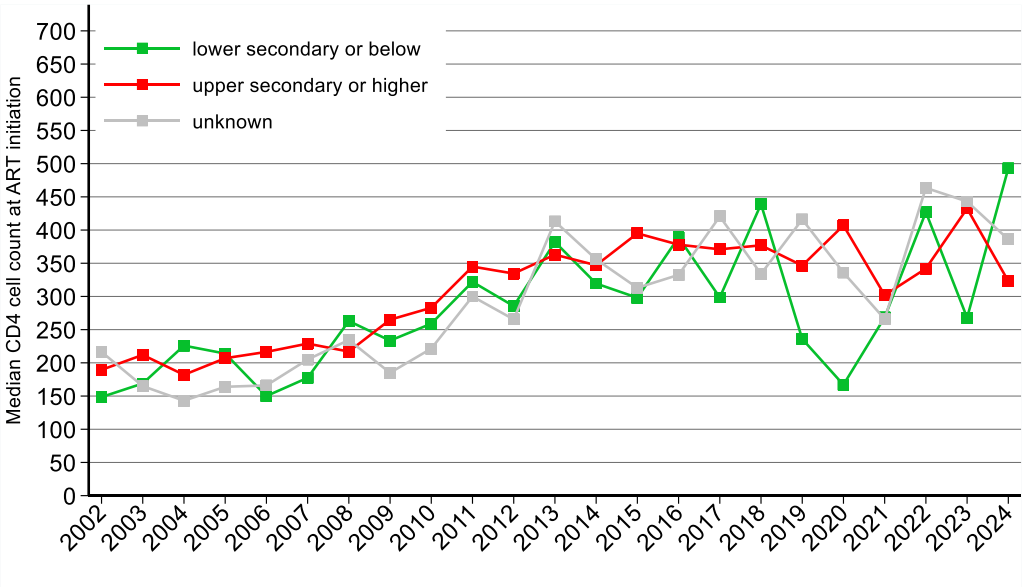
9.3.1 CD4 cell counts at initiation of ART



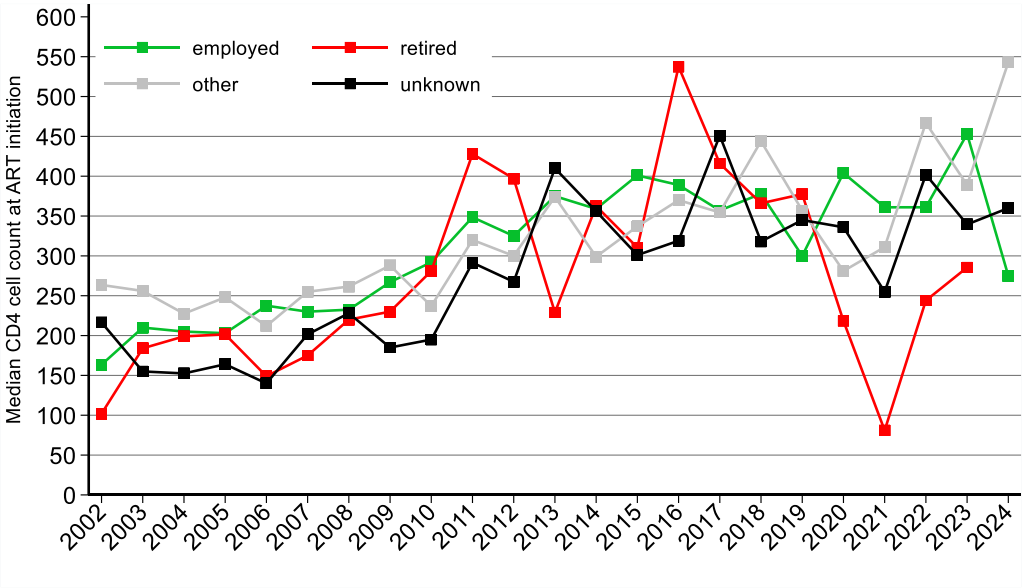
9.3.2 Median CD4 count at ART initiation



Level of education

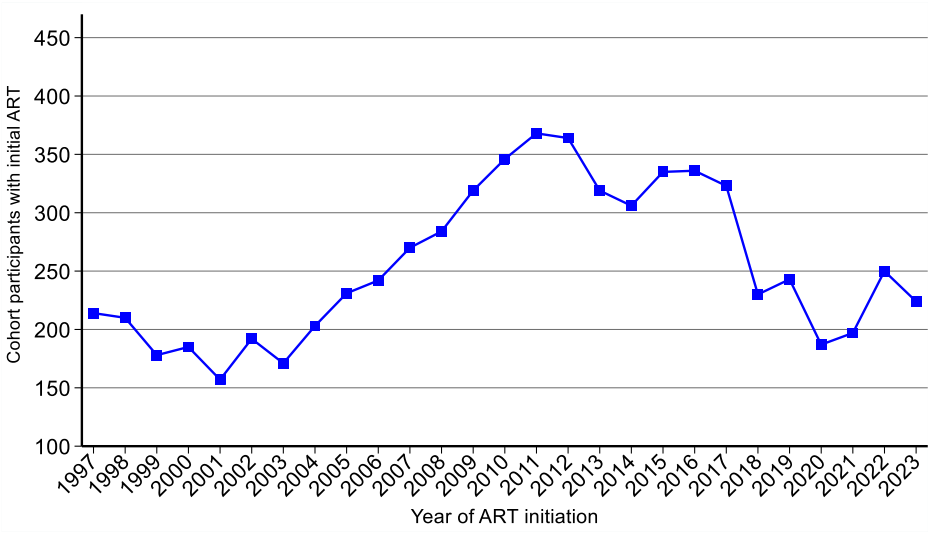


Status of employment



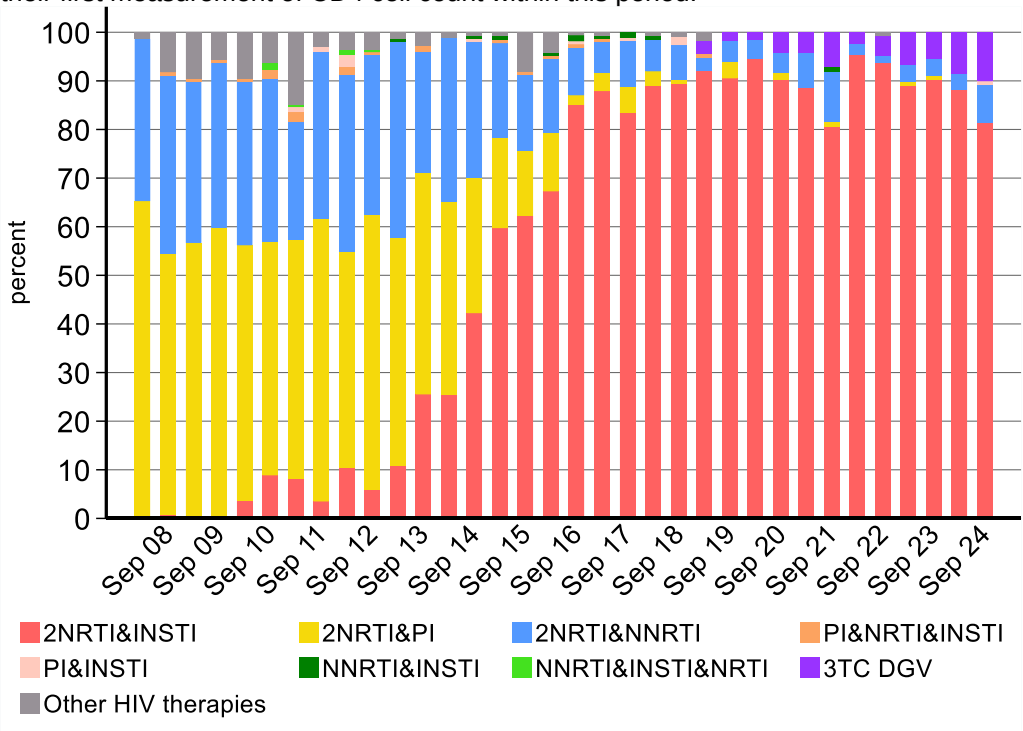
9.4 Initial therapy

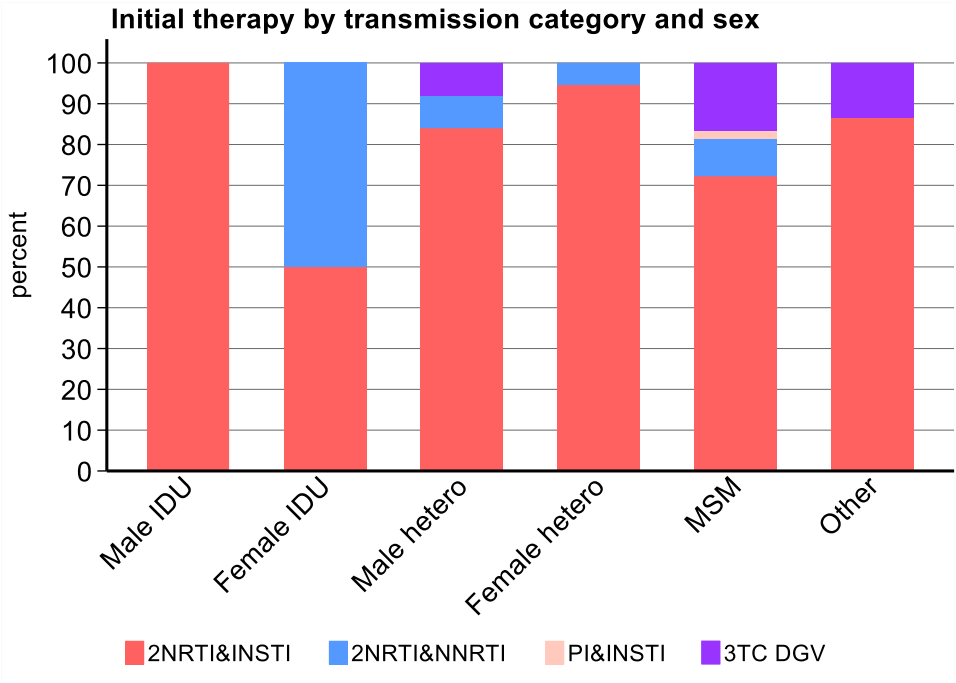
9.4.1 Number of persons who started ART in the respective year



9.4.2 Regimens of the initial therapy

After March 1st, 2024, 129 patients started antiretroviral therapy. 111 of them also had their first measurement of CD4 cell count within this period.




Initial therapy by transmission category and sex
percent
100
90
80
70
60
50
40
30
20
10
0
Male IDU
Female IDU
Male hetero
Female hetero
MSM
Other
2NRTI&INSTI
2NRTI&NNRTI
PI&INSTI
3TC DGV

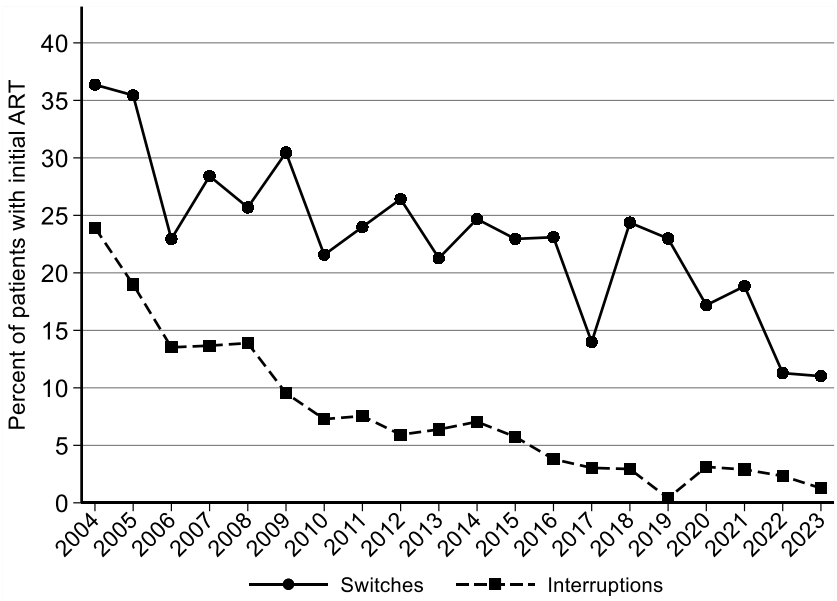
9.5 ART switches and interruptions

9.5.1 Switches and interruptions of ART during the first year of treatment

9.5.1.1 All switches, excluding switches from TDF to TAF containing regimens

Percentage of patients with ART switches and interruptions during the first year of treatment

Year of ART initiation	% of patients with ART switches	% of patients with ART interruptions
2004	36.4	23.9
2005	35.4	19.0
2006	23.0	13.5
2007	28.4	13.7
2008	25.7	13.9
2009	30.5	9.5
2010	21.6	7.3
2011	24.0	7.5
2012	26.4	5.9
2013	21.3	6.4
2014	24.7	7.1
2015	23.0	5.7
2016	23.1	3.8
2017	14.0	3.0
2018	24.4	2.9
2019	23.0	0.4
2020	17.2	3.1
2021	18.8	2.9
2022	11.3	2.3
2023	11.0	1.3

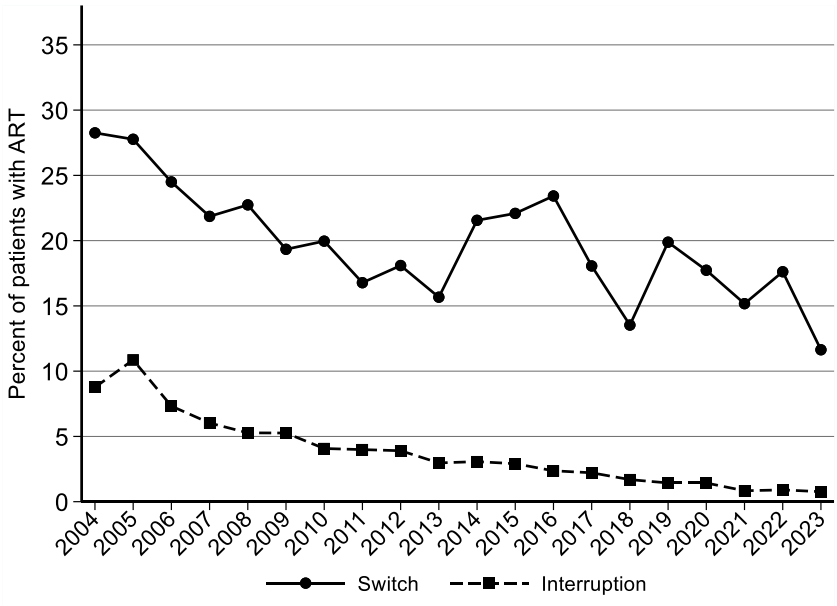


9.5.2 ART switches and interruptions per calendar year

9.5.2.1 All switches, excluding switches from TDF to TAF containing regimens

Percentage of patients with ART switches and interruptions in the respective year

Year of ART initiation	% of patients with ART switches	% of patients with ART interruptions
2004	28.3	8.8
2005	27.8	10.9
2006	24.5	7.3
2007	21.9	6.0
2008	22.7	5.3
2009	19.3	5.3
2010	20.0	4.1
2011	16.8	4.0
2012	18.1	3.9
2013	15.7	3.0
2014	21.6	3.1
2015	22.1	2.9
2016	23.4	2.4
2017	18.1	2.2
2018	13.5	1.7
2019	19.9	1.4
2020	17.7	1.4
2021	15.2	0.8
2022	17.6	0.9
2023	11.6	0.8



9.5.3 Risk factors for treatment switches during the first year of treatment, excluding switches from TDF to TAF containing regimens

10 Transgender persons were excluded from these analyses

	Switch	All		Univariable logistic regression			Multivariable logistic regression		
	1327	5726	23.17%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	131	617	21.23%	1.03	[0.83,1.28]	0.777	0.92	[0.74,1.15]	0.456
Female IDU	42	216	19.44%	0.92	[0.65,1.31]	0.657	0.84	[0.59,1.21]	0.346
Male heterosexual	235	1044	22.51%	1.11	[0.93,1.32]	0.232	0.93	[0.78,1.12]	0.449
Female heterosexual	303	961	31.53%	1.76	[1.49,2.08]	<0.001	1.61	[1.35,1.90]	<0.001
Other	79	296	26.69%	1.39	[1.06,1.83]	0.018	1.32	[0.99,1.75]	0.056
MSM	537	2592	20.72%	1.00		.	1.00		.
Age at baseline									
< 30 years	306	1401	21.84%	0.81	[0.67,0.98]	0.029	0.81	[0.66,1.00]	0.045
30-50 years	774	3365	23.00%	0.86	[0.73,1.02]	0.079	0.84	[0.71,1.00]	0.044
≥ 50	247	960	25.73%	1.00		.	1.00		.
AIDS at baseline									
Yes	293	862	33.99%	1.91	[1.63,2.23]	<0.001			
No	1034	4864	21.26%	1.00		.			
CD4 count at baseline									
< 50	210	647	32.46%	2.12	[1.74,2.59]	<0.001	1.95	[1.59,2.40]	<0.001
50-199	302	1099	27.48%	1.67	[1.41,1.99]	<0.001	1.49	[1.24,1.79]	<0.001
200-349	311	1446	21.51%	1.21	[1.02,1.43]	0.027	1.07	[0.90,1.28]	0.420
Missing	127	494	25.71%	1.53	[1.21,1.92]	<0.001	1.59	[1.26,2.02]	<0.001
≥ 350	377	2040	18.48%	1.00		.	1.00		.
HIV-RNA at baseline									
10.000-99.999	384	1961	19.58%	0.87	[0.72,1.04]	0.128			
≥ 100.000	534	2037	26.22%	1.26	[1.05,1.51]	0.011			
Missing	190	731	25.99%	1.25	[1.00,1.56]	0.052			
≤ 9.999	219	997	21.97%	1.00		.			
Nationality									
High prevalence countries	203	716	28.35%	1.37	[1.15,1.63]	<0.001			
Low prevalence countries	1124	5010	22.44%	1.00		.			
Population size of area of residence									
Rural areas	538	2319	23.20%	1.08	[0.95,1.24]	0.240	1.10	[0.96,1.26]	0.184
Capital cities	218	788	27.66%	1.37	[1.14,1.64]	0.001	1.44	[1.19,1.74]	<0.001
Vienna	571	2619	21.80%	1.00		.	1.00		.
Year of ART Initiation									
2004-2007	295	967	30.51%	2.64	[2.09,3.33]	<0.001	2.62	[2.06,3.34]	<0.001
2008-2011	339	1339	25.32%	2.04	[1.63,2.55]	<0.001	2.22	[1.76,2.80]	<0.001
2012-2015	328	1377	23.82%	1.88	[1.50,2.36]	<0.001	2.06	[1.64,2.60]	<0.001
2016-2019	238	1152	20.66%	1.57	[1.24,1.98]	<0.001	1.70	[1.34,2.16]	<0.001
2020-2023	127	891	14.25%	1.00		.	1.00		.

9.5.4 Risk factors for treatment interruptions (TI) during the first year of treatment

10 Transgender persons were excluded from these analyses

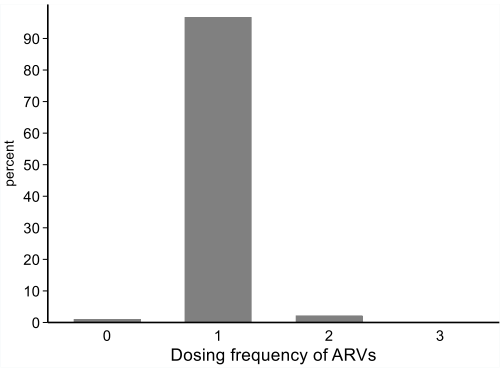
	TI	All		Univariable logistic regression			Multivariable logistic regression		
	428	5726	7.47%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	90	617	14.59%	4.64	[3.42,6.30]	<0.001	3.35	[2.43,4.61]	<0.001
Female IDU	53	216	24.54%	8.84	[6.08,12.83]	<0.001	6.22	[4.19,9.23]	<0.001
Male heterosexual	73	1044	6.99%	2.04	[1.49,2.80]	<0.001	1.67	[1.19,2.35]	0.003
Female heterosexual	106	961	11.03%	3.37	[2.52,4.50]	<0.001	2.32	[1.67,3.22]	<0.001
Other	14	296	4.73%	1.35	[0.76,2.40]	0.308	1.35	[0.74,2.44]	0.327
MSM	92	2592	3.55%	1.00		.	1.00		.
Age at baseline									
< 30 years	169	1401	12.06%	2.61	[1.87,3.63]	<0.001	1.78	[1.24,2.55]	0.002
30-50 years	211	3365	6.27%	1.27	[0.92,1.75]	0.144	0.96	[0.68,1.35]	0.810
≥ 50	48	960	5.00%	1.00		.	1.00		.
AIDS at baseline									
Yes	69	862	8.00%	1.09	[0.83,1.43]	0.521			
No	359	4864	7.38%	1.00		.			
CD4 count at baseline									
< 50	49	647	7.57%	1.10	[0.78,1.53]	0.597			
50-199	85	1099	7.73%	1.12	[0.85,1.48]	0.425			
200-349	117	1446	8.09%	1.18	[0.91,1.52]	0.210			
Missing	35	494	7.09%	1.02	[0.69,1.50]	0.923			
≥ 350	142	2040	6.96%	1.00		.			
HIV-RNA at baseline									
10.000-99.999	146	1961	7.45%	0.87	[0.66,1.16]	0.347			
≥ 100.000	141	2037	6.92%	0.81	[0.61,1.07]	0.138			
Missing	57	731	7.80%	0.92	[0.65,1.31]	0.638			
≤ 9.999	84	997	8.43%	1.00		.			
Nationality									
High prevalence countries	89	716	12.43%	1.96	[1.53,2.51]	<0.001	1.37	[1.01,1.85]	0.040
Low prevalence countries	339	5010	6.77%	1.00		.	1.00		.
Population size of area of residence									
Rural areas	133	2319	5.74%	0.66	[0.53,0.82]	<0.001	0.89	[0.70,1.13]	0.335
Capital cities	73	788	9.26%	1.10	[0.84,1.45]	0.491	1.45	[1.08,1.96]	0.013
Vienna	222	2619	8.48%	1.00		.	1.00		.
Year of ART Initiation									
2004-2007	166	967	17.17%	8.59	[5.40,13.65]	<0.001	6.25	[3.90,10.02]	<0.001
2008-2011	125	1339	9.34%	4.27	[2.67,6.83]	<0.001	3.37	[2.09,5.43]	<0.001
2012-2015	85	1377	6.17%	2.73	[1.68,4.43]	<0.001	2.43	[1.49,3.97]	<0.001
2016-2019	31	1152	2.69%	1.15	[0.65,2.01]	0.635	1.14	[0.65,2.00]	0.654
2020-2023	21	891	2.36%	1.00		.	1.00		.

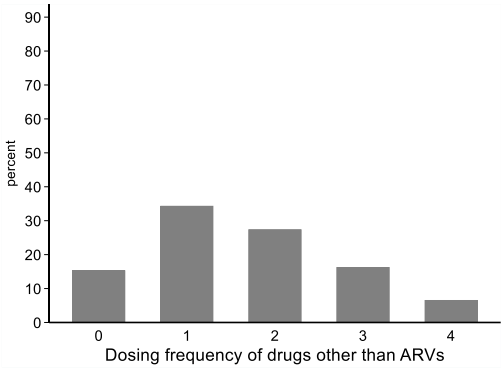
9.7 Frequency of drug dosing

9.7.1 Overview

21 of 4844 (0.4%) patients do not take any drugs at all and 29 (0.6%) patients have no ART but take other drugs. 722 (14.9%) patients are receiving ART only.

	Number of patients					
Dosing frequency	**0**	**1**	**2**	**3**	**4**	**Total**
Antiretrovirals (ARVs)	50	4687	106	1	0	4844
Drugs other than ARVs	743	1664	1328	790	319	4844
Overall dosing frequency	21	1668	1816	973	366	4844
Overall dosing frequency in patients with once daily ARVs	0	1661	1748	926	352	4687





9.7.2 Most frequent regimen on September 1st 2024

Regimen	Frequency	Percent
BGV FTC TAF	2,186	45.60
3TC DGV	961	20.05
3TC DOR TDF	284	5.92
FTC RPV TAF	269	5.61
3TC ABC DGV	235	4.90
DGV FTC TDF	83	1.73
EVG FTC TAF	76	1.59
CAB RPV	64	1.34
3TC ABC RAL	59	1.23
DGV FTC TAF	58	1.21
DGV RPV	53	1.11
3TC ABC NVP	43	0.90
FTC RAL TDF	43	0.90
DGV DOR	41	0.86
FTC RPV TDF	35	0.73
3TC DGV DOR	34	0.71
EFV FTC TDF	27	0.56
FTC RAL TAF	20	0.42
DGV DRV RTVb	18	0.38
FTC NVP TAF	17	0.35
FTC NVP TDF	14	0.29
BGV DOR FTC TAF	12	0.25
DRV FTC RTVb TDF	10	0.21
Other	152	3.13
Total	**4794**	**100.00**

9.8 Use of antiretroviral drugs to prevent HIV infection

PEP

	Non-occupational PEP started in								
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Sex									
Women	37	40	63	65	44	45	42	79	15
Men	107	134	160	263	149	180	189	210	37
Age (years)									
<30	64	97	114	164	103	126	118	150	26
30-48	72	72	102	150	83	94	107	123	22
≥50	8	5	7	14	7	5	6	16	4
Area of residence									
Vienna	74	101	126	192	108	120	129	156	24
Lower Austria	4	6	10	13	21	13	17	28	5
Burgenland	1	0	1	4	3	2	2	3	0
Upper Austria	3	15	17	25	11	32	21	25	6
Salzburg	0	7	8	11	3	3	8	3	1
Tyrol	22	11	23	29	28	29	18	34	6
Vorarlberg	2	1	2	3	3	3	9	11	0
Styria	10	6	14	17	8	10	17	19	4
Carinthia	0	0	1	1	0	0	0	1	0
Missing/Foreign	28	27	21	33	8	13	10	9	6

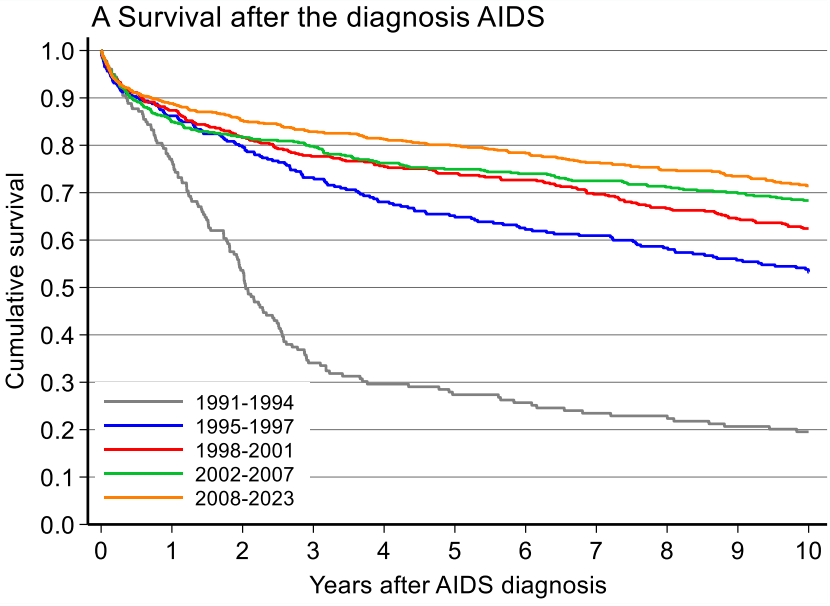
PrEP

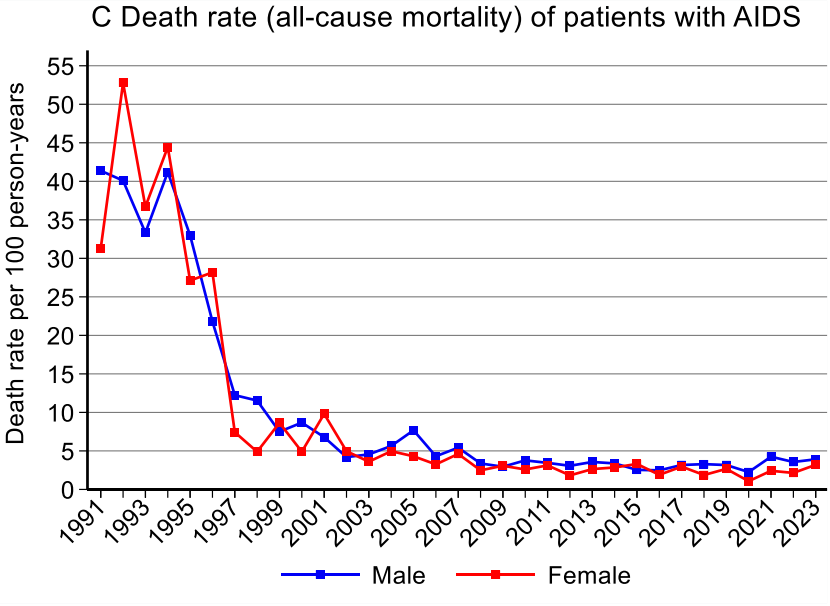
	PrEP started in									On PrEP at 01.03.2024
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	
Sex										
Women	0	1	3	9	5	2	4	12	2	30
Men	6	101	199	288	211	305	423	484	73	1652
Age (years)										
<30	3	32	52	83	63	113	175	179	26	553
30-48	3	64	124	188	132	158	204	282	42	963
≥50	0	6	26	26	21	36	48	35	7	166
Area of residence										
Vienna	1	80	83	132	65	87	104	152	22	602
Lower Austria	0	6	9	12	10	9	14	26	3	81
Burgenland	0	0	0	3	1	3	2	2	0	11
Upper Austria	0	0	21	28	33	51	71	90	16	285
Salzburg	0	1	5	7	3	5	24	23	1	61
Tyrol	4	12	60	89	70	120	155	145	23	418
Vorarlberg	1	1	19	12	18	22	32	30	6	123
Styria	0	1	4	10	14	8	20	26	3	83
Carinthia	0	0	0	0	1	1	1	0	0	3
Missing/Foreign	0	1	1	4	1	1	4	2	1	15

10 Disease progression and Response to ART

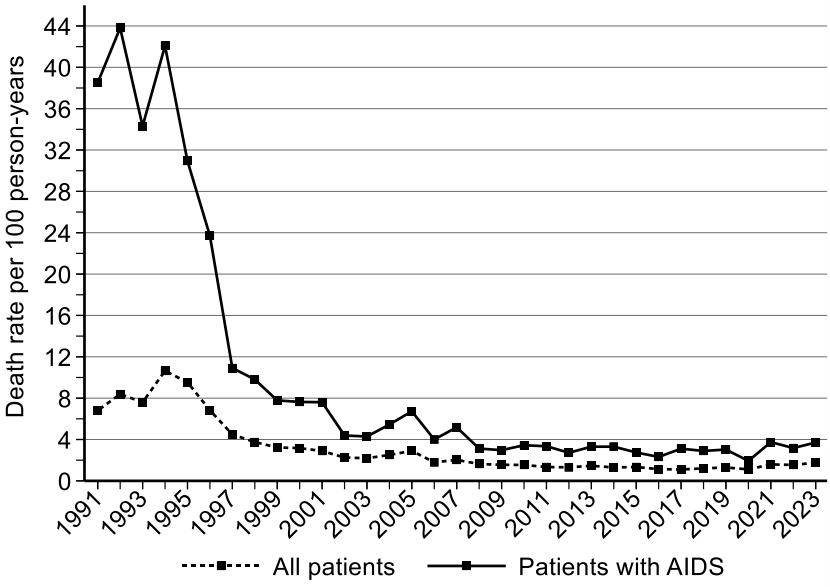
10.1 Mortality of patients with AIDS since 1985

The documentation of death is partially incomplete in the HIV Patient Management System (e.g. considerable proportion of patients without follow-up since 2001 are not documented dead but presumed dead, see chapter 4).





Transgender persons excluded

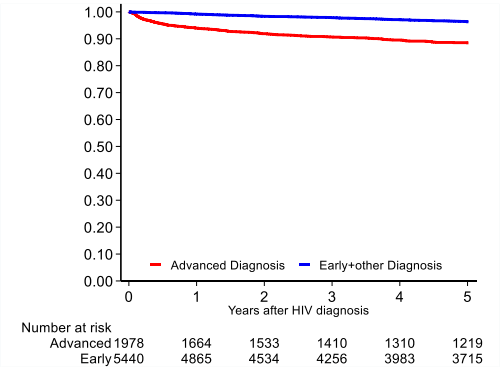

Death rate per 100 person-years
44
40
36
32
28
24
20
16
12
8
4
0
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
All patients
Patients with AIDS

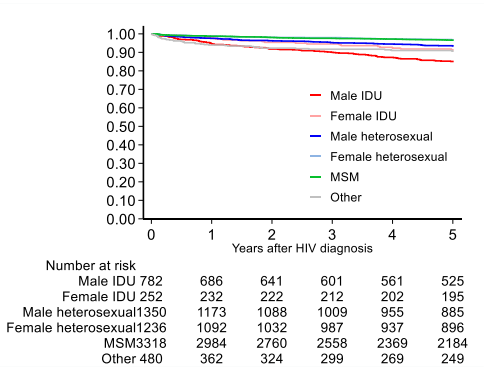
10.2 Factors associated with mortality in patients diagnosed since 2001

Date of censoring: last contact with the HIV centre (34 missing)

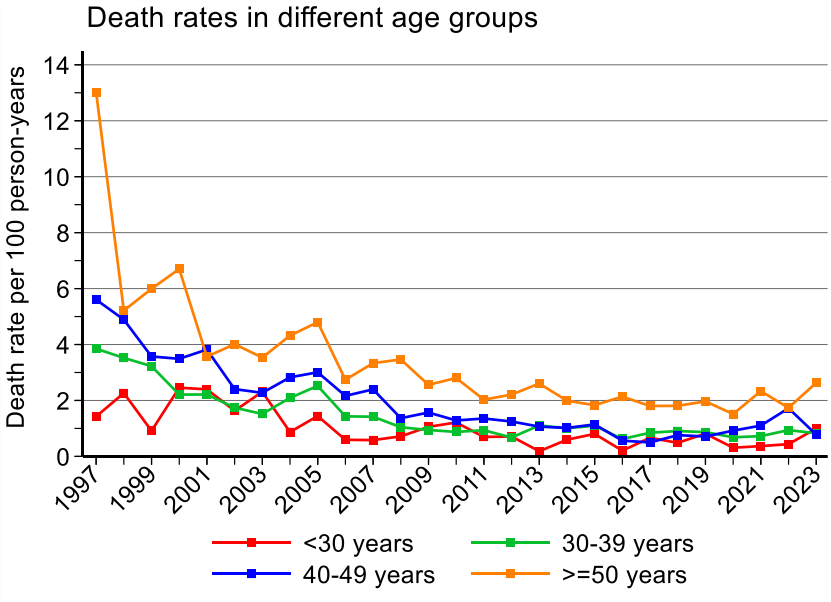
All centres	870	7435	11.70%	**Univariable Cox Regression**			**Multivariable Cox Regression**		
	Frequencies		**%**	**HR**	**[95% CI]**	**p value**	**HR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	226	2549	8.87%	0.26	[0.22,0.31]	<0.001	0.19	[0.15,0.23]	<0.001
30-50 years	399	3921	10.18%	0.32	[0.27,0.38]	<0.001	0.28	[0.24,0.34]	<0.001
≥ 50	245	965	25.39%	1.00		.	1.00		.
HIV transmission category									
Male IDU	242	785	30.83%	3.77	[3.14,4.51]	<0.001	4.14	[3.42,5.01]	<0.001
Female IDU	78	252	30.95%	3.32	[2.57,4.30]	<0.001	3.93	[3.00,5.16]	<0.001
Male heterosexual	183	1350	13.56%	1.70	[1.40,2.07]	<0.001	1.18	[0.97,1.45]	0.101
Female heterosexual	77	1237	6.22%	0.71	[0.55,0.92]	0.009	0.73	[0.56,0.96]	0.022
Other	59	486	12.14%	2.07	[1.56,2.76]	<0.001	1.76	[1.31,2.36]	<0.001
MSM	231	3325	6.95%	1.00		.	1.00		.
Population size of area of residence									
Missing value	6	109	5.50%	0.71	[0.32,1.58]	0.400	0.97	[0.42,2.21]	0.934
< 100 000	276	2999	9.20%	0.60	[0.51,0.69]	<0.001	0.65	[0.56,0.76]	<0.001
≥ 100 000	93	1006	9.24%	0.59	[0.47,0.73]	<0.001	0.75	[0.60,0.95]	0.015
> 1 million	495	3321	14.91%	1.00		.	1.00		.
Nationality									
Missing/Unknown	4	36	11.11%	1.11	[0.41,2.96]	0.837	1.37	[0.50,3.78]	0.538
Low prevalence countries	104	1951	5.33%	0.44	[0.35,0.54]	<0.001	0.59	[0.48,0.73]	<0.001
High prevalence countries	48	796	6.03%	0.40	[0.30,0.53]	<0.001	0.67	[0.49,0.91]	0.011
Austria	714	4652	15.35%	1.00		.	1.00		.
Stage of disease									
Advanced diagnosis									
Yes	360	1979	18.19%	2.08	[1.82,2.38]	<0.001	1.90	[1.65,2.19]	<0.001
No	510	5456	9.35%	1.00		.	1.00		.
Calendar period of HIV test									
2005-2008	240	1545	15.53%	0.78	[0.66,0.93]	0.006	0.87	[0.73,1.04]	0.131
2009-2012	171	1514	11.29%	0.75	[0.62,0.91]	0.004	0.85	[0.69,1.03]	0.097
2013-2016	88	1317	6.68%	0.62	[0.49,0.80]	<0.001	0.72	[0.56,0.93]	0.012
≥ 2017	55	1744	3.15%	0.55	[0.41,0.75]	<0.001	0.60	[0.44,0.81]	0.001
2001-2004	316	1315	24.03%	1.00		.	1.00		.

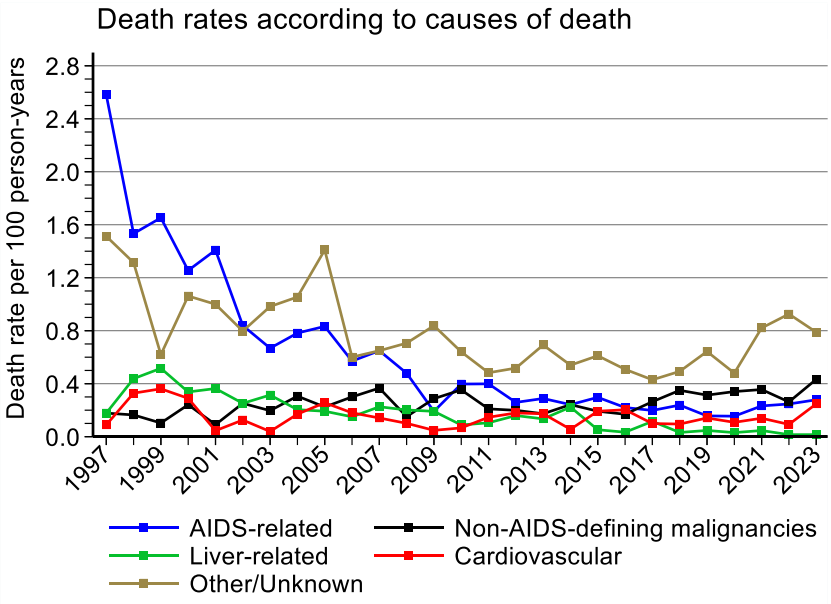
Survival after the HIV diagnosis

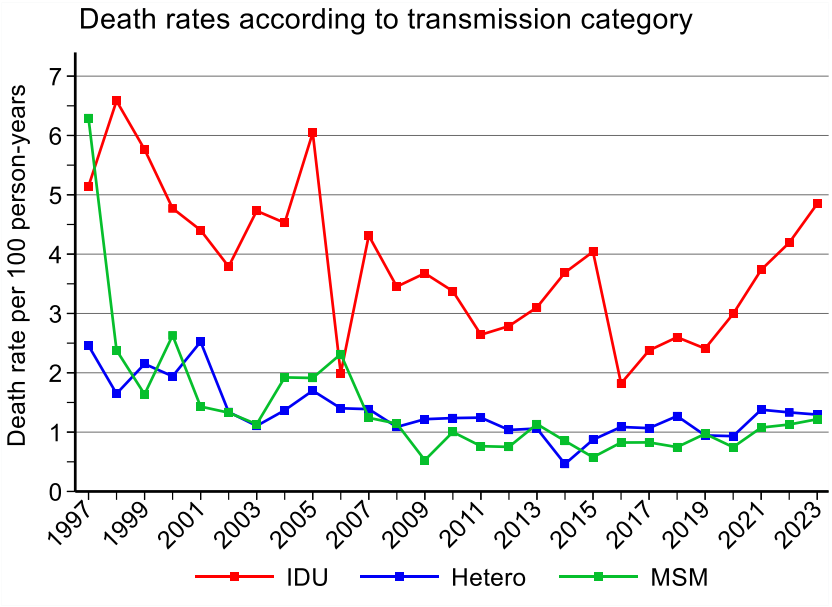




10.3 Mortality in combination ART era (years 1997-2017)

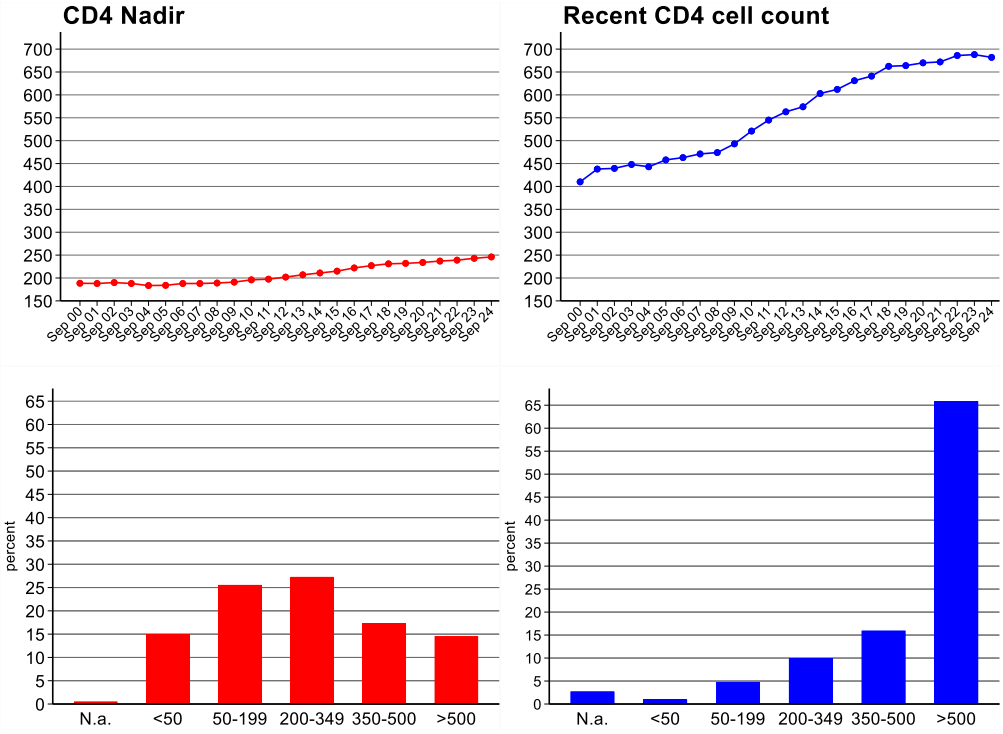


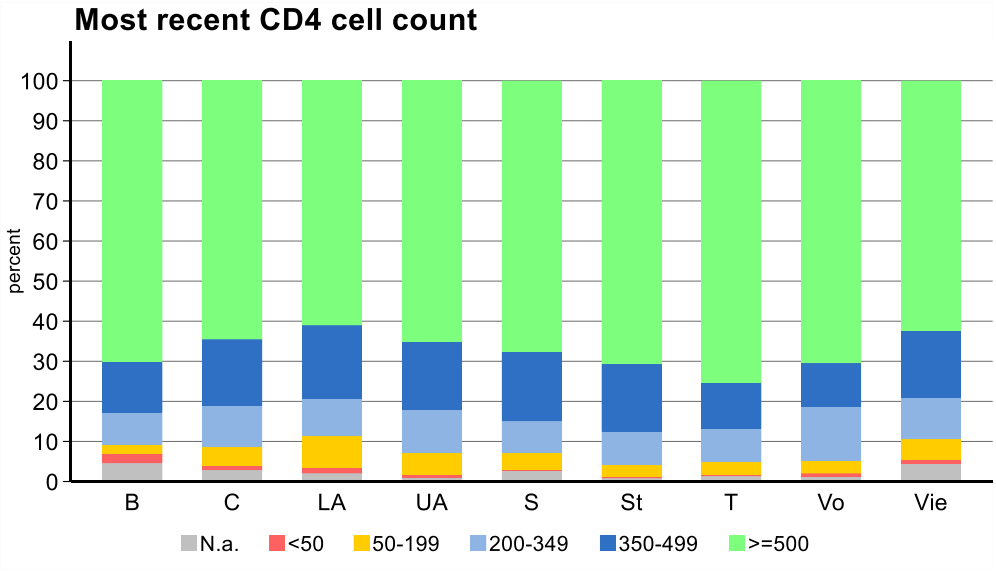



Death rates according to transmission category
Death rate per 100 person-years
0
1
2
3
4
5
6
7
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
IDU
Hetero
MSM

10.4 CD4 cell counts

10.4.1 CD4 cell counts: nadir and most recent

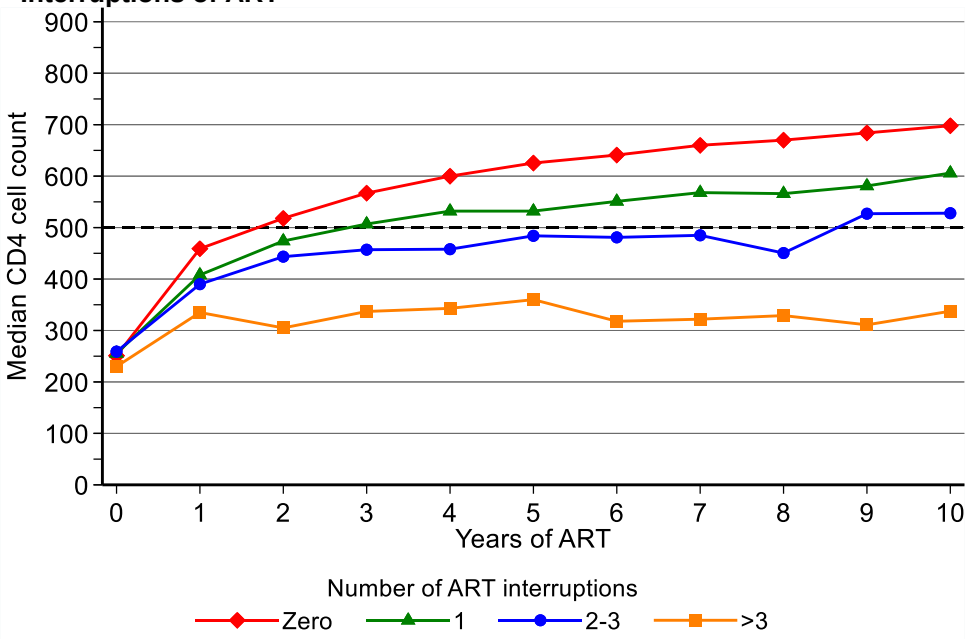




10.4.2 Median CD4 cell counts after initiating ART

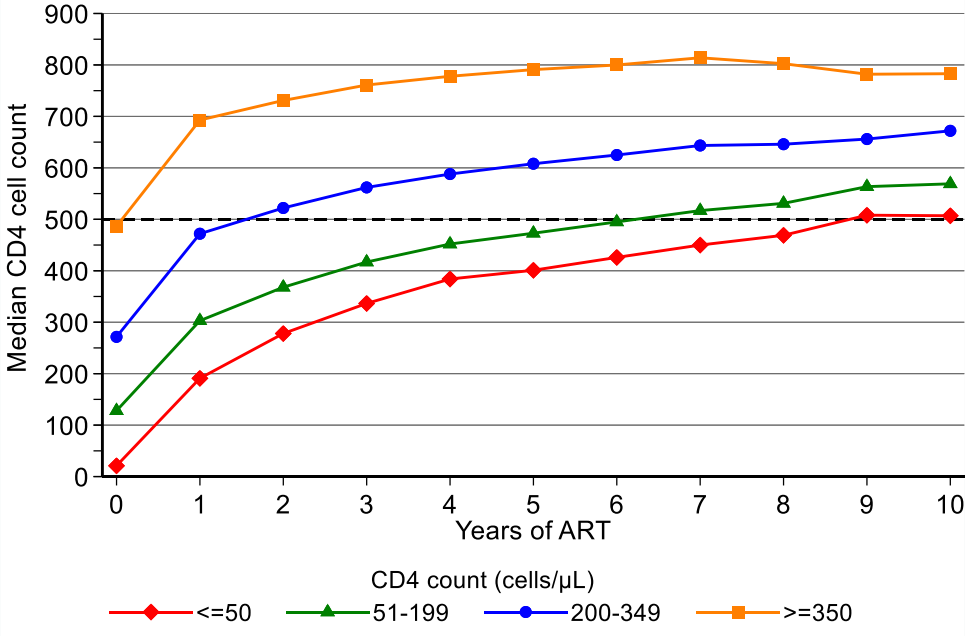
The analyses include only patients who initiated ART after January 1st, 1997.

a) Interruptions of ART



b) Baseline CD4 count

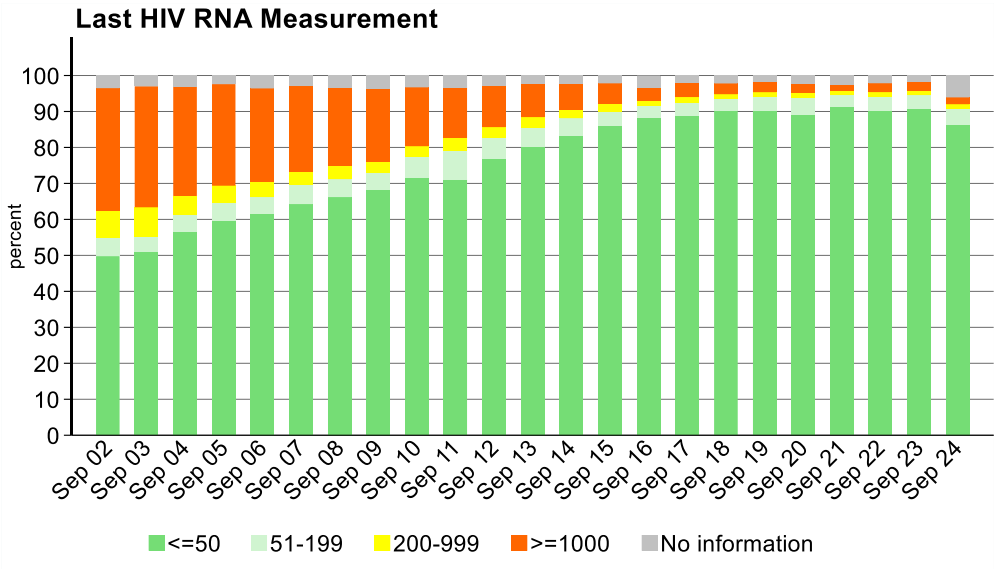
Patients were included until treatment interruption.

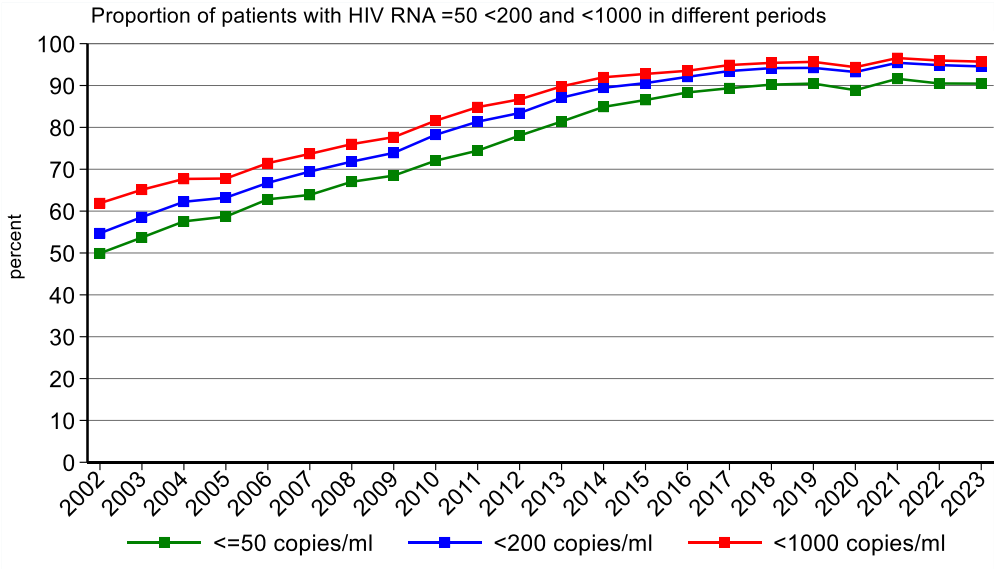


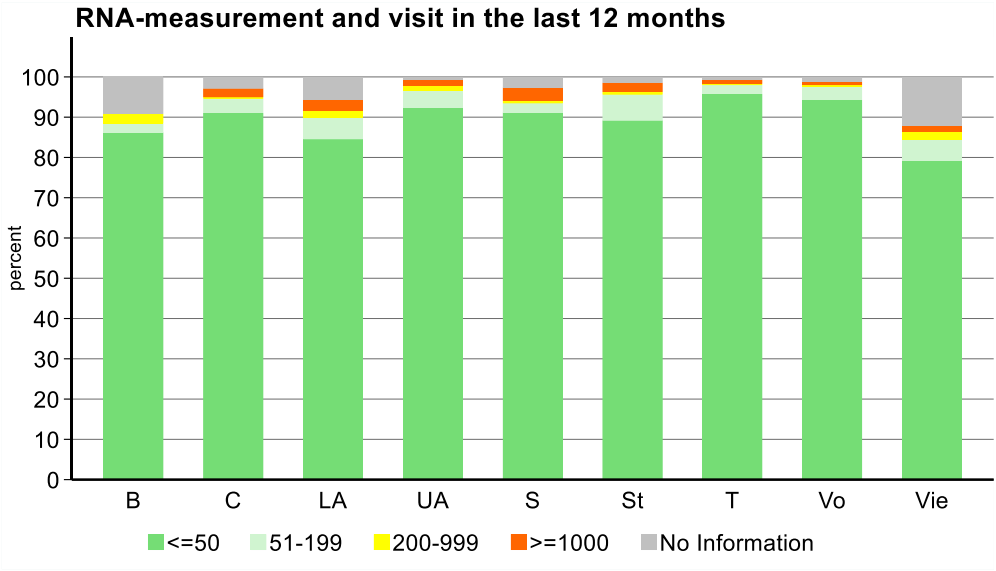
10.5 HIV RNA (viral load)

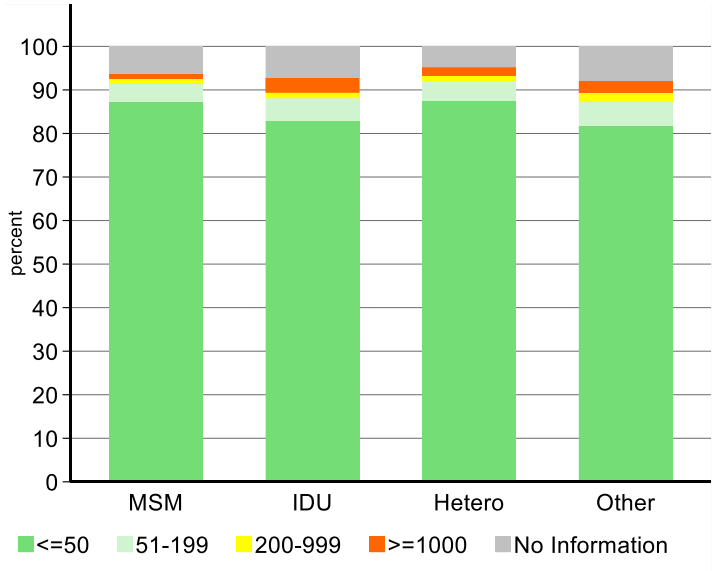
10.5.1 Last HIV RNA currently in care regardless of ART

91.8% of the patients currently in care (4750 of 5172) have a current HIV RNA below 400 copies/ml.






RNA-measurement and visit in the last 12 months
percent
100
90
80
70
60
50
40
30
20
10
0
B
C
LA
UA
S
St
T
Vo
Vie
<=50
51-199
200-999
>=1000
No Information


percent
100
90
80
70
60
50
40
30
20
10
0
MSM
IDU
Hetero
Other
<=50
51-199
200-999
>=1000
No Information

10.5.2 The continuum of care in Austria

Data from AHIVCOS were used to derive the four-stage continuum of HIV care and assessed for all patients and for men who have sex with men (MSM) for the years 2010 to 2022.

a. People living with HIV (PLHIV) estimates were obtained using back-calculation models (ECDC tool 1.3.0) to estimate HIV incidence and the undiagnosed fraction.
b. Proportion ever diagnosed.
c. Proportion ever diagnosed who ever initiated ART
d. Proportion of them who were virally suppressed (≤200 c/mL)
e. Proportion suppressed of all PLHIV (e) for all patients in Austria

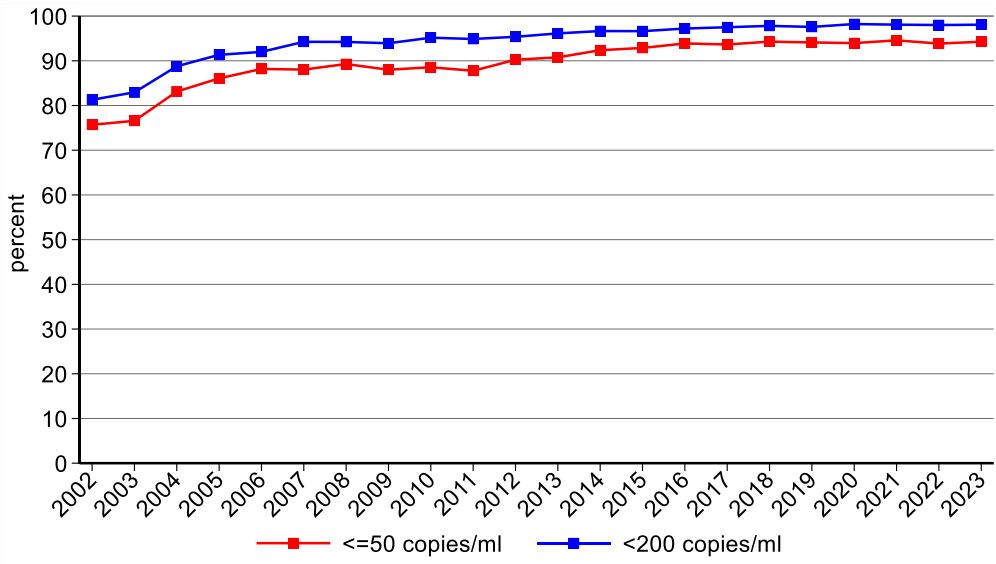
For high estimates patients lost to follow-up (LTFU, no contact 1.5 years before the end of the respective year) were excluded and for low estimates they were included. The preferred estimate was the mid-point between the high and low estimate.
Missing HIV-RNA was considered as unsuppressed.

Year	(a) PLHIV	(b) Diagnosed [estimated range]	(c) On ART Mean [low, high estimate]	(d) Suppressed Mean [low, high estimate]	(e) Suppressed of all PLHIV
2010	6254	**84%** [80%,86%]	**83%** [76%,89%]	**79%** [71%,86%]	**55%**
2011	6432	**86%** [82%,88%]	**85%** [79%,91%]	**80%** [72%,88%]	**59%**
2012	6594	**88%** [84%,90%]	**87%** [81%,93%]	**81%** [73%,89%]	**62%**
2013	6734	**89%** [85%,91%]	**89%** [83%,94%]	**83%** [74%,91%]	**66%**
2014	6864	**90%** [86%,92%]	**91%** [85%,96%]	**84%** [75%,92%]	**69%**
2015	6975	**91%** [88%,94%]	**92%** [87%,97%]	**84%** [75%,93%]	**70%**
2016	7079	**92%** [89%,94%]	**94%** [89%,98%]	**85%** [77%,93%]	**74%**
2018	7480	**94%** [91%,96%]	**95%** {91%,99%]	**85%** [76%,94%]	**76%**
2019	7655	**94%** [91%,97%]	**95%** {91%,99%]	**85%** [74%,95%]	**76%**
2020	7652	**96%** [93%,99%]	**96%** [92%,99%]	**89%** [72%,95%]	**82%**
2021	7732	**97%** [94%,100%]	**96%** [92%,99%]	**89%** [69%,96%]	**82%**
2022	7596	**96%** [93%, 99%]	**96%** [93%, 99%]	**89%** [70%, 95%]	**82%**

We conclude that Austria has finally reached the 90-90-90 target of UNAIDS for 2020. The somewhat smaller estimate of viral suppression may be explained substantially by transfer of care in Vienna and out-migration. This and the decrease in HIV incidence support the hypothesis that the high estimate of being on ART and virally-suppressed is the more likely scenario. For more reliable nationwide estimates data from private physicians might be included.

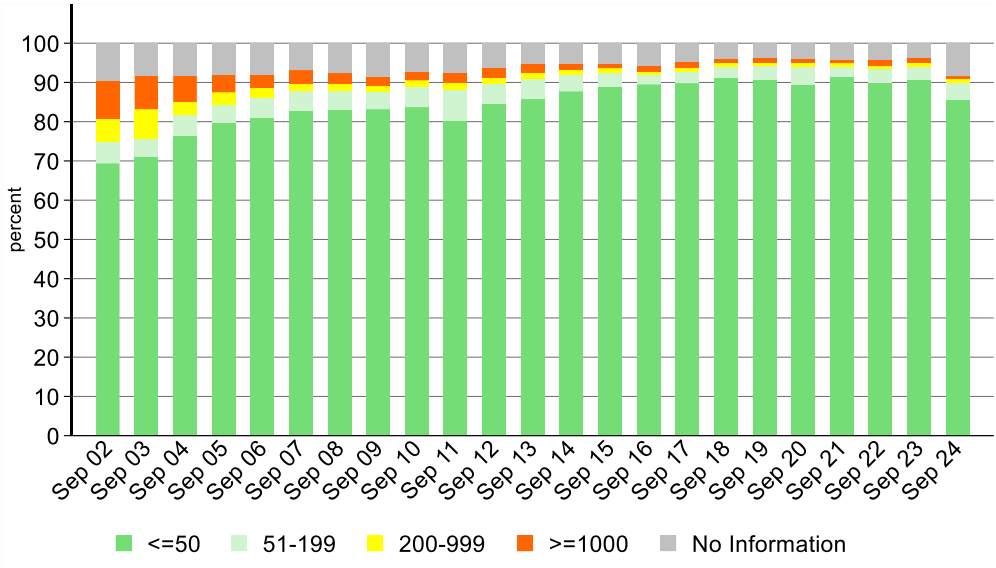
10.5.3 Last HIV RNA on ART

Patients were included if there were at least 75 days between ART initiation and HIV RNA measurement.



10.5.3.1 Last HIV RNA on ART at different points in time

Patients currently in care (12 months), currently on ART and measurement of viral load at least 2.5 months after ART initiation



10.5.4 Risk factors for viral replication

Risk factors for HIV RNA ≥200 copies/ml on ART

The analyses in this chapter include all patients with a visit in the last 12 months who have been on ART for at least 75 days before the measurement of the viral load.

				Univariable logistic regression			Multivariable logistic regression		
	107	**4978**	**2.15%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Age									
< 30 years	5	146	3.42%	2.47	[0.96,6.36]	0.062	2.82	[0.99,8.08]	0.053
30-50 years	64	2151	2.98%	2.13	[1.42,3.20]	<0.001	2.63	[1.67,4.14]	<0.001
≥ 50	38	2681	1.42%	1.00		.	1.00		.
HIV transmission category									
Male IDU	10	403	2.48%	1.77	[0.86,3.64]	0.121	0.90	[0.42,1.90]	0.773
Female IDU	7	178	3.93%	2.85	[1.24,6.56]	0.014	1.33	[0.55,3.22]	0.524
Male heterosexual	22	933	2.36%	1.68	[0.97,2.92]	0.066	1.54	[0.86,2.77]	0.148
Female heterosexual	28	1006	2.78%	1.99	[1.19,3.34]	0.009	1.19	[0.67,2.13]	0.553
Other	9	271	3.32%	2.39	[1.12,5.07]	0.023	1.84	[0.83,4.07]	0.133
MSM	31	2187	1.42%	1.00		.	1.00		.
Nationality									
Missing/unknown	1	13	7.69%	4.21	[0.54,32.84]	0.170	2.33	[0.27,20.14]	0.441
High prevalence	20	420	4.76%	2.53	[1.52,4.20]	<0.001	1.61	[0.88,2.92]	0.119
Low prevalence	18	1041	1.73%	0.89	[0.53,1.50]	0.660	0.79	[0.45,1.38]	0.405
Austria	68	3504	1.94%	1.00		.	1.00		.
Population size of area of residence									
Rural areas	41	2313	1.77%	0.58	[0.39,0.87]	0.009			
Capital cities	11	839	1.31%	0.43	[0.22,0.82]	0.011			
Vienna	55	1826	3.01%	1.00		.			
AIDS									
Yes	19	766	2.48%	1.19	[0.72,1.97]	0.493			
No	88	4212	2.09%	1.00		.			
CD4 Nadir									
<50	27	771	3.50%	2.49	[1.53,4.07]	<0.001	2.24	[1.34,3.76]	0.002
50-199	38	1277	2.98%	2.11	[1.35,3.28]	0.001	1.88	[1.17,3.01]	0.009
≥200	42	2926	1.44%	1.00		.	1.00		.
ART initiation									
Before 1.1.1997	10	353	2.83%	1.36	[0.70,2.63]	0.360	0.87	[0.41,1.84]	0.710
After 1.1.1997	97	4625	2.10%	1.00		.	1.00		.
Ever ART interruptions									
None	53	3822	1.39%	0.20	[0.13,0.32]	<0.001	0.18	[0.10,0.30]	<0.001
1	21	646	3.25%	0.49	[0.28,0.85]	0.011	0.51	[0.29,0.92]	0.024
≥2	33	510	6.47%	1.00		.	1.00		.
Art duration									
< 9 months	6	80	7.50%	4.01	[1.70,9.45]	0.001	5.43	[2.17,13.61]	<0.001
9-18 months	7	150	4.67%	2.42	[1.10,5.32]	0.027	3.93	[1.69,9.15]	0.001
> 18 months	94	4748	1.98%	1.00		.	1.00		.

11 Development of resistance to ART (data: 03/2024)

11.1 Abstract

Prevalence of Development of Drug Resistance in HIV infected patients in Austria

Objective: To determine the prevalence of development of drug resistance, predictors and temporal trends in resistance.
Method: Patients currently in care in one of nine centres who have ever been on antiretroviral therapy (ART) were analyzed. Mutations were judged as resistant according to "2022 Update of the Drug Resistance Mutations in HIV-1" from the International Antiviral-Society-USA (https://www.iasusa.wpenginepowered.com/wp-content/uploads/2022/10/30-4-559.pdf).
Results: Overall 4744 patients have ever received ART, 1248 had a resistance test after ART (26.3%). The overall prevalence of development of drug resistance was 63.3% (790 of 1248 patients), the prevalence of NRTI resistance was 30.1%, the prevalence of NNRTI resistance was 24.8%, and the prevalence of PI resistance was 53.1%. The prevalence of 3-class-resistance was 13.1% (163 of 1248 patients). The risk factors for developing a 3-class-resistance were a CD4 nadir <50 (OR=3.6; 95% CI: 2.3-5.6), a CD4 nadir between 50 and 200 (OR=1.9; 95% CI: 1.3-2.9) and initial therapy before 1997 (OR=33.1; 95% CI: 20.9-52.5) as well as from 1997 to 2003 (OR=8.2; 95% CI: 5.1-13.4), a CD4 nadir between 50 and 200 (OR=2.1; 95% CI: 1.3-3.3) and an age at ART-start <30 (OR=2.3; 95% CI: 1.01-5.4). The risk to develop a 3-class-resistance was lower in patients with a low viral load (for <50 copies/ml OR=0.2; 95% CI: 0.1-0.4).
Conclusions: The overall prevalence of development of drug resistance is at a rather high level, while the prevalence of 3-class-resistance was found to be stabilizing at a low level. The risk for developing resistance is small in those who initiated therapy in recent years.

11.2 Definition of resistance under ART

The rate of resistance development during antiretroviral therapy („percent with resistance“) corresponds to the number of patients with resistance mutations in relation to the number of patients on ART (see also chapter 5).
“Cumulative resistance” includes any mutation ever found in a particular patient.
The resistance mutations have been classified according to the “2022 Update of the Drug Resistance Mutations in HIV-1” from the International AIDS-Society-USA (https://www.iasusa.wpenginepowered.com/wp-content/uploads/2022/10/30-4-559.pdf).

The following codons and amino acids have been classified as resistance (IAS):

Reverse transcriptase				Protease	
NRTI		NNRTI			
M41	L	V90	I	L10	F, R, I, V
A62	V	A98	G	V11	I
K65	R, E, N	L100	I	K20	R, M, T
D67	N	K101	H, E, P	L24	I
T69	ins	K103	N, S	D30	N
K70	R, E	V106	A, M, I, T	V32	I
L74	V	V108	I	L33	F
V75	I	E138	A, G, K, Q, R	M36	I, L, V
F77	L	V179	D, F, T, L	K43	T
Y115	F	Y181	C, I, V	M46	I, L
F116	Y	Y188	L, H, C	I47	V, A
Q151	M	G190	A, S, E	G48	V
M184	V, I	H221	Y	I50	V, L
L210	W	P225	H	F53	L, Y
T215	Y, F	F227	C, L, R, I, V	I54	V, M, L, T, S, A
K219	Q, E	M230	I, L	Q58	E
		L234	I	I62	V
		Y318	F	H69	K, R
				A71	V, T
				G73	S, T, C, A
				T74	P
				L76	V
				V77	I
				V82	A, T, F, S, I, L, M
				N83	D
				I84	V
				I85	V
				N88	D, S
				L89	V, I, M
				L90	M

11.3 Frequency of resistance

11.3.1 Frequency of NRTI-associated resistance mutations

11.3.1.1 Overview

The table shows the numbers of patients with NRTI-associated resistance mutations among all patients who have ever been treated with Nucleoside Reverse Transcriptase Inhibitors („NRTI“).

All centers	Deceased since 1997, NRTI use	Patients currently in care and NRTI use ever
	N = 1574	N = 4737
Resistance to NRTI	255 (16.2%)	376 (7.9%)
Codon 41	93 (5.9%)	136 (2.9%)
Codon 62	10 (0.6%)	25 (0.5%)
Codon 65	11 (0.7%)	25 (0.5%)
Codon 67	81 (5.1%)	118 (2.5%)
Codon 69	3 (0.2%)	3 (0.1%)
Codon 70	61 (3.9%)	101 (2.1%)
Codon 74	36 (2.3%)	29 (0.6%)
Codon 75	5 (0.3%)	7 (0.1%)
Codon 77	3 (0.2%)	6 (0.1%)
Codon 115	7 (0.4%)	13 (0.3%)
Codon 116	2 (0.1%)	4 (0.1%)
Codon 151	2 (0.1%)	6 (0.1%)
Codon 184	199 (12.6%)	261 (5.5%)
Codon 210	62 (3.9%)	62 (1.3%)
Codon 215	105 (6.7%)	142 (3.0%)
Codon 219	51 (3.2%)	64 (1.4%)

11.3.1.2 Risk factors for the resistance mutation K65R of the RT

Recruitment for this analysis has been in agreement to entry criteria of COHERE. Additionally, patients who died before 1.1.2000 have been excluded.

All centres						**Model 1 (N = 9105)**		
	Frequencies N=			Univariable regression			**Multivariable regression***	
Variable	48 /	9105	(0.5%)	OR (95% CI)	p-value	**OR (95% CI)**		**p-value**
Demographic characteristics								
Age at ART start								
<30 years	12 /	2420	(0.5%)	2.1 0.6 – 7.6	0.238			
30-50 years	33 /	5391	(0.6%)	2.7 0.8 – 8.7	0.106			
>50 years	3 /	1294	(0.2%)	1				
Sex/ mode of transmission								
Male IDU	7 /	1058	(0.7%)	2.4 0.9 – 6.1	0.077	**1.4**	**0.5 – 3.6**	**0.532**
Female IDU	6 /	447	(1.3%)	4.8 1.8 – 13.1	0.002	**2.6**	**0.9 – 7.4**	**0.063**
Male heterosexual	10 /	1594	(0.6%)	2.2 0.9 – 5.3	0.066	**1.8**	**0.7 – 4.3**	**0.194**
Female heterosexual	14 /	1559	(0.9%)	3.2 1.5 – 7.1	0.004	**2.7**	**1.2 – 6.0**	**0.016**
Other	0 /	543	(0.0%)	- -	-	**-**	**-**	**-**
MSM	11 /	3904	(0.3%)	1		**1**		
Population size of area of residence								
Missing value	0 /	86	(0.0%)	- -	-			
Rural areas	16 /	3614	(0.4%)	0.7 0.4 – 1.3	0.215			
Capital cities	5 /	1277	(0.4%)	0.6 0.2 – 1.6	0.290			
Vienna	27 /	4128	(0.7%)	1				
Stage of disease								
AIDS								
Yes	27 /	2512	(1.1%)	3.4 1.9 – 6.0	<0.001			
No	21 /	6593	(0.3%)	1				
CD4 nadir								
Missing value	0 /	93	(0.0%)	- -	-	**-**	**-**	**-**
<50 cells/µl	23 /	1610	(1.4%)	8.9 4.0 – 19.8	<0.001	**7.0**	**3.1 – 16.1**	**<0.001**
50-199 cells/µl	17 /	2508	(0.7%)	4.2 1.8 – 9.7	0.001	**3.2**	**1.4 – 7.7**	**0.008**
≥200 cells/µl	8 /	4894	(0.2%)	1		**1**		
ART								
Abacavir use ever								
Yes	21 /	3374	(0.6%)	1.3 0.7 – 2.3	0.337			
No	27 /	5731	(0.5%)	1				
Tenofovir use ever								
Yes	45 /	6039	(0.7%)	7.7 2.4 – 24.7	0.001	**6.3**	**1.9 – 20.3**	**0.002**
No	3 /	3066	(0.1%)	1		**1**		
ART initiation								
Before 1.1.1997	9 /	820	(1.1%)	2.3 1.1 – 4.9	0.022			
After 1.1.1997	39 /	8285	(0.5%)	1				

* adjusted for the variables: age, population size of area of residence, Abacavir use ever, ART initiation

11.3.2 Frequency of NNRTI-associated resistance mutations

The table shows the numbers of NNRTI-associated resistance mutations among patients who have ever been treated with Non-Nucleoside Reverse Transcriptase Inhibitors („NNRTI“).

All centers	Deceased since 1997, NNRTI use	Patients currently in care and NNRTI use ever
	N = 920	N = 2423
Resistance to NNRTI	193 (21.0%)	257 (10.6%)
Codon 90	9 (1.0%)	20 (0.8%)
Codon 98	16 (1.7%)	12 (0.5%)
Codon 100	5 (0.5%)	8 (0.3%)
Codon 101	30 (3.3%)	28 (1.2%)
Codon 103	100 (10.9%)	127 (5.2%)
Codon 106	19 (2.1%)	23 (0.9%)
Codon 108	29 (3.2%)	24 (1.0%)
Codon 138	10 (1.1%)	33 (1.4%)
Codon 179	8 (0.9%)	16 (0.7%)
Codon 181	74 (8.0%)	75 (3.1%)
Codon 188	10 (1.1%)	14 (0.6%)
Codon 190	46 (5.0%)	43 (1.8%)
Codon 221	14 (1.5%)	14 (0.6%)
Codon 225	7 (0.8%)	6 (0.2%)
Codon 227	6 (0.7%)	4 (0.2%)
Codon 230	4 (0.4%)	5 (0.2%)
Codon 234	0 (0.0%)	0 (0.0%)
Codon 318	4 (0.4%)	0 (0.0%)

11.3.3 Frequency of PI-associated resistance mutations

The table shows the numbers of the PI-associated resistance mutations among patients who have ever been treated with Protease Inhibitors („PI“).

Minor mutations:

All centers	Deceased since 1997, PI use N = 1217	Patients currently in care and PI use ever N = 2167
Any minor resistance to PI	377 (31.0%)	568 (26.2%)
Codon 10	120 (9.9%)	177 (8.2%)
Codon 11	7 (0.6%)	5 (0.2%)
Codon 20	67 (5.5%)	71 (3.3%)
Codon 24	7 (0.6%)	11 (0.5%)
Codon 33	19 (1.6%)	30 (1.4%)
Codon 36	182 (15.0%)	280 (12.9%)
Codon 43	3 (0.2%)	6 (0.3%)
Codon 53	10 (0.8%)	11 (0.5%)
Codon 62	49 (4.0%)	82 (3.8%)
Codon 69	31 (2.5%)	102 (4.7%)
Codon 71	152 (12.5%)	157 (7.2%)
Codon 73	21 (1.7%)	14 (0.6%)
Codon 77	137 (11.3%)	202 (9.3%)
Codon 85	1 (0.1%)	2 (0.1%)
Codon 89	32 (2.6%)	103 (4.8%)

Major mutations:	All centers	Deceased since 1997, PI use N = 1217	Patients currently in care and PI use ever N = 2167
	Any major resistance to PI	125 (10.3%)	165 (7.6%)
	Codon 30	12 (1.0%)	31 (1.4%)
	Codon 32	12 (1.0%)	5 (0.2%)
	Codon 46	60 (4.9%)	66 (3.0%)
	Codon 47	8 (0.7%)	6 (0.3%)
	Codon 48	4 (0.3%)	7 (0.3%)
	Codon 50	1 (0.1%)	5 (0.2%)
	Codon 54	38 (3.1%)	42 (1.9%)
	Codon 58	7 (0.6%)	10 (0.5%)
	Codon 74	0 (0.0%)	1 (0.0%)
	Codon 76	1 (0.1%)	0 (0.0%)
	Codon 82	47 (3.9%)	65 (3.0%)
	Codon 83	1 (0.1%)	1 (0.0%)
	Codon 84	20 (1.6%)	17 (0.8%)
	Codon 88	15 (1.2%)	22 (1.0%)
	Codon 90	63 (5.2%)	60 (2.8%)

11.3.4 Resistance to single or multiple drug classes

All centres	Deceased since 1997, ever ART N = 1583	Patients currently in care and ever ART N = 4744
Resistance test available	683 (43.1%)	1248 (26.3%)
Wild type	194 (12.3%)	458 (9.7%)
"Any" resistance	489 (30.9%)	790 (16.7%)
NRTI	256 (16.2%)	376 (7.9%)
NNRTI	223 (14.1%)	310 (6.5%)
PI	411 (26.0%)	663 (14.0%)
NRTI and PI	199 (12.6%)	284 (6.0%)
NRTI and NNRTI	154 (9.7%)	202 (4.3%)
NNRTI and PI	179 (11.3%)	236 (5.0%)
3-class-resistance	131 (8.3%)	163 (3.4%)

All patients				Resistance to							
	Number of patients	Resistance test available	Wild type	Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of ART initiation											
Up to 1995	212	168	8	160	134	77	128	102	71	70	64
1996	134	94	21	73	57	33	60	45	31	24	23
1997	96	62	16	46	25	17	38	18	14	12	10
1998	97	48	6	42	15	11	35	9	6	7	3
1999	85	47	13	34	16	17	26	10	9	13	7
2000	99	57	10	47	21	17	44	19	11	16	11
2001	72	29	7	22	9	6	19	6	5	4	3
2002	94	46	17	29	14	11	27	13	8	10	8
2003	99	47	18	29	3	9	26	3	2	6	2
2004	123	41	19	22	7	9	21	7	3	8	3
2005	123	45	11	34	9	9	33	9	4	8	4
2006	141	36	19	17	4	6	16	4	4	5	4
2007	152	44	17	27	7	9	25	6	3	7	2
2008	157	40	25	15	7	5	12	4	3	4	2
2009	216	56	32	24	9	11	20	7	6	7	4
2010	217	47	25	22	5	7	17	3	3	3	2
2011	224	47	26	21	7	9	16	4	6	4	3
2012	231	44	23	21	7	10	19	5	5	8	3
2013	225	40	20	20	3	3	15	-	1	-	-
2014	219	31	13	18	4	7	14	2	1	5	1
2015	222	32	16	16	4	7	11	2	2	3	1
2016	216	23	11	12	3	5	10	2	1	4	1
2017	221	21	11	10	2	8	8	2	2	6	2
2018	164	18	14	4	1	2	3	1	-	1	-
2019	175	23	14	9	-	2	7	-	-	-	-
2020	145	18	14	4	1	2	2	-	1	-	-
2021	169	13	10	3	-	-	3	-	-	-	-
2022	212	17	12	5	-	1	5	-	-	1	-
2023	204	14	10	4	2	-	3	1	-	-	-
Federal state											
Burgenland	79	23	9	14	6	4	13	5	3	4	3
Carinthia	246	34	14	20	8	5	15	4	2	2	0
Lower Austria	467	116	32	84	43	37	70	31	24	33	22
Upper Austria	661	192	72	120	78	53	96	60	46	34	33
Salzburg	284	73	18	55	23	26	45	17	13	19	10
Styria	462	111	50	61	19	22	55	17	13	16	11
Tyrol	578	181	51	130	69	44	103	46	28	34	22
Vorarlberg	237	61	16	45	16	12	40	11	7	11	6
Vienna	1669	445	191	254	113	104	221	93	65	82	56
Foreign countries	61	12	5	7	1	3	5	-	1	1	-
Missing value	-	-	-	-	-	-	-	-	-	-	-
Total	**4744**	**1248**	**458**	**790**	**376**	**310**	**663**	**284**	**202**	**236**	**163**

Patients who initiated ART after 2000	Number of patients	Resistance test	Wild type	Resistance to							
				Any resistance	NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of ART initiation											
2001	72	29	7	22	9	6	19	6	5	4	3
2002	94	46	17	29	14	11	27	13	8	10	8
2003	99	47	18	29	3	9	26	3	2	6	2
2004	123	41	19	22	7	9	21	7	3	8	3
2005	123	45	11	34	9	9	33	9	4	8	4
2006	141	36	19	17	4	6	16	4	4	5	4
2007	152	44	17	27	7	9	25	6	3	7	2
2008	157	40	25	15	7	5	12	4	3	4	2
2009	216	56	32	24	9	11	20	7	6	7	4
2010	217	47	25	22	5	7	17	3	3	3	2
2011	224	47	26	21	7	9	16	4	6	4	3
2012	231	44	23	21	7	10	19	5	5	8	3
2013	225	40	20	20	3	3	15	-	1	-	-
2014	219	31	13	18	4	7	14	2	1	5	1
2015	222	32	16	16	4	7	11	2	2	3	1
2016	216	23	11	12	3	5	10	2	1	4	1
2017	221	21	11	10	2	8	8	2	2	6	2
2018	164	18	14	4	1	2	3	1	-	1	-
2019	175	23	14	9	-	2	7	-	-	-	-
2020	145	18	14	4	1	2	2	-	1	-	-
2021	169	13	10	3	-	-	3	-	-	-	-
2022	212	17	12	5	-	1	5	-	-	1	-
2023	204	14	10	4	2	-	3	1	-	-	-
Population size of area of residence											
Missing value	3	2	1	1	-	1	1	-	-	1	-
Rural areas	1916	336	163	173	51	65	152	40	30	50	25
Capital cities	667	139	53	86	21	27	71	15	10	13	5
Vienna	1435	295	167	128	36	45	108	26	20	30	15
Sex/ mode of transmission											
MSM	1857	247	135	112	21	43	93	15	11	27	8
Male IDU	301	109	52	57	16	18	51	13	7	13	5
Female IDU	107	44	23	21	4	4	21	4	1	4	1
Male heterosexual	775	150	72	78	28	29	67	23	18	19	14
Female heterosexual	784	197	92	105	36	41	86	24	21	28	15
Others	197	25	10	15	3	3	14	2	2	3	2
Age at time of HIV-test											
< 35 years	1995	490	234	256	69	94	222	52	40	67	30
≥ 35 years	2026	282	150	132	39	44	110	29	20	27	15
Total	**4021**	**772**	**384**	**388**	**108**	**138**	**332**	**81**	**60**	**94**	**45**

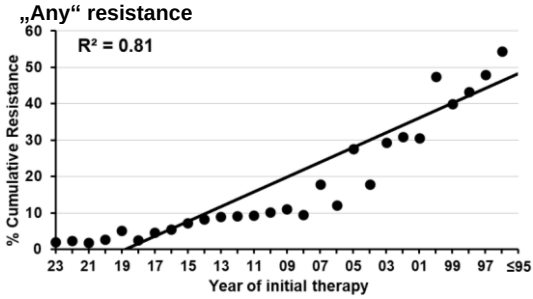
11.3.6 Cumulative resistance related to different time periods of ART initiation

		Initial therapy before 1.1.1997		Initial therapy between 1.1.1997 and 31.12.2002		Initial therapy after 1.1.2003	
		N	%	N	%	N	%
Ever HIV RNA ≥ 200 copies/ml		331	95.7%	404	74.4%	1147	29.8%
At least 5 HIV RNA ≥ 200 copies/ml		278	80.3%	227	41.8%	296	7.7%
No resistance test after ART		84	24.3%	254	46.8%	3152	81.9%
Resistance test after ART		262	75.7%	289	53.2%	695	18.1%
Total		**346**	**100%**	**543**	**100%**	**3847**	**100%**
Number of NRTI-associated resistance mutations							
0	mutations	71	20.5%	189	34.8%	610	15.9%
1	mutation	35	10.1%	51	9.4%	57	1.5%
2	mutations	26	7.5%	20	3.7%	16	0.4%
3	mutations	30	8.7%	12	2.2%	8	0.2%
4	mutations	45	13.0%	10	1.8%	2	0.1%
5	mutations	29	8.4%	7	1.3%	1	0.0%
6	mutations	18	5.2%			1	0.0%
7	mutations	6	1.7%				
8	mutations	2	0.6%				
Number of NNRTI-associated resistance mutations							
0	mutations	152	43.9%	210	38.7%	574	14.9%
1	mutation	51	14.7%	40	7.4%	73	1.9%
2	mutations	38	11.0%	32	5.9%	32	0.8%
3	mutations	12	3.5%	7	1.3%	9	0.2%
4	mutations	6	1.7%			4	0.1%
5	mutations	2	0.6%			3	0.1%
6	mutations	1	0.3%				
Number of PI-associated resistance mutations							
0	mutations	74	21.4%	100	18.4%	409	10.6%
1	mutation	57	16.5%	79	14.5%	91	2.4%
2	mutations	46	13.3%	45	8.3%	65	1.7%
3	mutations	17	4.9%	36	6.6%	62	1.6%
4	mutations	17	4.9%	12	2.2%	45	1.2%
5	mutations	16	4.6%	10	1.8%	18	0.5%
6	mutations	11	3.2%	2	0.4%	1	0.0%
7	mutations	5	1.4%	3	0.6%	2	0.1%
8	mutations	4	1.2%	2	0.4%	0	0.0%
9	mutations	3	0.9%			2	0.1%
10	mutations	2	0.6%				
11	mutations	2	0.6%				
12	mutations	3	0.9%				
13	mutations	5	1.4%				

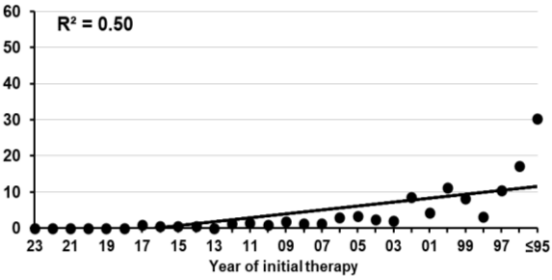
11.3.7 Probability of development of resistance

11.3.7.1 Any ART regimen

„Any“ resistance

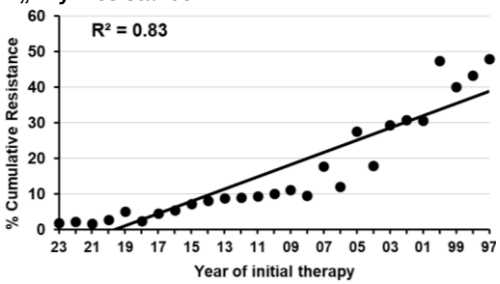


3-class-resistance

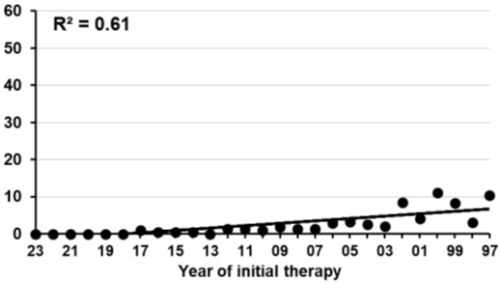


11.3.7.2 Any ART regimen and initial ART after January 1, 1997

„Any“ resistance

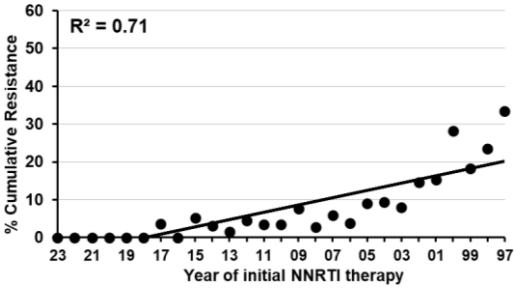


3-class-resistance

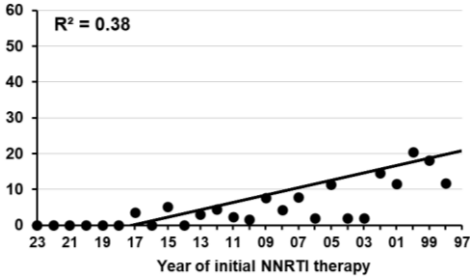


11.3.7.3 Initial ART with 2 NRTI + 1 NNRTI

Resistance to NNRTI

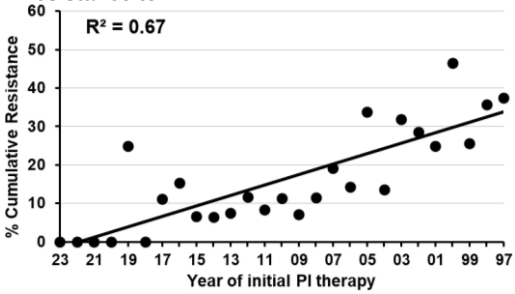


Resistance to NRTI

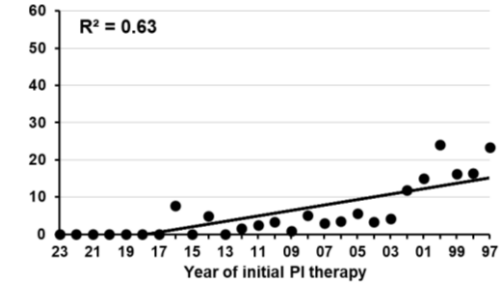


11.3.7.4 Initial ART with 2 NRTI + 1 PI

Resistance to PI

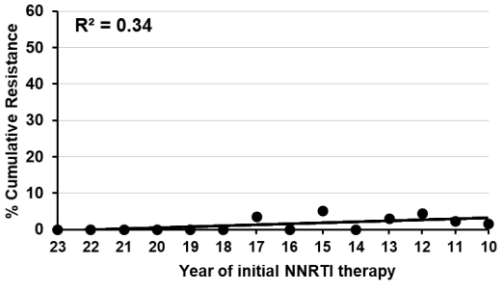


Resistance to NRTI

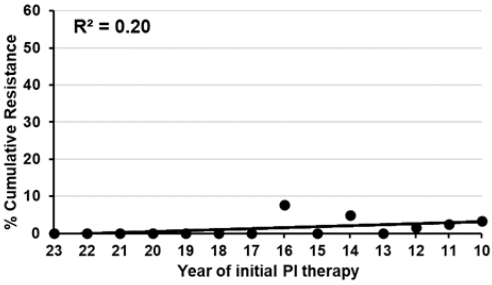


11.3.7.5 Development of resistance to NRTI, ART after Jan. 2010

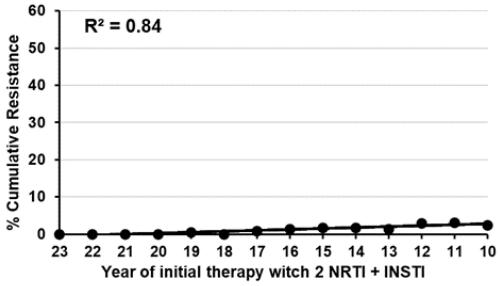
A) ART with 2 NRTI + 1 NNRTI



B) ART with 2 NRTI + 1 PI



C) ART mit 2 NRTI + 1 INSTI



11.3.8 Risk factors for the development of resistance

11.3.8.1 Patients with 3-class-resistance

All centres	**All deaths after 1996**		**AIDS related deaths after 1996**		**AIDS related deaths after 1996 and ART > 6 months**		**Patients currently in care and ART use ever**	
	N = 1949		**N = 518**		**N = 446**		**N = 4744**	
3-class-resistance	131	(6.7%)	37	(7.1%)	37	(8.3%)	163	(3.4%)

3-class-resistance	Patients currently in care and ART use ever N = 163
Age (years; mean ± S. D.)	57.8 ± 11.0
Federal states	
Carinthia	0 (0.0%)
Upper Austria	33 (20.2%)
Salzburg	10 (6.1%)
Styria	11 (6.7%)
Tyrol	22 (13.5%)
Vienna	56 (34.4%)
Other federal states	31 (19.0%)
Foreign countries	0 (0.0%)
Sex/ Mode of transmission	
MSM	52 (31.9%)
Male IDU	10 (6.1%)
Female IDU	10 (6.1%)
Male heterosexual	37 (22.7%)
Female heterosexual	40 (24.5%)
Others	14 (8.6%)
AIDS	79 (48.5%)
CD4 nadir (cells/µl; mean ± S. D.)	123 ± 126.6
Current CD4 cell counts (cells/µl; mean ± S. D.)	678.6 ± 352.9
Last HIV-RNA	
≤50 copies/ml	141 ± (86.5%)
51-199 copies/ml	13 (7.4%)
≥200 copies/ml	20 (6.1%)
Duration of ART (months; mean ± S. D.)	303.7 ± 75.4

All centres						**Model 1 (N = 4744)**		
	Frequencies N=			Univariable regression			**Multivariable regression***	
Variable	163 / 4744	(3.4%)	OR (95% CI)		p-value	**OR (95% CI)**		**p-value**
Demographic characteristics								
Age at ART start								
<30 years	61 / 1183	(5.2%)	5.2	2.4 - 11.4	<0.001	**2.3**	**1.0 - 5.4**	**0.047**
30-50 years	95 / 2885	(3.3%)	3.3	1.5 - 7.0	0.003	**1.8**	**0.8 - 4.0**	**0.165**
>50 years	7 / 676	(1.0%)	1			**1**		
Sex/ mode of transmission								
Male IDU	10 / 376	(2.7%)	1.1	0.5 - 2.1	0.833			
Female IDU	10 / 167	(6.0%)	2.5	1.3 - 5.0	0.010			
Male heterosexual	37 / 894	(4.1%)	1.7	1.1 - 2.6	0.015			
Female heterosexual	40 / 953	(4.2%)	1.7	1.1 - 2.6	0.011			
Other	14 / 253	(5.5%)	2.3	1.3 - 4.2	0.007			
MSM	52 / 2101	(2.5%)	1					
Population size of area of residence								
Missing value	0 / 3	(0.0%)	-	-	-			
Rural areas	71 / 2254	(3.1%)	0.9	0.7 - 1.3	0.727			
Capital cities	36 / 815	(4.4%)	1.3	0.9 - 2.0	0.187			
Vienna	56 / 1672	(3.3%)	1					
Stage of disease								
AIDS								
Yes	79 / 1095	(7.2%)	3.3	2.4 - 4.5	<0.001			
No	84 / 3649	(2.3%)	1					
CD4 nadir								
Missing value	0 / 9	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	61 / 728	(8.4%)	7.0	4.6 - 10.6	<0.001	**4.0**	**2.5 - 6.3**	**<0.001**
50-199 cells/µl	66 / 1230	(5.4%)	4.3	2.9 - 6.5	<0.001	**2.1**	**1.3 - 3.3**	**<0.001**
≥200 cells/µl	36 / 2777	(1.3%)	1			**1**		
Current HIV RNA								
Missing value	0 / 22	(0.0%)	-	-	-	**-**	**-**	**-**
≤50 copies/ml	141 / 4424	(3.2%)	0.3	0.2 - 0.6	0.001	**0.2**	**0.1 - 0.4**	**<0.001**
51-199 copies/ml	12 / 188	(6.4%)	0.7	0.3 - 1.6	0.391	**0.6**	**0.2 - 1.7**	**0.356**
≥200 copies/ml	10 / 110	(9.1%)	1			**1**		
ART								
ART initiation								
Before 1.1.1997	87 / 346	(25.1%)	37.8	24.9 - 57.2	<0.001	**33.1**	**20.9 - 52.5**	**<0.001**
1.1.1997 to 31.12.2002	42 / 543	(7.7%)	9.4	5.9 - 14.9	<0.001	**8.2**	**5.1 - 13.4**	**<0.001**
Since 1.1.2003	34 / 3855	(0.9%)	1			**1**		

*adjusted for the variables: sex/ mode of transmission, population size of area of residence

11.3.8.2 Patients with any resistance (ART start since 1.1.1997)

All centres	All deaths after 1996		AIDS related deaths after 1996		AIDS related deaths after 1996 and ART > 6 months		Patients currently in care and ART use ever after 1996	
	N = 1591		N = 425		N = 354		N = 4398	
Any resistance	307	(19.3%)	80	(18.8%)	80	(22.6%)	557	(12.7%)

Any resistance	Patients currently in care and ART use ever after 1996 N = 557	
Age (years; mean ± S. D.)	34.5 ± 9.7	
Federal states		
Carinthia	16	(2.9%)
Upper Austria	82	(14.7%)
Salzburg	48	(8.6%)
Styria	51	(9.2%)
Tyrol	72	(12.9%)
Vienna	186	(33.4%)
Other federal states	96	(17.2%)
Foreign countries/ missing	6	(1.1%)
Sex/ Mode of transmission		
MSM	168	(30.2%)
Male IDU	75	(13.5%)
Female IDU		
Male heterosexual	112	(20.1%)
Female heterosexual	149	(26.8%)
Others	23	(4.1%)
AIDS	208	(37.3%)
CD4 nadir (cells/µl; mean ± S. D.)	115.8 ± 154.7	
Current CD4 cell counts (cells/µl; mean ± S. D.)	667.5 ± 332.3	
Last HIV-RNA		
≤50 copies/ml	505	(90.7%)
51-199 copies/ml	24	(4.3%)
≥200 copies/ml	28	(5.0%)
Duration of ART (months; mean ± S. D.)	215.3 ± 80.6	

All centres	Frequencies N=		Univariable regression			Model 1 (N = 4398) Multivariable regression		
Variable	557 / 4398	(12.7%)	OR (95% CI)		p-value	OR (95% CI)		p-value
Demographic characteristics								
Age at ART start								
<30 years	191 / 1053	(18.1%)	3.5	2.5 - 5.1	<0.001	**3.2**	**2.2 - 4.7**	**<0.001**
30-50 years	327 / 2683	(12.2%)	2.2	1.6 - 3.1	<0.001	**1.8**	**1.2 - 2.6**	**<0.001**
>50 years	39 / 662	(5.9%)	1			**1**		
Sex/ mode of transmission								
Male IDU	75 / 333	(22.5%)	3.1	2.3 - 4.2	<0.001	**2.5**	**1.8 - 3.5**	**<0.001**
Female IDU	30 / 133	(22.6%)	3.1	2.0 - 4.9	<0.001	**1.8**	**1.1 - 2.9**	**0.017**
Male heterosexual	112 / 849	(13.2%)	1.6	1.3 - 2.1	<0,001	**1.4**	**1.1 - 1.8**	**0.016**
Female heterosexual	149 / 881	(16.9%)	2.2	1.7 - 2.8	<0.001	**1.7**	**1.3 - 2.1**	**<0.001**
Other	23 / 221	(10.4%)	1.3	0.8 - 2.0	0.335	**0.8**	**0.5 - 1.4**	**0.443**
MSM	168 / 1981	(8.5%)	1			**1**		
Population size of area of residence								
Missing value	1 / 3	(33.3%)	-	-	-	**-**	**-**	**-**
Rural areas	250 / 2094	(11.9%)	1.0	0.8 - 1.2	0.983	**1.1**	**0.9 - 1.4**	**0.412**
Capital cities	120 / 740	(16.2%)	1.4	1.1 - 1.8	0.005	**1.6**	**1.2 - 2.1**	**<0.001**
Vienna	186 / 1561	(11.9%)	1			**1**		
Stage of disease								
AIDS								
Yes	208 / 943	(22.1%)	2.5	2.1 - 3.0	<0.001			
No	349 / 3455	(10.1%)	1					
CD4 nadir								
Missing value	0 / 9	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	144 / 643	(22.4%)	3.2	2.6 - 4.1	<0.001	**2.9**	**2.3 - 3.8**	**<0.001**
50-199 cells/µl	194 / 1073	(18.1%)	2.5	2.0 - 3.0	<0.001	**1.8**	**1.5 - 2.3**	**<0.001**
≥200 cells/µl	219 / 2673	(8.2%)	1			**1**		
Current HIV RNA								
Missing value	0 / 22	(0.0%)	-	-	-	**-**	**-**	**-**
≤50 copies/ml	505 / 4093	(12.3%)	0.4	0.3 - 0.6	<0.001	**0.4**	**0.2 - 0.6**	**<0.001**
51-199 copies/ml	24 / 177	(13.6%)	0.4	0.2 - 0.8	0.008	**0.6**	**0.3 - 1.1**	**0.112**
≥200 copies/ml	28 / 106	(26.4%)	1			**1**		
ART								
ART initiation								
1.1.1997 to 31.12.2002	220 / 543	(40.5%)	7.1	5.8 - 8.7	<0.001	**6.0**	**4.8 - 7.5**	**<0.001**
Since 1.1.2003	337 / 3855	(8.7%)	1			**1**		

*adjusted for the variables: age

12 Co-morbidities and Co-medication

12.1 Co-morbidities related to age

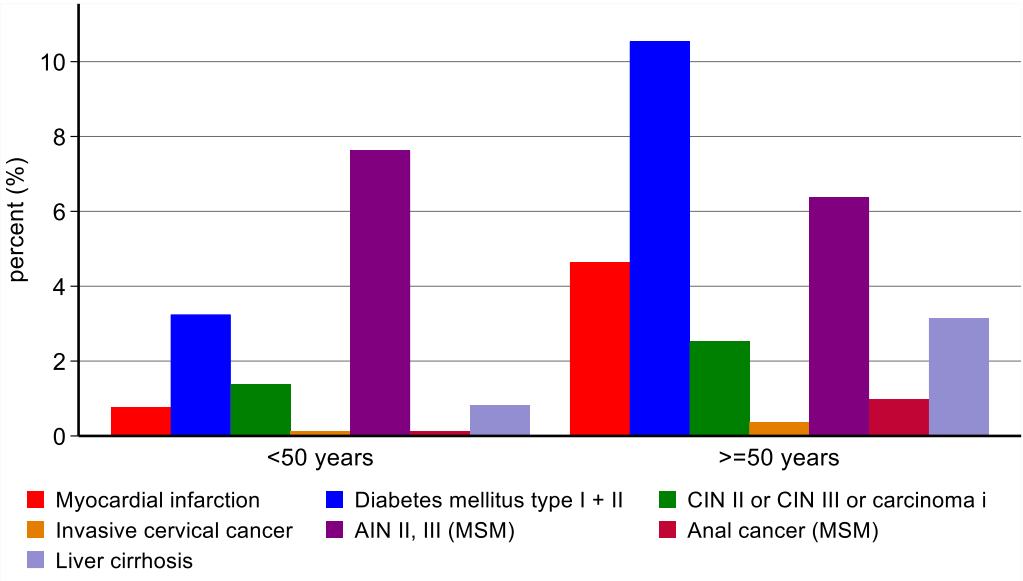
One aim of the Austrian HIV Cohort Study is to document co-morbidities and adverse drug reactions, as well as to investigate possible associations with ART. As a first step, important co-morbidities are illustrated.

Cumulative incidence in patients with a follow-up in the last 12 months (co-morbidities ever documented)

	< 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Number of patients	223	%	87	%	320	%	521	%	1147	%
Hypertension	18	8.1	5	5.7	41	12.8	50	9.6	90	7.8
Coronary heart disease	4	1.8	1	1.1					6	0.5
Myocardial infarction	1	0.4	1	1.1	2	0.6			13	1.1
Stroke	4	1.8	1	1.1	3	0.9	4	0.8	5	0.4
Diabetes mellitus type I + II	8	3.6	3	3.4	20	6.3	19	3.6	23	2.0
CIN II or CIN III or carcinoma in situ			5	5.7			29	5.6		
Invasive cervical cancer							3	0.6		
St. p. hysterectomy			1	1.1			5	1.0		
Anal intraepithelial neoplasia II, III	4	1.8	1	1.1	9	2.8	3	0.6	188	16.4
Anal cancer					1	0.3			3	0.3
Osteoporosis	1	0.4			4	1.3	9	1.7	14	1.2
Liver cirrhosis	9	4.0	2	2.3	1	0.3	4	0.8	2	0.2
Attempted suicide or suicide	7	3.1	3	3.4	1	0.3	1	0.2	11	1.0
Drug overdose (mainly opiates)	9	4.0	3	3.4			1	0.2	5	0.4
Chronic kidney disease	3	1.3	4	4.6	6	1.9	10	1.9	16	1.4

	≥ 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Number of patients	199	%	104	%	640	%	516	%	1110	%
Hypertension	57	28.6	18	17.3	218	34.1	144	27.9	334	30.1
Coronary heart disease	25	12.6	14	13.5	81	12.7	31	6.0	125	11.3
Myocardial infarction	11	5.5	6	5.8	27	4.2	10	1.9	64	5.8
Stroke	16	8.0	7	6.7	20	3.1	10	1.9	30	2.7
Diabetes mellitus type I + II	16	8.0	7	6.7	93	14.5	53	10.3	98	8.8
CIN II or CIN III or carcinoma in situ			14	13.5			53	10.3		
Invasive cervical cancer			4	3.8			5	1.0		
St. p. hysterectomy			12	11.5			32	6.2		
Anal intraepithelial neoplasia II, III	5	2.5	6	5.8	18	2.8	10	1.9	172	15.5
Anal cancer			2	1.9	5	0.8	3	0.6	26	2.3
Osteoporosis	33	16.6	27	26.0	58	9.1	86	16.7	105	9.5
Liver cirrhosis	28	14.1	13	12.5	9	1.4	7	1.4	24	2.2
Attempted suicide or suicide	7	3.5	3	2.9	7	1.1	3	0.6	13	1.2
Drug overdose (mainly opiates)	11	5.5	7	6.7	3	0.5	1	0.2	7	0.6
Chronic kidney disease	12	6.0	22	21.2	51	8.0	67	13.0	54	4.9

Comparison of co-morbidities in different age groups

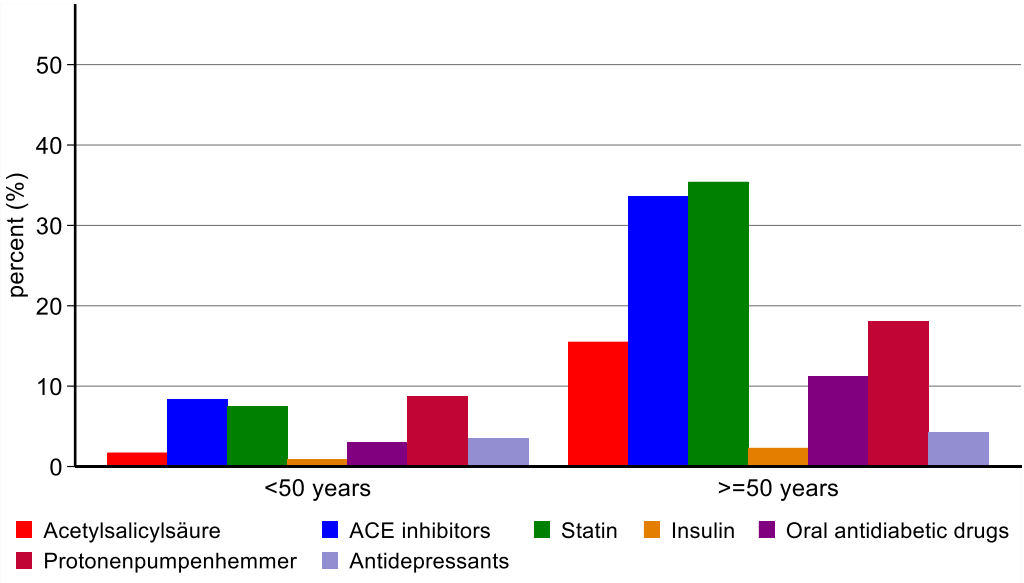


12.2 Co-medication related to age

	< 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	223	%	87	%	320	%	521	%	1147	%
Acetylsalicylic acid	7	3.1	3	3.4	9	2.8	3	0.6	18	1.6
ACE inhibitors/angiotensin antagonists	14	6.3	5	5.7	35	10.9	40	7.7	92	8
Beta blocker	14	6.3	3	3.4	13	4.1	15	2.9	47	4.1
Statin	15	6.7	1	1.1	28	8.8	31	6	97	8.5
Insulin	2	0.9			7	2.2	3	0.6	8	0.7
Oral antidiabetic drugs	8	3.6	5	5.7	24	7.5	18	3.5	17	1.5
Proton pump inhibitors	48	21.5	15	17.2	31	9.7	46	8.8	65	5.7
Bisphosphonates	1	0.4			1	0.3	1	0.2	5	0.4
Thyroid hormones	3	1.3	6	6.9	9	2.8	35	6.7	20	1.7
Opiate substitution	134	60.1	52	59.8	17	5.3	5	1.0	15	1.3
Psychotropic drugs	164	73.5	62	71.3	51	15.9	82	15.7	191	16.7
Anxiolytics, hypnotics, sedatives	60	26.9	31	35.6	14	4.4	13	2.5	32	2.8
Antidepressants	52	23.3	20	23.0	21	6.6	49	9.4	113	9.9
Antipsychotics	52	23.3	18	20.7	15	4.7	31	6.0	54	4.7

≥ 50 years										
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	199	%	104	%	640	%	516	%	1110	%
Acetylsalicylic acid	45	22.6	16	15.4	108	16.9	56	10.9	173	15.6
ACE inhibitors/angiotensin antagonists	66	33.2	23	22.1	260	40.6	152	29.5	370	33.3
Beta blocker	37	18.6	15	14.4	118	18.4	69	13.4	193	17.4
Statin	61	30.7	36	34.6	255	39.8	185	35.9	387	34.9
Insulin	7	3.5			22	3.4	12	2.3	19	1.7
Oral antidiabetic drugs	14	7	6	5.8	102	15.9	50	9.7	116	10.5
Proton pump inhibitors	52	26.1	32	30.8	107	16.7	84	16.3	193	17.4
Bisphosphonates	1	0.5	5	4.8	12	1.9	25	4.8	24	2.2
Thyroid hormones	19	9.5	21	20.2	31	4.8	72	14.0	69	6.2
Opiate substitution	109	54.8	57	54.8	24	3.8	12	2.3	44	4.0
Psychotropic drugs	127	63.8	74	71.2	129	20.2	131	25.4	305	27.5
Anxiolytics, hypnotics, sedatives	53	26.6	31	29.8	27	4.2	31	6.0	54	4.9
Antidepressants	45	22.6	29	27.9	67	10.5	83	16.1	187	16.8
Antipsychotics	29	14.6	12	11.5	30	4.7	35	6.8	68	6.1

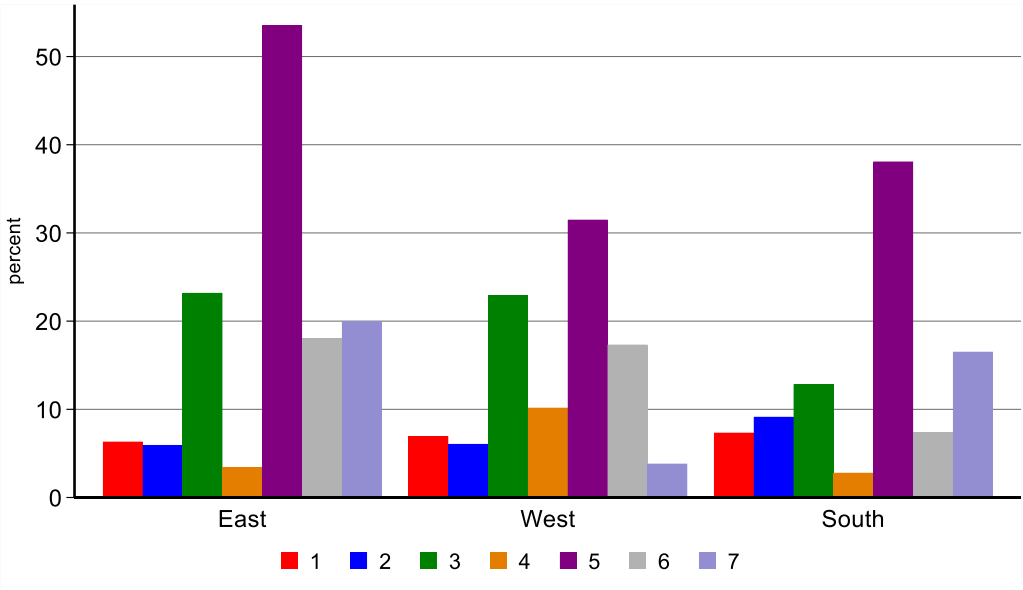
Comparison of co-medications in the different age groups



12.3 Examples of quality assurance

"Quality assurance"	Fulfilled	Total	%
LDL cholesterol documented within the last 12 months	4782	5172	92.5%
LDL > 160 mg/dl (1*)	322	4782	6.7%
Smoking history documented	4830	5172	93.4%
Smoking	2213	4830	45.8%
LDL > 160 mg/dl & smoking in those 50 years and above (2*)	67	2704	2.5%
Blood pressure documented within the last 12 months	5065	5172	97.9%
Arterial hypertension (3*)	1093	5065	21.6%
Smoking among those with arterial hypertension	362	1093	33.1%
Coronary heart disease (CHD) or MI or ICP stenting (4*)	305	5172	5.9%
No statin use among patients with CHD (5*)	116	305	38.0%
Diabetes or Glucose >200 or HbA1c	365	5172	7.1%
Diabetes and recent HbA1c > 8 (6*)	62	365	17.0%
Hepatitis C RNA pos. within the last 12 months	121	5172	2.3%
No syphilis screening in the last 6 months in MSM (7*)	298	2269	13.1%

*Conditions (numbers in parentheses) are shown in the figure (legend) below



13 Summary

HIV Patient Management System

The Austrian HIV Cohort Study uses its own electronic health record, the *HIV Patient Management System,* which is the common tool for the HIV Cohort. The data input is done decentralized in the HIV centres. The input of laboratory results is done mostly electronically, and in every centre various professional groups are involved in data entry. Before data sets are merged, the cohort participants have been made anonymous. Therefore, it is very laborious to identify cohort participants who are/ were treated in more than just one treatment centre. This cannot be done by using personal data such as initials, date of birth or postal code, but with HIV specific data (date of the HIV test, CD4 cell counts etc.).

On the one hand, the *HIV Patient Management System* fulfills complex tasks for the clinical management of HIV infected patients, and on the other hand it allows queries and analyses to be performed by the users without restrictions. However, to allow both individual patient management and scientific queries is an enormous challenge which scientific HIV cohorts in other countries have not had to deal with. While for the clinical patient management the focus is on readability of diagnoses and therapies, creation of medical reports, prescriptions (trade names!), print-out of results etc., scientific queries need precise coding and categorization. Furthermore, the optimization of individual patient management requires an ongoing adjustment to the progress of information technology, whereas purely scientific data bases do not have such technological renewal pressure. However, in Austria, there was no acceptance for a purely scientific data base.

Patients with a follow-up in the last 12 months

The highest number of cohort participants are seen at the AKH Vienna (27.4%), followed by the OWS Vienna (15.9%), Innsbruck (14.7%), Linz (13.9%), Graz (9.5%), Salzburg (6.7%), Klagenfurt (5.0%), Favoriten Vienna (4.2%) and Feldkirch (2.6%). However, a considerable proportion 27.7%) of patients did not have a follow-up within the last 12 months. The main reasons for this „loss of follow-up“ is the transfer of care to health-care providers outside the hospital based HIV-centres of AHIVCOS and the substantial number of individuals who have left the country.

Who and how many are infected with HIV in Austria?

The median age at diagnosis has been between 30 and 40 years since 1990. 25.1% of the patients with a follow-up in the last 12 months are female. The rate is highest in Burgenland (33.4%), Upper Austria (31.0%), Vorarlberg (26.7%), Styria (26.4%) and Lower Austria (25.8%).
In the subgroup of heterosexually acquired infections, the rate of the women is 51.9%. It is highest in Upper Austria (56.8%), Styria (56.7%), Carinthia (55.5%) and Tyrol (54.3%). Among patients newly diagnosed in 2024, 34.9% have been infected through heterosexual contacts. Since 2000, 35.0% of all newly diagnosed HIV infections were transmitted through heterosexual contacts.

Most of the cohort participants are Austrian nationals (68.6%). 8.2% come from high prevalence countries and 20.8% from low prevalence countries outside Austria. Information on the nationality of the remaining patients is missing.

According to Dachverband der Sozialversicherungsträger, 7768 persons received ART in 2022. According to the ECDC modelling tool the proportion of PLHIV on ART in 2022 is estimated to be between 86,5% and 92,2%. Thus, the estimate for PLHIV in Austria ranges from 8400 to 9000 for end of 2022.

As of January 1st 2022, the modelling tool of ECDC reveals 7596 PLHIV. Assuming that AHIVCOS is representative for Austria, the overall estimate for PLHIV sums up to 11860. This is an overestimation, since the ascertainment of persons who left the country is very incomplete (e.g. migrant workers from Europe mainly in the tourism industry and rejection of asylum application).

Is the HIV test used efficiently?

Austria has one of the highest rates of HIV tests per capita in Europe. Nevertheless, a substantial number of patients (~25%) is already immune deficient (CD4 cell count <200/µl) at the time of the first contact with an HIV centre.

Therefore, risk factors for an “early“ and a “late“ diagnosis have been evaluated. Patients who have been diagnosed with HIV between 2001 and 2024 were analysed. During this period, 7435 HIV infections were newly diagnosed. The infections occurred in 34.8% through heterosexual transmission, in 44.9% through MSM and in 14.0% through IDU.

An “early“ diagnosis is defined by: a seroconversion illness (westernblot pattern or antigen/HIV RNA with corresponding clinical symptoms) or documented seroconversion with negative test not more than 3 years before the first positive HIV test.

A “late“ diagnosis is defined by: CD4<350 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis.

16.3% of the examined patients had an “early“ diagnosis and 42.1% a “late“ diagnosis.

A higher risk to be diagnosed “late” was found in older patients (>50), in those who have been infected heterosexually and male IDU compared to MSM and in persons originating not from Austria.

An „early“ diagnosis was found more frequently in younger patients (<50), MSM, in patients originating from Austria and in persons residing in places with less than 1 million inhabitants.

Transmission of drug resistant HIV

In all centres, 282 (7.1%) of 3998 patients were identified who had at least one resistance mutation before their first antiretroviral therapy. Two patients had a 3-class resistance to NRTI, NNRTI and PI before starting ART. Ten patients had a resistance to NRTI and PI, eight patients had a resistance to NRTI and NNRTI, and five patients had a resistance to NNRTI and PI. The transmission of drug resistant HI viruses has decreased in the last years. However, not all centres did resistance tests before ART initiation or at diagnosis, but most have implemented the routine testing in 2003.

Stage of HIV disease

The cohort participants represent all stages of HIV infection. Half of the patients have a CD4 nadir <200/µl. The median of the CD4 nadir of the patients with a visit in the last 12 months is 247/µl. The current CD4 cell count is 683/µl (median at the last measurement). As of September 1st, 2024, about 3.4% of the patients with a visit in the last 12 months had a current CD4 cell count below 200/µl and 17 (0.3%) of them had a CD4 cell count <50/µl. The mean CD4 cell count is currently 723/µl. Therefore, the number of patients with an opportunistic infection will remain low in the following years.

Mortality

The reduction of mortality after the implementation of antiretroviral combination therapies is impressive (see items 10.1 and 10.2). In 1994, the death rate of patients with AIDS was 40.6 per 100 person-years for men and 44.4 for women. Over the last years the rate decreased to below 5 for men and for women. From 2005 to 2023 (except for the year 2006), injecting drug users had a higher death rate than homosexual men. Only in 2006 the death rate of homosexual men was higher than for IDU.

Viral suppression under antiretroviral therapy

The rate of viral suppression under antiretroviral therapy in Austria is similar to figures from other countries. However, it has to be considered that the rate of viral suppression has been measured with the patients currently in care and that patients with “loss of follow-up“ are not included.

Increase of CD4 cell counts during antiretroviral therapy

The CD4 cells during antiretroviral therapy have continuously increased, and the increase continues after 5 and 7.5 years of ART initiation. The increase is faster in patients on continuous ART compared to patients with treatment interruptions (see item 10.3.2).

Development of resistances during antiretroviral therapy

The probability of developing resistance to antiretroviral drugs seems to be decreasing (chapter 12.3.7). So, the risk of „any“ resistance after more than 20 years of ART is about 40%, for NRTI-associated resistance about 20% and for 3-class resistance 10%. The probability of NNRTI-associated resistance after more than 20 years is about 20% in patients who started ART with NNRTIs. The probability of PI-associated resistance after 20 years is about 35% in patients who had a PI-based antiretroviral combination therapy as their initial therapy. The results are about the same if transmitted resistances are excluded.
The strongest risk factor for the development of 3-class-resistance during antiretroviral therapy is initiation of ART before 1997 as well as from 1997 to 2003, followed by low CD4 nadir and younger age at initiation of ART. Persons with a current HIV RNA below 50 copies/ml seem to have a lower risk of developing 3-class-resistance during ART.
In our cohort, 48 patients of 9105 (0.5%) have a mutation of the codon 65 of the RT (K65R). The occurrence of the mutation K65R was more frequent in regimens including Tenofovir compared with Abacavir and could be found more often in patients with advanced immune deficiency (low CD4 nadir/ AIDS; chapter 12.3.1.2) as well as in women infected heterosexually or through IDU.

Co-infections

Co-infections with syphilis, hepatitis B, and hepatitis C are common. Like in other European countries, an enormous increase of new syphilis infections, especially among MSM, is apparent. This indicates a lack of prevention and “Safer Sex” practices. However, it is necessary to note that an increased “*sero-sorting“* behaviour (sexual

contacts with partners with the same HIV status) could have substantially contributed to this increase.

In Austria, infection with hepatitis C is still uncommon in MSM. Not all patients are offered vaccination against hepatitis B, although it is recommended for all HIV infected persons.

Co-morbidities

Improved survival has shifted the health care towards more individuals older than 50 years. The medical needs of older HIV-infected patients may differ from those of younger patients. Older individuals, with new or longstanding HIV infection, are at greater risk for non-HIV-related morbidities. Of special concern are cardiovascular diseases, osteoporosis, liver and neuropsychiatric disorders. Thus, aging of the HIV-infected population under care will lead to more complex medical management and increased costs of care. Health care agencies need to be aware of the impact of this important change in near future.

Outlook

The report of the Austrian HIV Cohort Study is still representative of the epidemiology of HIV/AIDS in Austria and therefore serves as source of data for the ECDC in Stockholm. It can be well compared with other reports from Austria, such as the report of renal replacement therapy of the Austrian Society for Nephrology and Austrotransplant. Moreover, the establishment of the *HIV Patient Management System* has played an important role to improve clinical care for persons with HIV/AIDS *(„Good Clinical Chronic Disease Practice“).*

Some remaining problems are mainly due to inconsistent use of the *HIV Patient Management System* with the corollary of inconsistent data entry into this software. Regular updates and improvements of the *HIV Patient Management System* should help to face these challenges.

The development of the HIV Patient Management System incorporated the international standard format, the HIV Cohorts Data Exchange Protocol (HICDEP). Therefore, data merging with international networks of cohorts like RESPOND and ART-CC has been and will be greatly facilitated.

14 Glossary

A	Austria
Ab	Antibody
ACE	Angiotensin-converting enzyme
AGES	Austrian Agency for Health and Food Safety
AHIVCOS	Austrian HIV Cohort Study
ART	Antiretroviral therapy (HIV-therapy)
ARVs	Antiretrovirals
ATC-Code	Anatomical therapeutic-chemical code
B	Burgenland
betw.	between
BMSGPK	Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschu
C	Carinthia
cART	Combination antiretroviral therapy
CDC	Centers for Disease Control
CHD	Coronary heart disease
CIN	Cervical intraepithelial neoplasia
CIS	Commonwealth of Independent States
ECDC	European Centre for Disease Prevention and Control
EuroHIV	European Centre for the Epidemiological Monitoring of AIDS
GP	General practitioner
HBA1c	Hemoglobin A1c
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HDL	High density lipoprotein
Hetero	Heterosexually acquired infection
HIP	HIV-Patient-Management-System
IAS	International AIDS-Society
ICD	International Classification of Diseases (WHO)
IDU	Injecting drug users
INSTI	Integrase strand transfer inhibitor
Interm.	Intermediate
KFJ	Kaiser-Franz-Josef-Spital Wien/Kaiser-Franz-Josef-Hospital Vienna
LA	Lower Austria
LDL	Low density lipoprotein
m.	month(s)
MI	Myocardial infarction
MSM	Men who have sex with men
N.a.	Not available/ not applicable
n.s.	not significant
neg.	negative
NNRTI	Non Nucleoside Reverse Transcriptase Inhibitor
NRTI	Nucleoside Reverse Transcriptase Inhibitor
OWS	Otto-Wagner-Spital Wien/Otto-Wagner Hospital Vienna
P	Protease
PI	Protease inhibitor
RNA	Ribonucleic acid
RT	Reverse transcriptase
S	Salzburg
SD/ s.d.	Standard deviation
St	Styria
St. p.	Status post
T	Tyrol
UA	Upper Austria
UK	United Kingdom
Vertical	Vertical transmission
Vie	Vienna
Vo	Vorarlberg
WHO	World Health Organization
ys.	years

15 Austrian HIV Cohort Study Group

As of November 2024

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