HIV/AIDS in Austria

43rd Report of the Austrian HIV Cohort Study

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HIV / AIDS
in Austria

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1 Introduction

At the end of the year 2001, representatives of 5 Austrian HIV treatment centres (AKH Vienna, Otto-Wagner-Hospital Vienna, AKH Linz, LKH Innsbruck and LKH Graz West) have founded the **„Austrian HIV Cohort Study (AHIVCOS)“**. In 2008, two more centres (LKH Salzburg and LKH Klagenfurt), in 2016 one more centre (Kaiser-Franz-Josef-Hospital Vienna) and in 2018 one more centre (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.

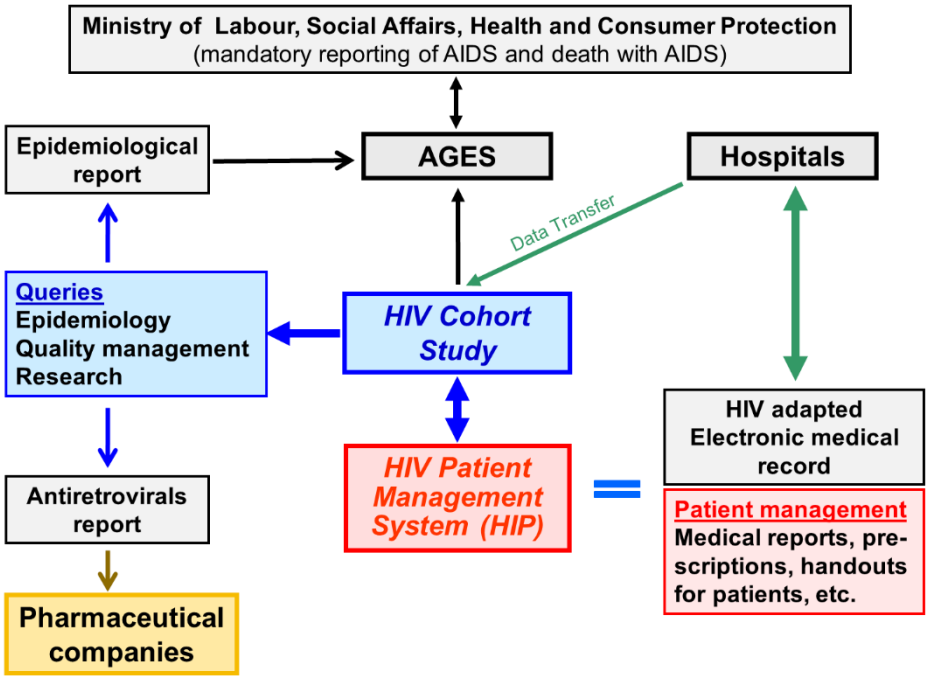
On the one hand, the *HIP* fulfils complex tasks for the clinical management of HIV infected patients, and on the other hand it allows queries and analyses to be performed by the users without restrictions. However, to allow both individual patient management and scientific queries is an enormous challenge 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

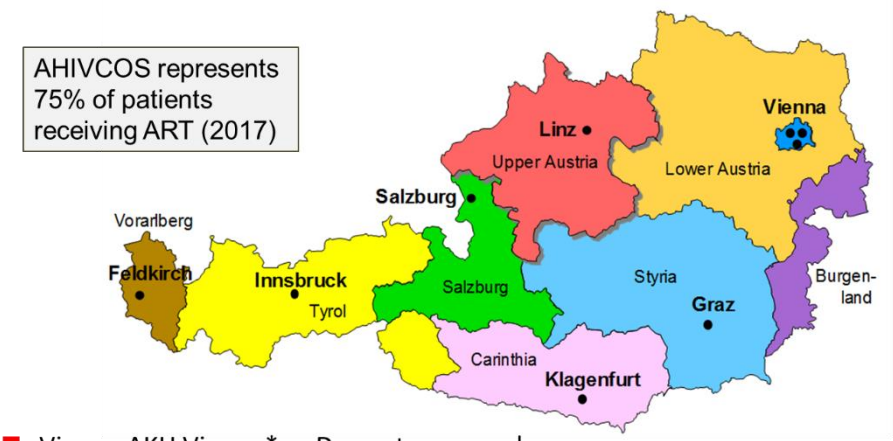
2 Organization of the Austrian HIV cohort study

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 Labour, Social Affairs, Health and Consumer Protection (BMASGK, Department IX/A/7, Dr. Bernhard Benka) 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 BMG 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 AKH Vienna*	Dermatovenereology
OWS Vienna	Pulmonary Medicine
KFJ Vienna	Infectious Diseases
■ Graz	Infectious Diseases
■ Linz**	Dermatovenereology
■ Salzburg**	Oncology/Infectious Diseases
■ Klagenfurt	Oncology
■ Innsbruck*	Dermatovenereology
■ Feldkirch (2018)	Oncology

* University Hospitals
** University in development or associated with private university

3 Funding

The Austrian HIV Cohort Study (AHIVCOS) will be financed until September 2022. The maintenance and the further development of the ***HIV Patient Management System ("HIP")*** as well as the provision of epidemiological reports ***(e.g. „Report of the Austrian HIV Cohort Study")*** are secured with the public sector (AGES, by order of the Federal Ministry of Health), the partners in the pharmaceutical industry (all companies providing HIV drugs) and the participating hospitals (routine maintenance contracts).

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.

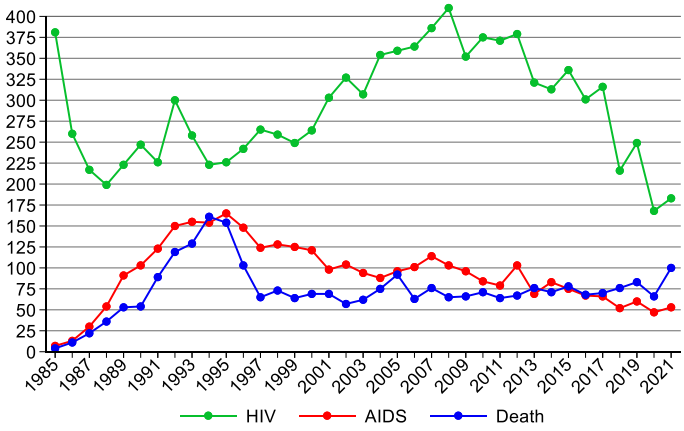
Minimal dataset:

- 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)

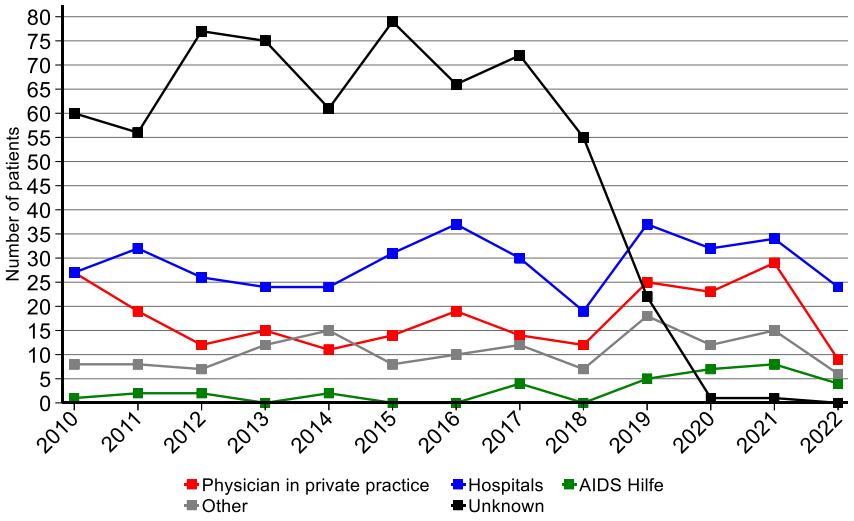
4.2 HIV, AIDS and Death per calendar year

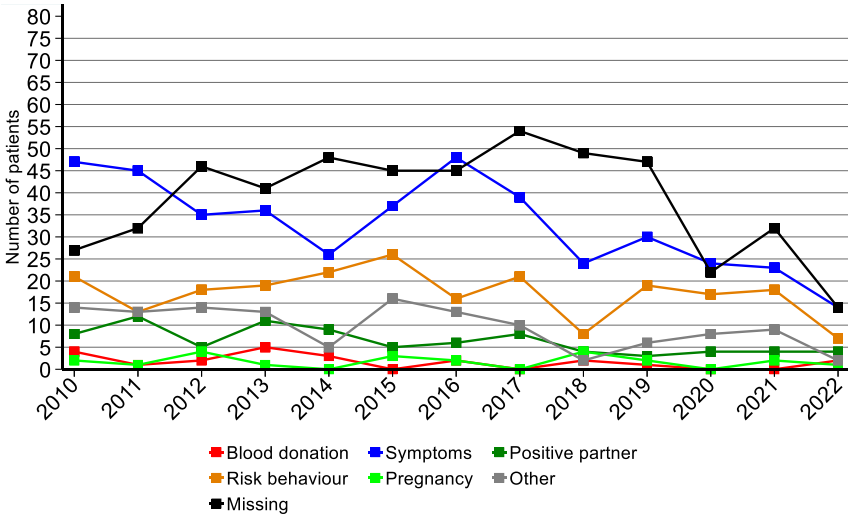


Year	HIV	AIDS	DEATH
1985	381	7	4
1986	260	13	11
1987	217	30	22
1988	199	54	36
1989	223	91	53
1990	247	103	54
1991	226	123	89
1992	300	150	119
1993	258	155	129
1994	223	154	161
1995	226	165	154
1996	242	148	103
1997	265	124	65
1998	259	128	73
1999	249	125	64
2000	264	121	69
2001	303	98	69
2002	327	104	57
2003	307	94	62
2004	354	88	75
2005	359	96	92
2006	364	101	63
2007	386	114	76
2008	410	103	65
2009	352	96	66
2010	375	84	71
2011	371	79	64
2012	379	103	67
2013	321	69	76
2014	313	83	71
2015	336	75	78
2016	301	67	68
2017	316	66	70
2018	216	52	76
2019	249	60	83
2020	168	47	66
2021	183	53	100
2022	107	26	11
Total	**10836**	**3449**	**2732**

4.3 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.





4.4 Recruitment and follow-up of cohort participants

So far, 10836 HIV infected patients providing 120000 years of follow-up have been recruited into the cohort study. We assume that there were more than 2732 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

	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
01.09.2022	2767	3247	261	1246	540	1485	144	826	320	**10836**

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**
OWS Vienna	822	61	762	1645
AKH Vienna	1331	76	1239	2646
KFJ Vienna	192	10	53	255
Linz	672	12	165	849
Salzburg	307	44	143	494
Innsbruck	754	231	90	1075
Feldkirch	111	4	22	137
Graz	495	20	197	712
Klagenfurt	217	12	62	291
Total	**4901**	**470**	**2733**	**8104**

	Death		**Total**
	Death within the last 12 months	Death since more than 12 months	
OWS Vienna	11	1111	1122
AKH Vienna	14	587	601
KFJ Vienna	0	6	6
Linz	7	390	397
Salzburg	4	42	46
Innsbruck	9	401	410
Feldkirch	1	6	7
Graz	4	110	114
Klagenfurt	1	28	29
Total	**51**	**2681**	**2732**

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

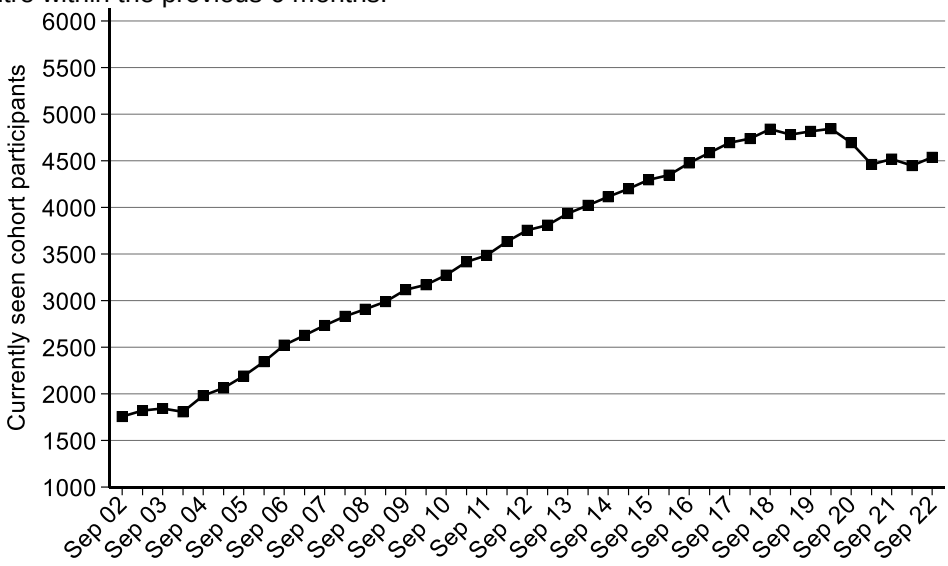
Persons with residency abroad were excluded from this analysis.

All centres	Frequencies		%	Univariable logistic Regression			Multivariable logistic Regression		
Variable	2733	7634	35.80%	**OR**	**(95%CI)**	**p-value**	**OR**	**(95%CI)**	**p-value**
Demographic characteristics									
Age at last contact									
< 30	530	746	71.05%	10.67	[8.87,12.83]	0.000	8.85	[7.26,10.81]	0.000
30-50	1676	4069	41.19%	3.05	[2.72,3.41]	0.000	2.66	[2.36,3.01]	0.000
> 50	527	2819	18.69%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	291	694	41.93%	1.23	[1.04,1.45]	0.016	1.14	[0.95,1.37]	0.147
Female IDU	116	304	38.16%	1.05	[0.82,1.33]	0.702	1.07	[0.82,1.40]	0.604
Male hetero	412	1326	31.07%	0.77	[0.67,0.88]	0.000	0.91	[0.78,1.07]	0.241
Female hetero	408	1379	29.59%	0.71	[0.62,0.82]	0.000	0.70	[0.60,0.82]	0.000
Other	247	533	46.34%	1.47	[1.22,1.76]	0.000	1.19	[0.96,1.48]	0.113
MSM	1259	3398	37.05%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of residence area									
Vienna	1753	3593	48.79%	3.16	[2.86,3.48]	0.000	3.07	[2.76,3.41]	0.000
Missing	56	57	98.25%	185.45	[25.64,1341.51]	0.000	80.07	[10.76,595.85]	0.000
Outside Vienna	924	3984	23.19%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
High prevalence	365	778	46.92%	1.91	[1.64,2.22]	0.000	1.74	[1.45,2.10]	0.000
Low prevalence	625	1523	41.04%	1.50	[1.34,1.69]	0.000	1.15	[1.01,1.31]	0.035
Missing	89	104	85.58%	12.82	[7.40,22.23]	0.000	6.27	[3.42,11.49]	0.000
Austria	1654	5229	31.63%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Stage of disease									
AIDS									
Yes	450	1597	28.18%	0.65	[0.57,0.73]	0.000	0.87	[0.76,1.00]	0.047
No	2283	6037	37.82%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

4.5 Patients currently in care

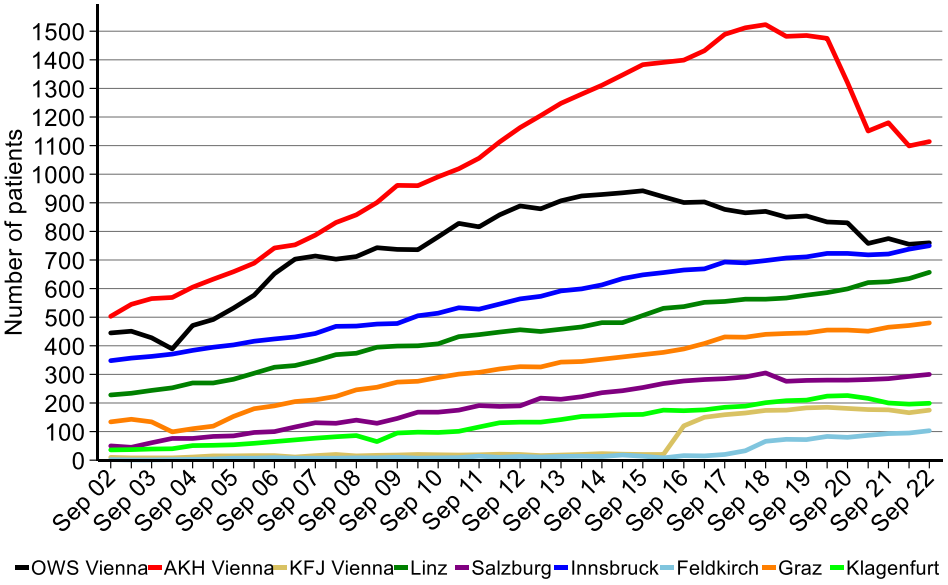
4.5.1 Overall

Patients were seen as currently in care when they had at least one contact to an HIV centre within the previous 6 months.



Number of patients currently in care

	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	Total
01.09.2022	760	1114	175	657	300	750	103	480	199	**4538**

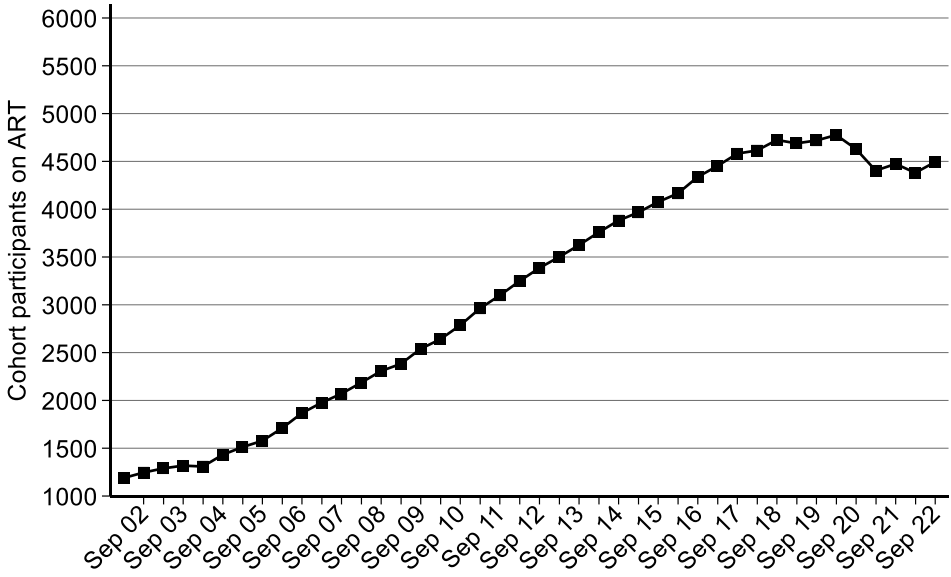


Number of currently seen patients by residence

	HIV-centre									
	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	**Total**
Burgenland	21	24	6	0	0	0	0	15	0	66
Carinthia	0	2	0	3	6	7	0	16	193	227
Lower Austria	168	200	20	44	1	2	1	2	0	438
Upper Austria	1	5	1	588	27	5	0	2	0	629
Salzburg	0	1	0	6	226	32	0	1	0	266
Styria	3	7	0	5	8	4	0	437	2	466
Tyrol	0	0	0	1	3	555	0	2	0	561
Vorarlberg	1	0	0	1	0	122	101	0	0	225
Vienna	564	873	145	6	1	8	0	4	1	1602
Foreign/missing	2	2	3	3	28	15	1	1	3	58
Total	**760**	**1114**	**175**	**657**	**300**	**750**	**103**	**480**	**199**	**4538**

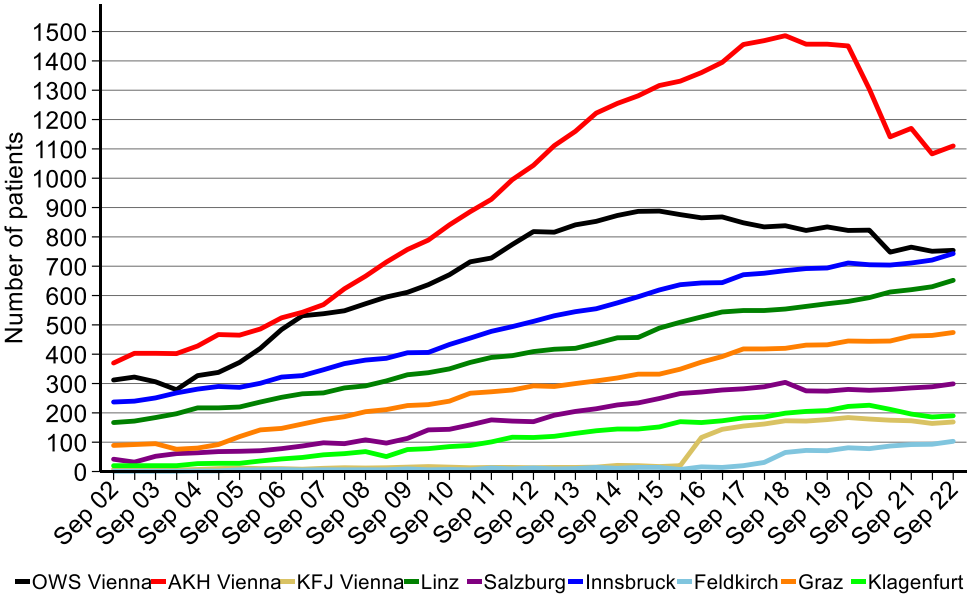
4.5.2 Number of patients currently on antiretroviral therapy

4494 patients (99.0%) were on antiretroviral therapy in the 9 HIV treatment centres. Of the 44 patients not on treatment 12 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.).



Number of participants currently on antiretroviral therapy

	OWS Vienna	**AKH Vienna**	**KFJ Vienna**	**Linz**	**Salz-burg**	**Inns-bruck**	**Feld-kirch**	**Graz**	**Klagen-furt**	**Total**
01.09.2022	754	1110	169	652	299	743	103	474	190	**4494**



Number of participants currently on antiretroviral therapy by area of residence

	HIV-centre									Total
	OWS Vienna	AKH Vienna	KFJ Vienna	Linz	Salz-burg	Inns-bruck	Feld-kirch	Graz	Klagen-furt	
Burgenland	21	24	4	0	0	0	0	15	0	64
Carinthia	0	2	0	3	6	7	0	16	185	219
Lower Austria	168	200	20	44	1	2	1	2	0	438
Upper Austria	1	5	1	583	27	5	0	2	0	624
Salzburg	0	1	0	6	225	32	0	1	0	265
Styria	3	7	0	5	8	4	0	431	1	459
Tyrol	0	0	0	1	3	549	0	2	0	555
Vorarlberg	1	0	0	1	0	121	101	0	0	224
Vienna	558	869	141	6	1	8	0	4	1	1588
Foreign/missing	2	2	3	3	28	15	1	1	3	58
Total	**754**	**1110**	**169**	**652**	**299**	**743**	**103**	**474**	**190**	**4494**

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

According to *Dachverband der Sozialversicherungsträger*, 7396 persons received ART in 2021. Within AHIVCOS 4881 persons received ART in 2021, representing 67%. According to the ECDC tool about 85% of PLHIV are receiving ART. Thus, based on the number given by the *Dachverband,* the estimate for PLHIV add up to 8 700 for end of 2021 (see also page 80).

As of January 1st 2021, the modelling tool of ECDC reveals 7358 PLHIV. Assuming that AHIVCOS is representative for Austria, the overall estimate for PLHIV sums up to 10 900. 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).

4.6 Use of antiretroviral drugs to prevent HIV infection

PEP

	Non-occupational PEP started in						
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Sex							
Women	37	40	63	65	44	45	4
Men	107	133	161	263	150	180	21
Age (years)							
<30	64	97	114	164	103	126	10
30-48	72	71	103	150	84	94	13
≥50	8	5	7	14	7	5	2
Area of residence							
Vienna	74	99	127	191	106	120	12
Lower Austria	4	6	9	13	21	13	3
Burgenland	1	0	1	4	4	2	0
Upper Austria	3	15	17	25	11	31	4
Salzburg	0	7	8	10	2	3	0
Tyrol	23	11	23	29	29	30	3
Vorarlberg	2	1	2	3	4	3	0
Styria	10	7	14	17	8	10	2
Carinthia	0	0	1	1	0	0	0
Missing/Foreign	27	27	22	35	9	13	1

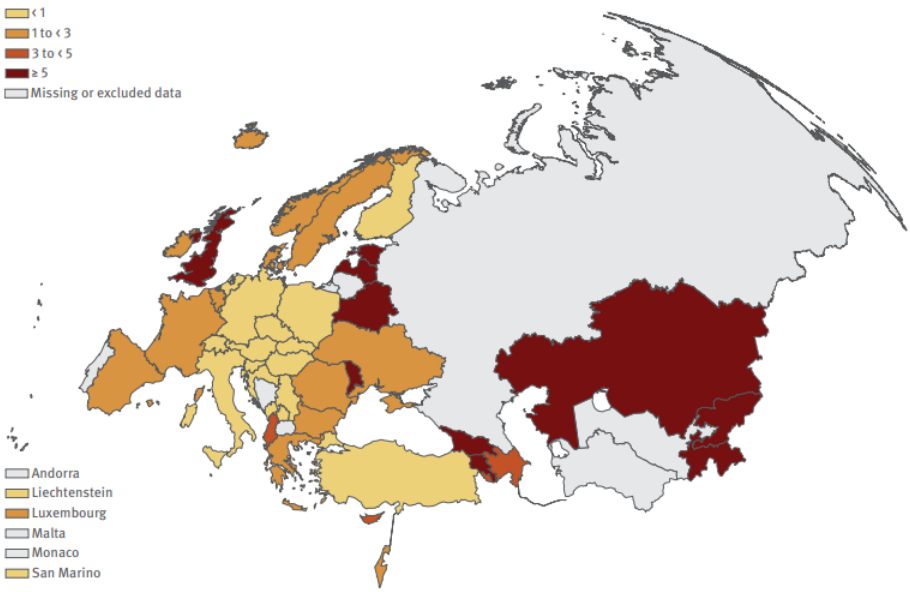
PrEP

	PrEP started in							
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**On PrEP at 01.03.2022**
Sex								
Women	0	0	3	8	4	2	2	16
Men	4	101	199	284	209	291	58	941
Age (years)								
<30	2	32	53	82	61	109	28	290
30-48	2	63	123	184	131	150	27	565
≥50	0	6	26	26	21	34	5	102
Area of residence								
Vienna	1	79	82	133	62	84	14	357
Lower Austria	0	5	9	11	10	7	1	38
Burgenland	0	0	0	3	1	4	0	8
Upper Austria	0	0	22	28	33	50	8	131
Salzburg	0	1	5	6	2	6	2	18
Tyrol	3	13	60	84	72	112	31	291
Vorarlberg	0	1	19	12	17	20	1	64
Styria	0	1	4	10	14	8	2	38
Carinthia	0	0	0	0	1	1	0	2
Missing/Foreign	0	1	1	5	1	1	1	10

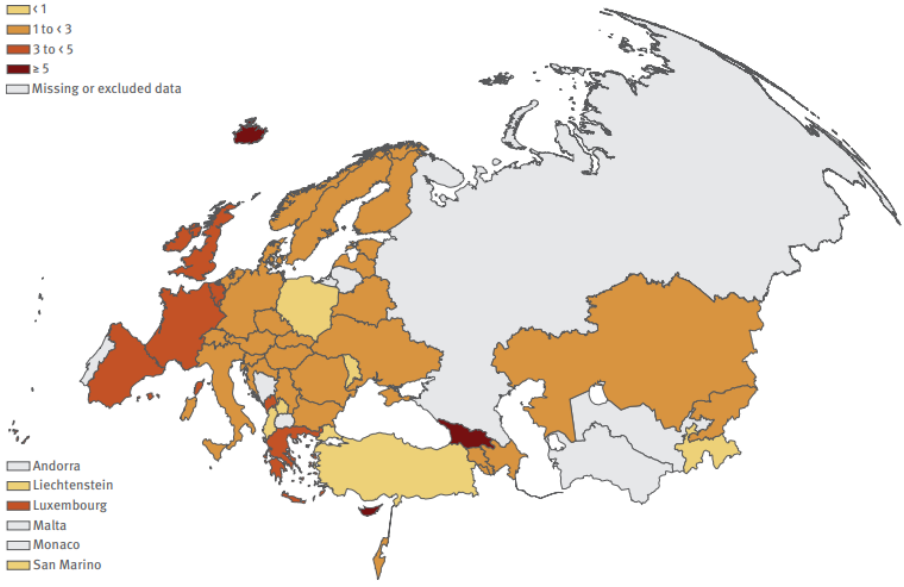
5 HIV/AIDS Surveillance in Austria

5.1 General overview (ECDC data)

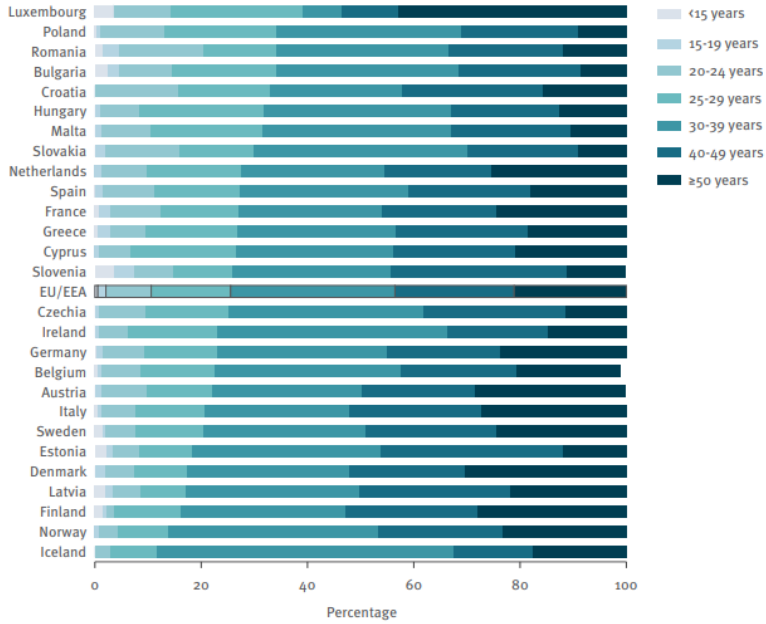
HIV diagnoses, per 100 000 population, reported for 2020: Heterosexual cases



HIV diagnoses, per 100 000 population, reported for 2020: Men who have sex with men cases

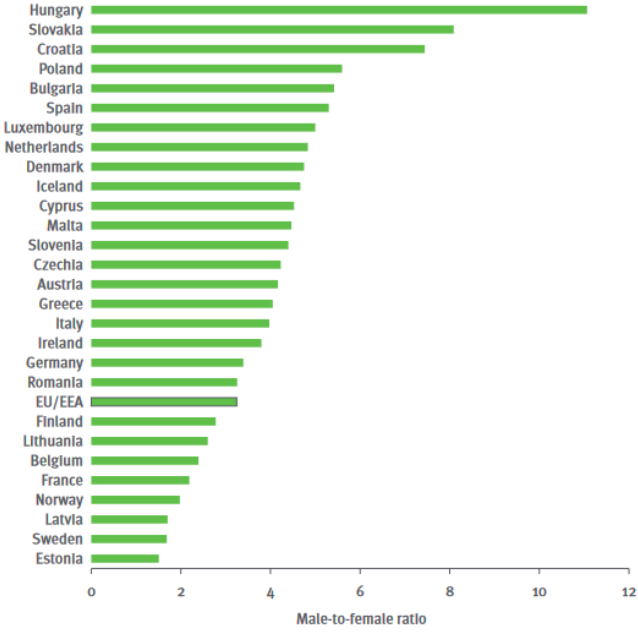


Percentage of new HIV diagnoses, by age group and country, EU/EEA, 2020 (n=14 971)



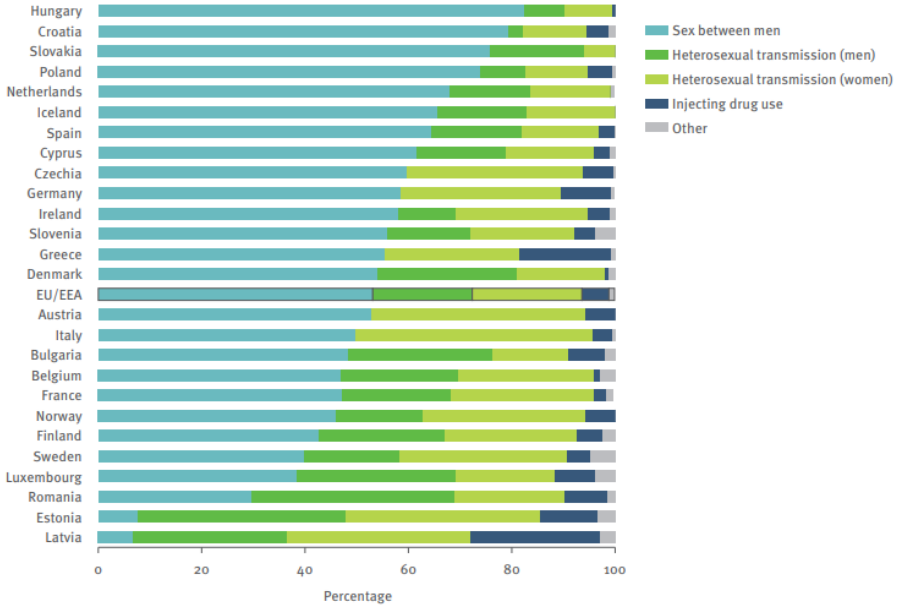
The graph organises countries in order of proportion of population <30 years. Data from Portugal not published at country request and Liechtenstein reported zero cases in 2020; Lithuania did not report data on age group. Unknown route of transmission is excluded from the proportions presented here.

Male-to-female ratio in new HIV diagnoses, by country, EU/EEA, 2020 (n=14 844)



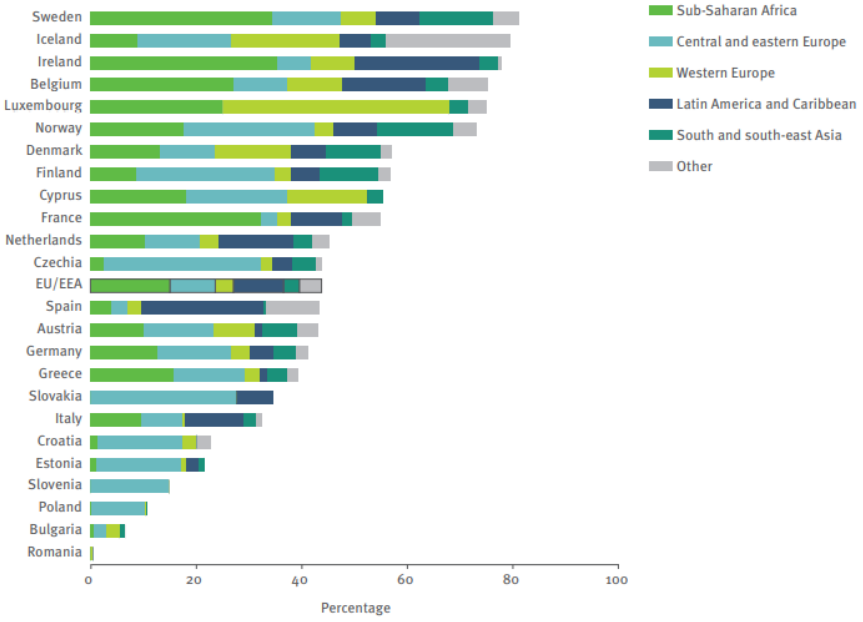
Data from Portugal not published at country request and Liechtenstein reported zero cases in 2020.

Percentage of new HIV diagnoses with known mode of transmission, by transmission route and country, EU/EEA, 2020 (n=10 949)



Data from Portugal not published at country request, Liechtenstein reported zero cases and Lithuania and Malta did not report transmission data in 2020. Unknown route of transmission is excluded from the proportions presented here.

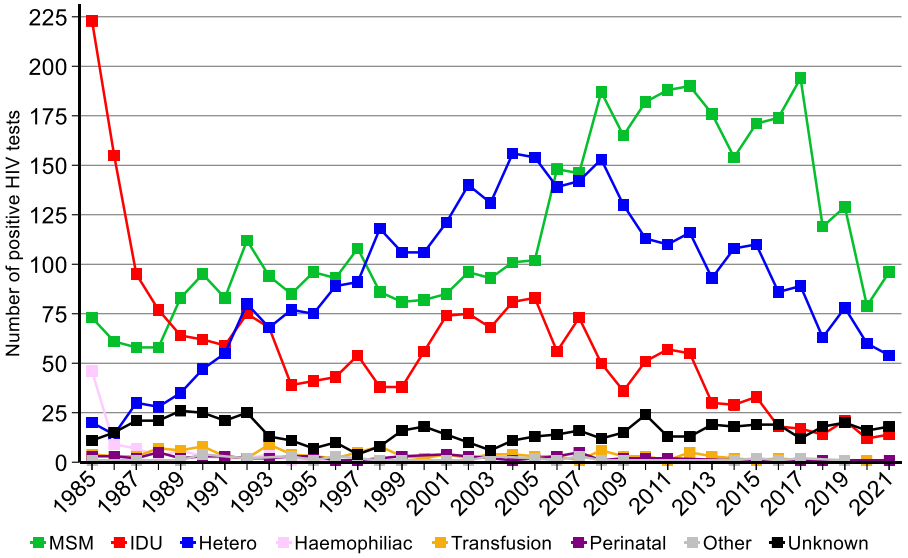
Percentage of new HIV diagnoses among migrants out of all reported cases with known information on region of origin, by country, EU/EEA, 2020 (n=12 327)



Portugal did not report 2020 data and Hungary, Latvia, Lithuania, and Malta did not report data on country of birth or region of origin or reported all cases as being from the reporting country.

5.2 Mode of transmission

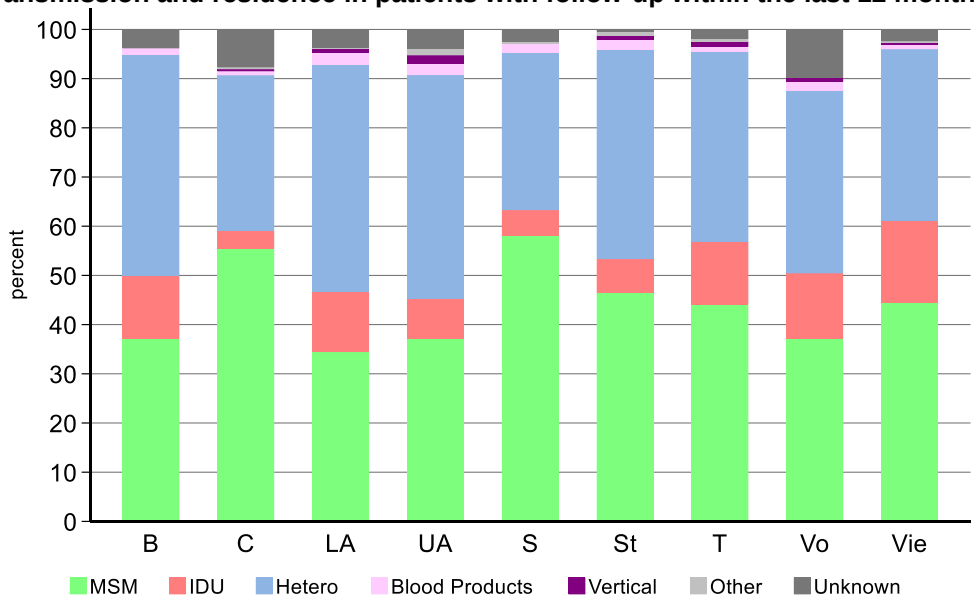
5.2.1 All modes of transmission



	BMG	AHIVCOS											
						Heterosexually							
Year	Total	MSM		IDU		infected		Others		Total	Women		
1998	313	86	33.20%	38	14.67%	118	45.56%	17	6.56%	259	61	23.55%	
1999	339	81	32.53%	38	15.26%	106	42.57%	24	9.64%	249	69	27.71%	
2000	428	82	31.06%	56	21.21%	106	40.15%	20	7.58%	264	76	28.79%	
2001	402	85	28.05%	74	24.42%	121	39.93%	23	7.59%	303	73	24.09%	
2002	442	96	29.36%	75	22.94%	140	42.81%	16	4.89%	327	92	28.13%	
2003	423	93	30.29%	68	22.15%	131	42.67%	15	4.89%	307	94	30.62%	
2004	470	101	28.53%	81	22.88%	156	44.07%	16	4.52%	354	107	30.23%	
2005	453	102	28.41%	83	23.12%	154	42.90%	20	5.57%	359	101	28.13%	
2006	435	148	40.66%	56	15.38%	139	38.19%	21	5.77%	364	89	24.45%	
2007	515	146	37.82%	73	18.91%	142	36.79%	25	6.48%	386	85	22.02%	
2008	505	187	45.61%	50	12.20%	153	37.32%	20	4.88%	410	96	23.41%	
2009	507	165	46.88%	36	10.23%	130	36.93%	21	5.97%	352	79	22.44%	
2010	487	182	48.53%	51	13.60%	113	30.13%	29	7.73%	375	70	18.67%	
2011	525	188	50.67%	57	15.36%	110	29.65%	16	4.31%	371	76	20.49%	
2012	523	190	50.13%	55	14.51%	116	30.61%	18	4.75%	379	76	20.05%	
2013	481	176	54.83%	30	9.35%	93	28.97%	22	6.85%	321	50	15.58%	
2014	403	154	49.20%	29	9.27%	108	34.50%	22	7.03%	313	68	21.73%	
2015	428	171	50.89%	33	9.82%	110	32.74%	22	6.55%	336	44	13.10%	
2016	447	174	57.81%	18	5.98%	86	28.57%	23	7.64%	301	51	16.94%	
2017	510	194	61.39%	17	5.38%	89	28.16%	16	5.06%	316	49	15.51%	
2018	323 / 74*	119	55.09%	14	6.48%	63	29.17%	20	9.26%	216	36	16.67%	
2019	336 / 94*	129	51.81%	21	8.43%	78	31.33%	21	8.43%	249	38	15.26%	
2020	283 / 49*	79	47.02%	12	7.14%	60	35.71%	17	10.12%	168	30	17.86%	
2021	310 / 66*	96	52.46%	14	7.65%	54	29.51%	19	10.38%	183	31	16.94%	
2022		59	55.14%	6	5.61%	26	24.30%	16	14.95%	107	12	11.21%	

*second number tested anonymously since 2018

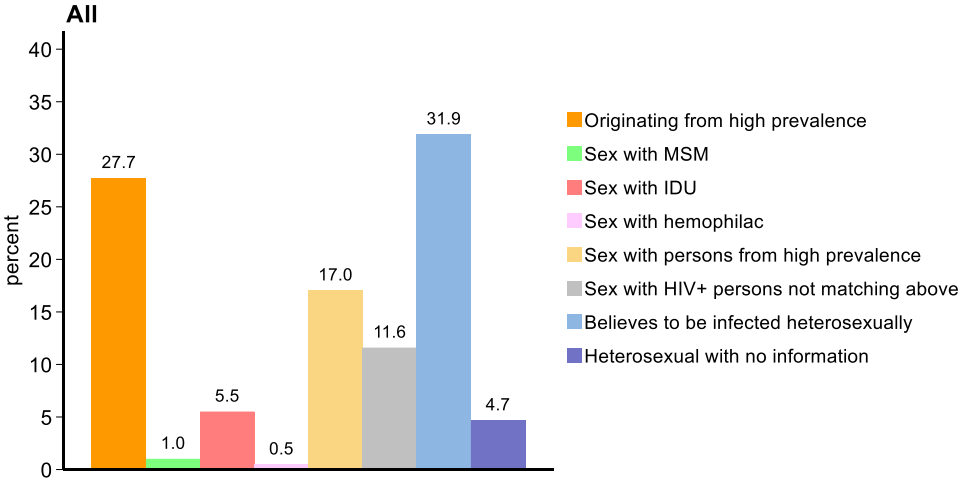
Transmission and residence in patients with follow-up within the last 12 months

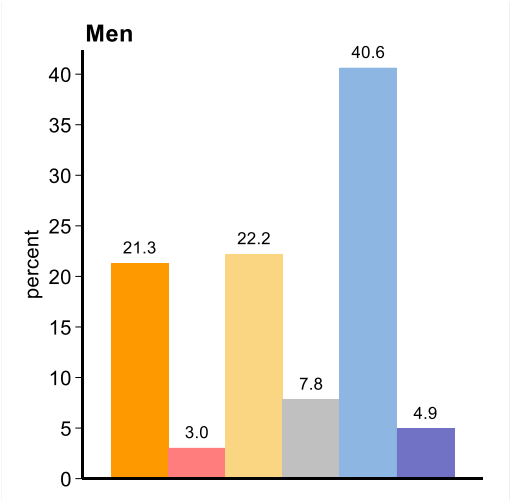


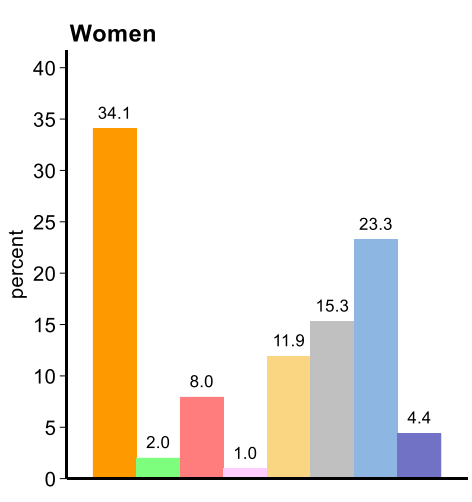
The abbreviation MSM is used for „Men who have sex with men". IDU means „Injecting Drug Use". The category IDU also includes men who are both MSM and IDU. The category "blood products" includes cohort participants who have received coagulation compounds or blood transfusions. Among the patients with a follow-up in the last 12 months, 38.4% have been infected through heterosexual contacts, 43.64% through homosexual contacts and 12.06% through the injection of drugs.

5.2.2 Categories of heterosexually acquired infections

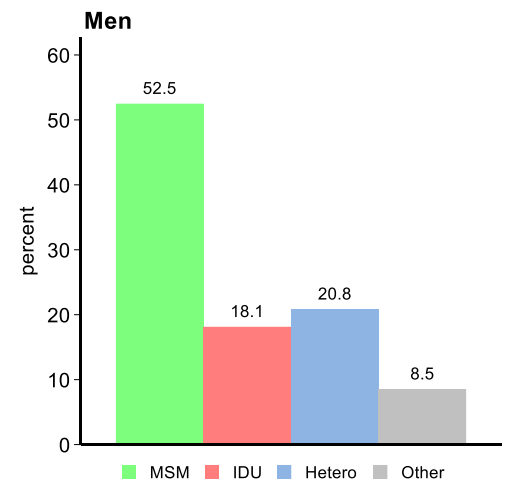
Because of missing data, the HIV treatment centre OWS Vienna has been excluded from some analyses.

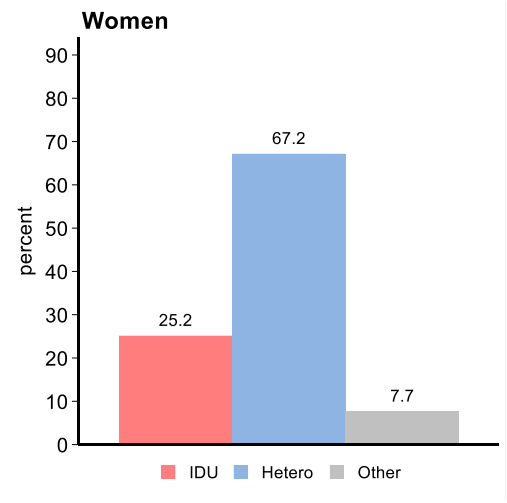




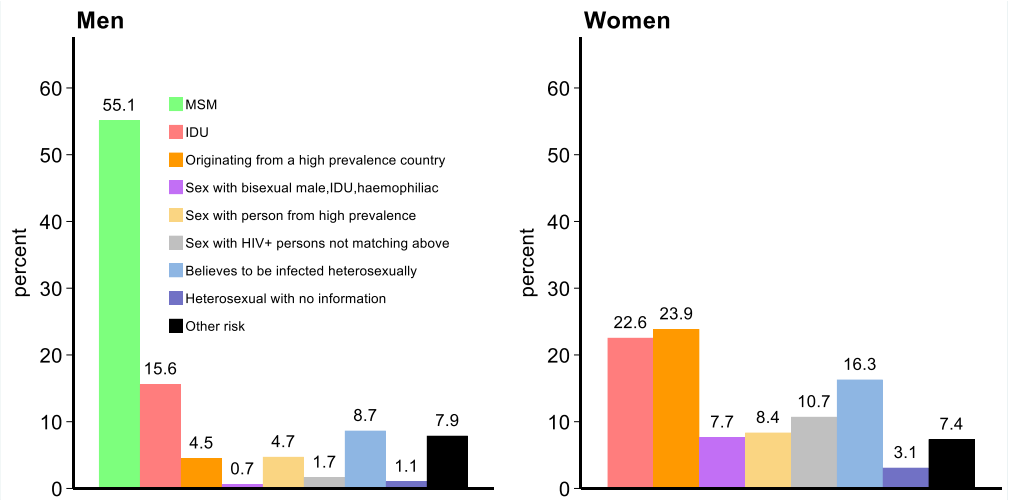


Categories of transmission

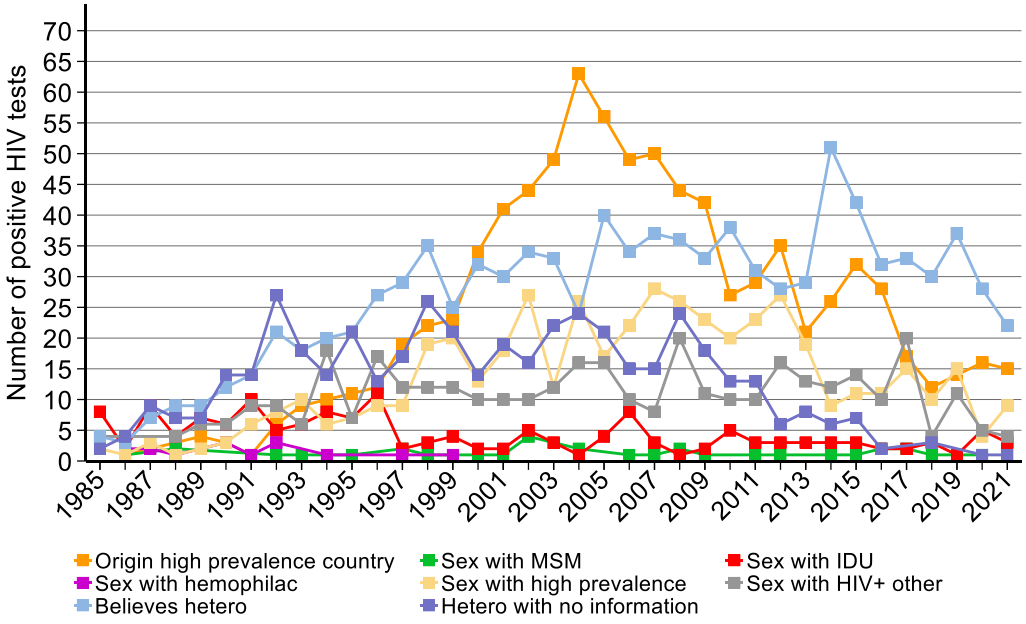




Sub-categories of transmission



Sub-categories of heterosexually acquired infections

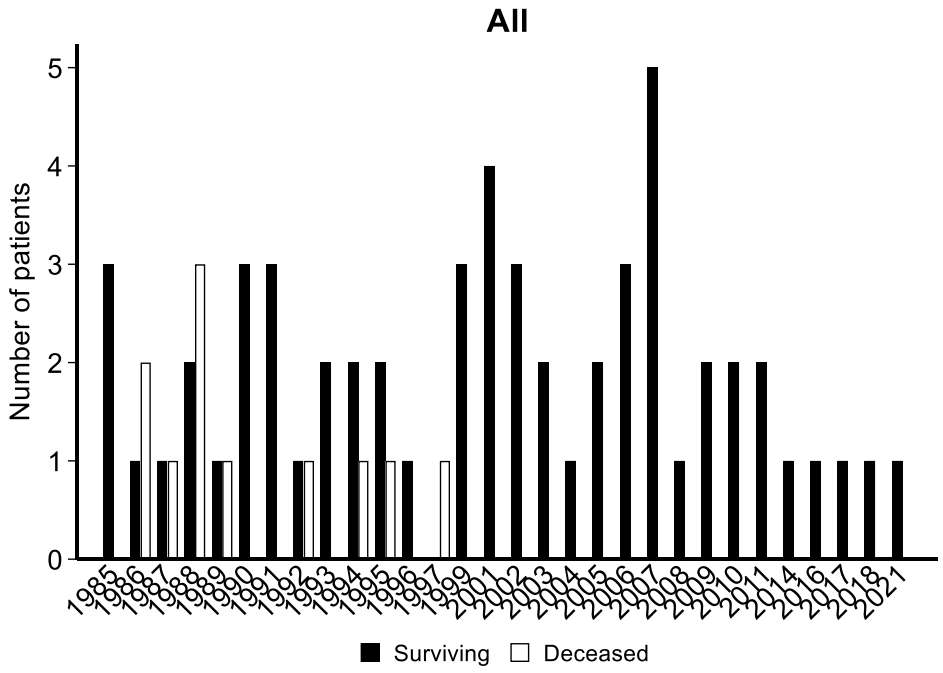


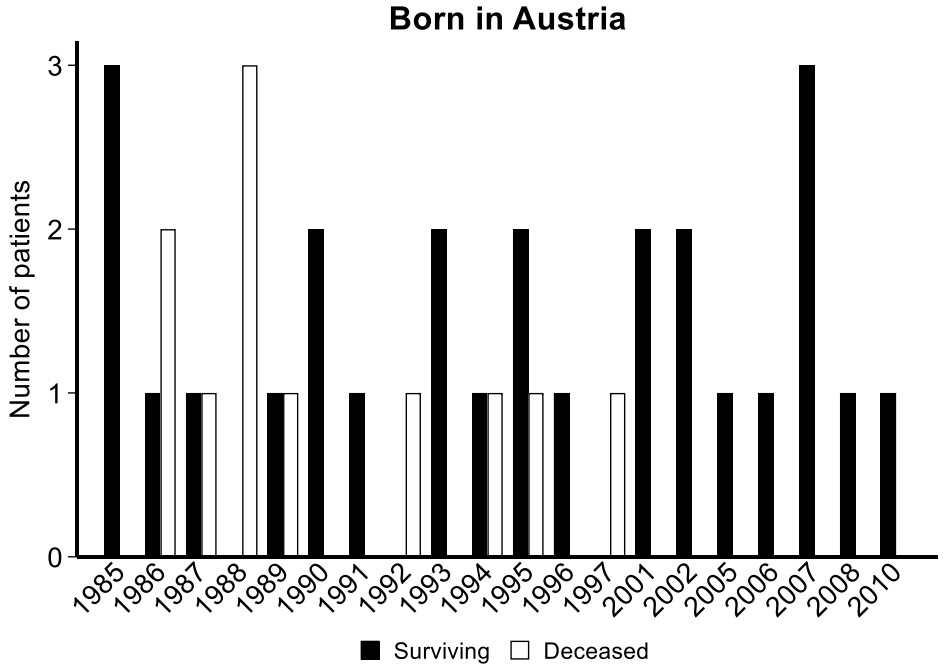
5.2.3 Mother-to-child-transmission

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.

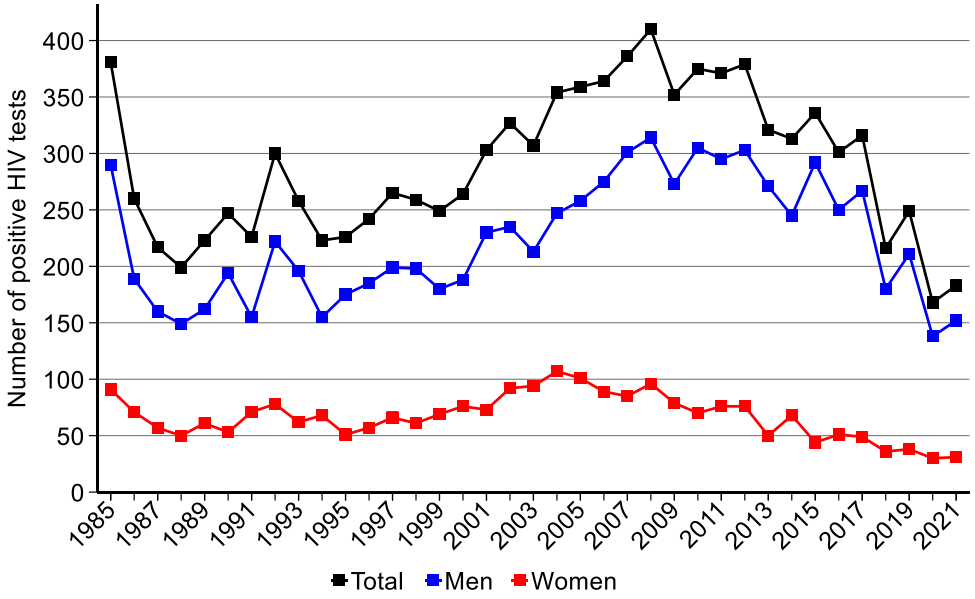
	Living participants		Deceased participants	Total
	<18 years	>18 years		
Burgenland	0	1	0	1
Carinthia	0	1	0	1
Lower Austria	1	4	0	5
Upper Austria	4	8	1	13
Salzburg	1	0	0	1
Styria	0	4	0	4
Tyrol	2	4	4	10
Vorarlberg	2	0	3	5
Vienna	6	16	3	25
Missing residency	0	1	0	1
Foreign	0	2	0	2
Total	**16**	**41**	**11**	**68**

In January 2010, routine HIV testing 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
Surviving
Deceased

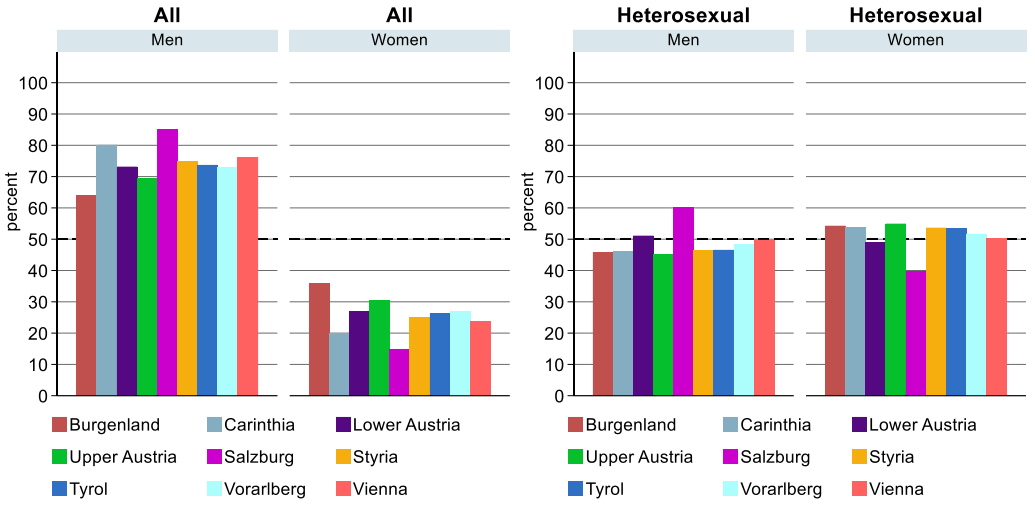

Born in Austria
Number of patients
0
1
2
3
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
2001
2002
2005
2006
2007
2008
2010
Surviving
Deceased

5.3 Sex



8 transgender women are participating in the Austrian HIV cohort study.
25.1% of the patients with a follow-up within the last 12 months are female. The rate is highest in Burgenland (35.9%) and Upper Austria (30.5%).
In the subgroup of heterosexually acquired infections, the rate of the women is 51.5%. It is highest in Upper Austria (55.0%), Burgenland (54.3%) and Carinthia (53.9%).

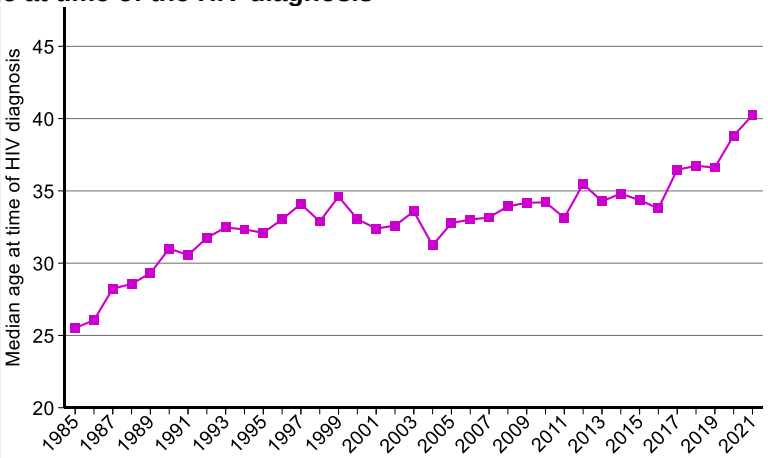
Sex of the patients with a follow-up in the last 12 months

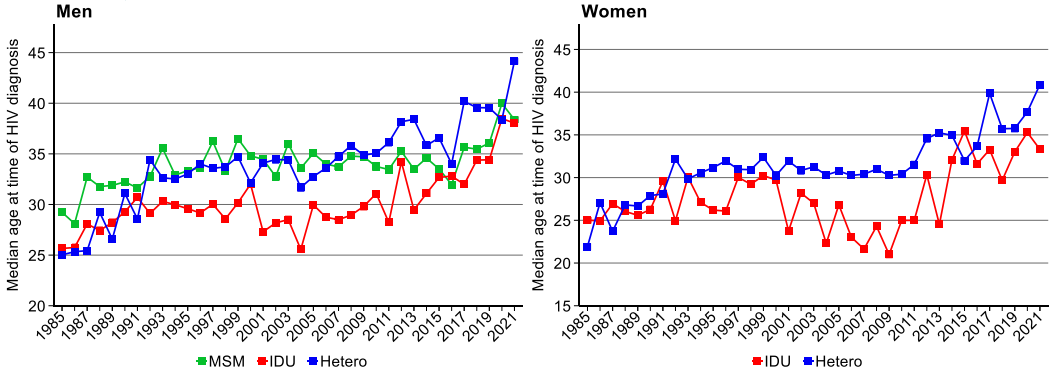


5.4 Age

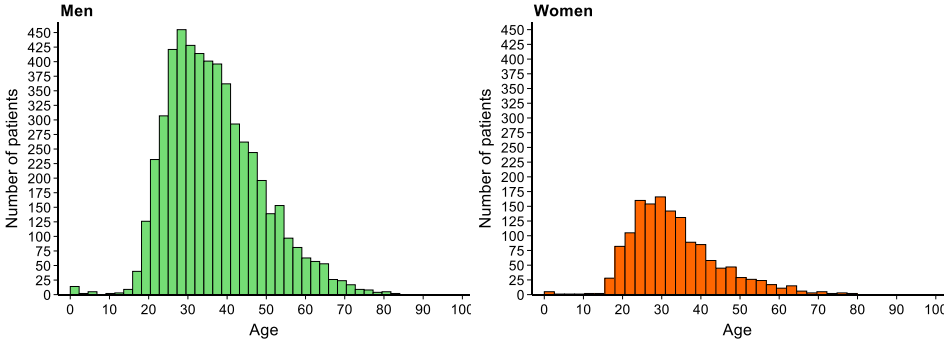
5.4.1 Age at time of HIV diagnosis

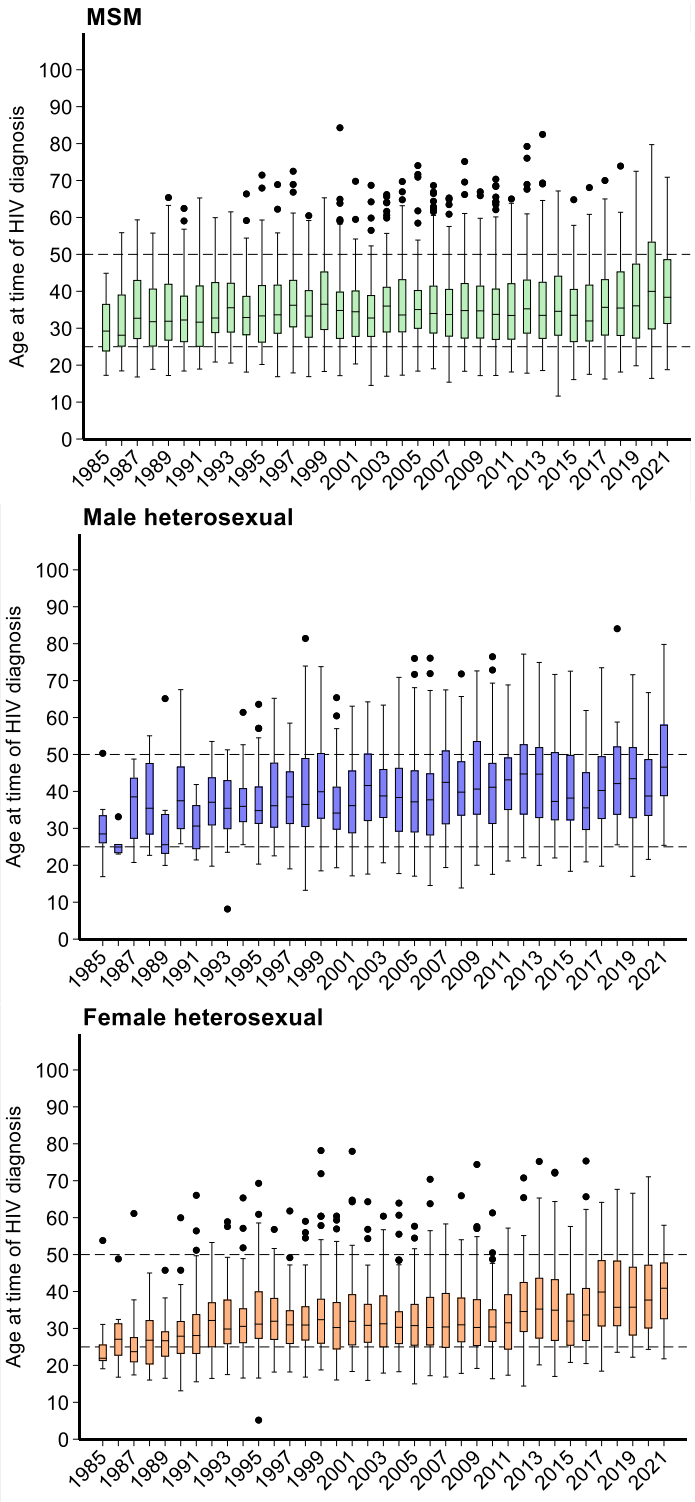
Median age at time of the HIV diagnosis





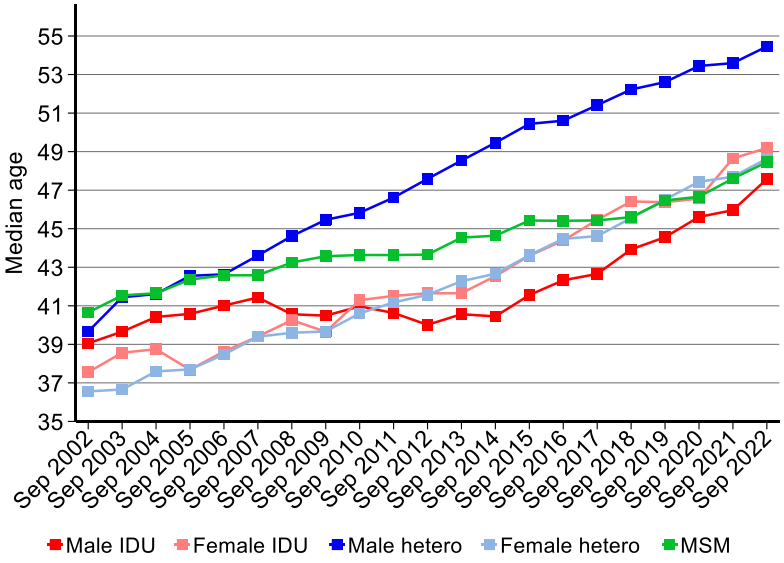
Age at time of the HIV diagnosis



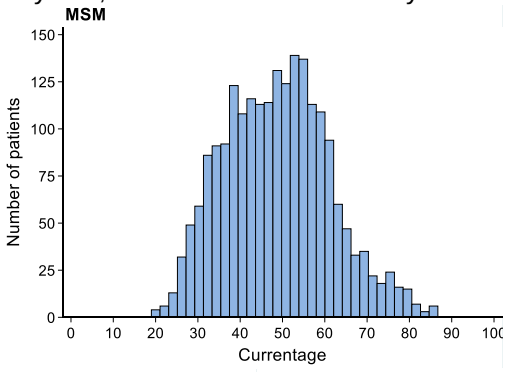

MSM
Age at time of HIV diagnosis
0
10
20
30
40
50
60
70
80
90
100
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Male heterosexual
Age at time of HIV diagnosis
Female heterosexual
Age at time of HIV diagnosis

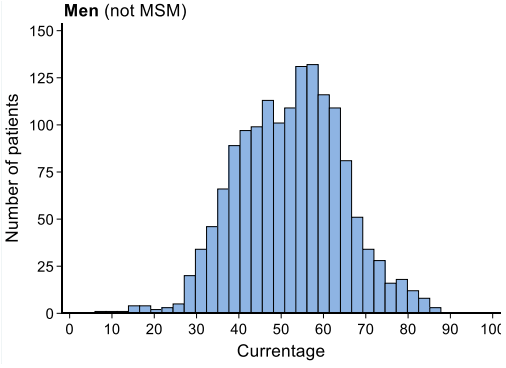
5.4.2 Age of patients currently in care

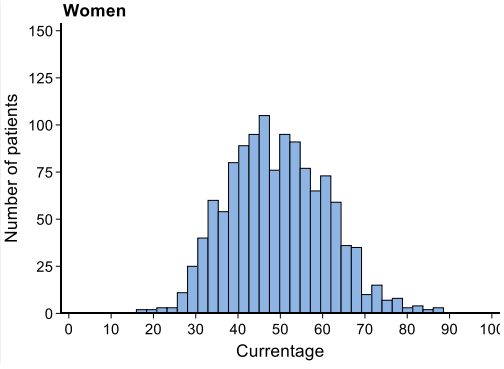
Overall, median age increased from 39.4 in September 2002 to 49.6 in September 2022. In MSM, median age increased from 40.7 in September 2002 to 48.5 in September 2022, in men (not MSM) from 39.5 to 52.6 and in women from 36.7 to 48.6.



Median and average age are 50.0 and 50.0 years, respectively. 21.2% are older than 60 years, 50.1% are older than 50 years.



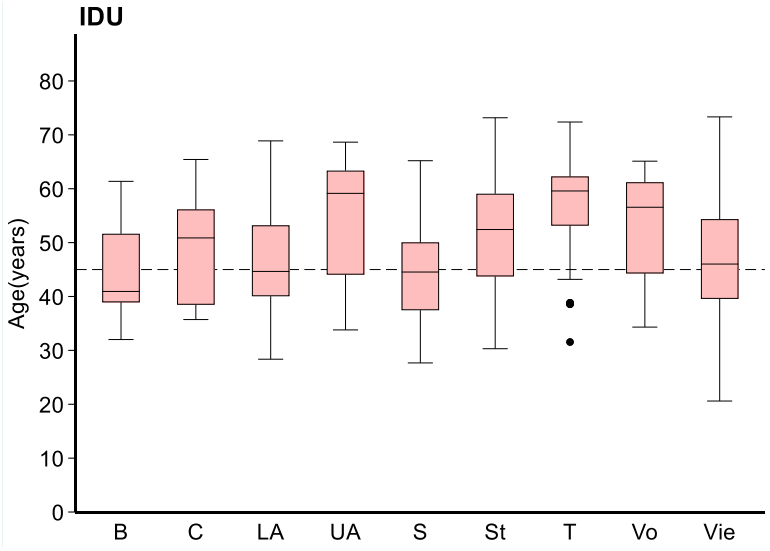




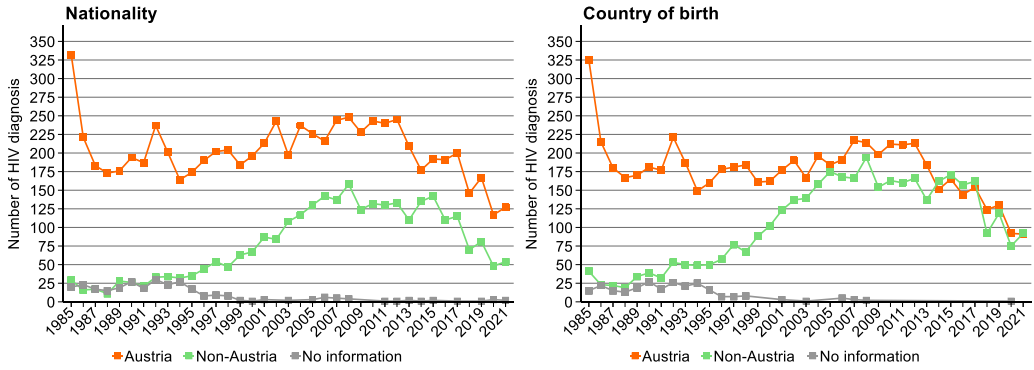
Age across the federal states: follow-up in the last 12 months

Federal state	Median Age years	≥50 years	≥60 years	≥75 years
Burgenland	50.1	50.0	20.5	1.3
Carinthia	50.2	51.8	21.5	2.0
Lower Austria	51.8	54.1	24.0	4.7
Upper Austria	49.8	49.4	23.7	2.6
Salzburg	49.3	48.4	16.0	2.2
Styria	48.7	47.1	17.2	1.7
Tyrol	52.7	57.3	25.9	3.2
Vorarlberg	50.7	53.0	23.5	5.1
Vienna	49.1	47.8	19.7	2.8
Total	**50.0**	**50.2**	**21.2**	**2.9**

Federal states: Patients with a follow-up in the last 12 months – injecting drug use



5.5 Nationality and country of birth

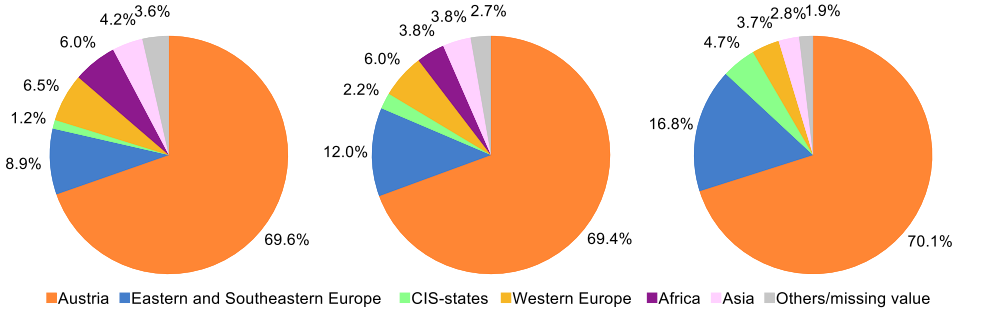


5.5.1 Overview

	BMG	AHIVCOS								
Year	Total	Austria		Low prevalence countries		High prevalence countries		Missing value		Total
1998	313	204	78.76%	29	11.20%	18	6.95%	8	3.09%	259
1999	339	184	73.90%	43	17.27%	20	8.03%	2	0.80%	249
2000	428	196	74.24%	35	13.26%	32	12.12%	1	0.38%	264
2001	402	213	70.30%	48	15.84%	39	12.87%	3	0.99%	303
2002	442	243	74.31%	49	14.98%	35	10.70%	0	0.00%	327
2003	423	197	64.17%	57	18.57%	51	16.61%	2	0.65%	307
2004	470	237	66.95%	59	16.67%	58	16.38%	0	0.00%	354
2005	453	226	62.95%	57	15.88%	73	20.33%	3	0.84%	359
2006	435	216	59.34%	80	21.98%	62	17.03%	6	1.65%	364
2007	515	244	63.21%	75	19.43%	62	16.06%	5	1.30%	386
2008	505	248	60.49%	103	25.12%	55	13.41%	4	0.98%	410
2009	507	228	64.77%	77	21.88%	47	13.35%	0	0.00%	352
2010	487	243	64.80%	100	26.67%	32	8.53%	0	0.00%	375
2011	525	240	64.69%	100	26.95%	30	8.09%	1	0.27%	371
2012	523	245	64.64%	97	25.59%	36	9.50%	1	0.26%	379
2013	481	209	65.11%	88	27.41%	22	6.85%	2	0.62%	321
2014	403	177	56.55%	100	31.95%	35	11.18%	1	0.32%	313
2015	428	192	57.14%	106	31.55%	36	10.71%	2	0.60%	336
2016	447	191	63.46%	83	27.57%	27	8.97%	0	0.00%	301
2017	510	200	63.29%	99	31.33%	16	5.06%	1	0.32%	316
2018	323 / 74*	146	67.59%	60	27.78%	10	4.63%	0	0.00%	216
2019	336 / 94*	167	67.07%	66	26.51%	15	6.02%	1	0.40%	249
2020	283 / 49*	117	69.64%	40	23.81%	8	4.76%	3	1.79%	168
2021	310 / 66*	127	69.40%	45	24.59%	9	4.92%	2	1.09%	183
2022		75	70.09%	30	28.04%	1	0.93%	1	0.93%	107

* second number tested anonymously since 2018

5.5.2 Nationality: HIV diagnoses between 2019 and 2022

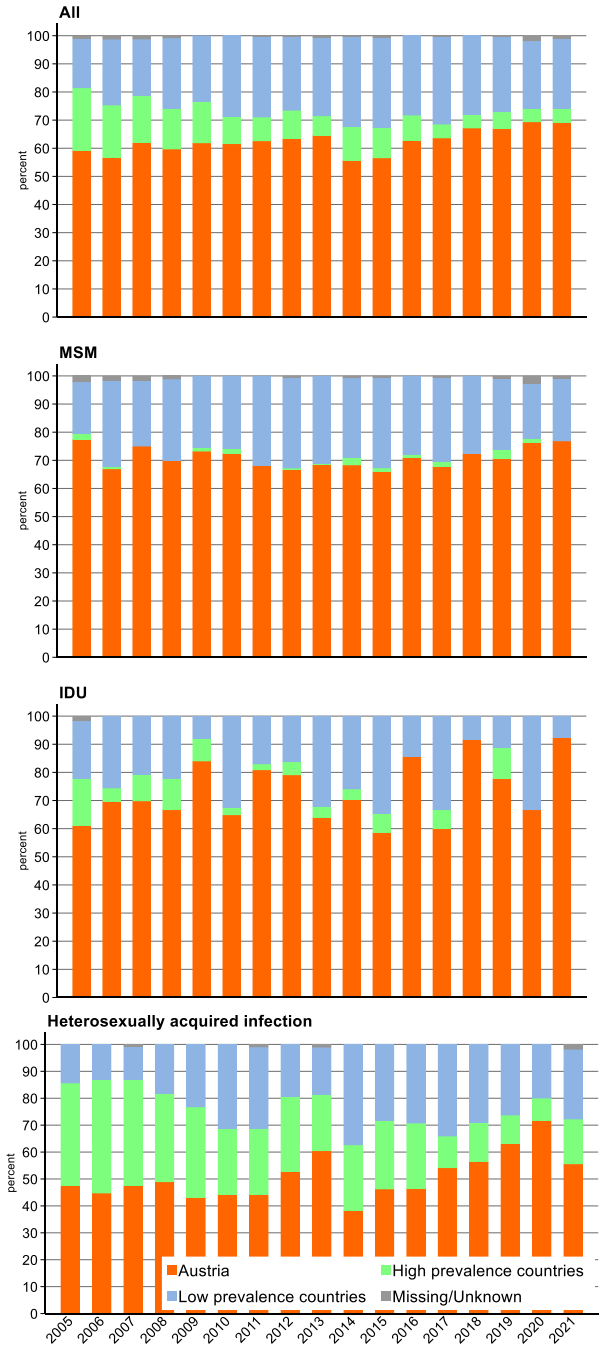


HIV diagnosis 2020 N=168	
Afghanistan	1
Africa	1
Algeria	1
Austria	117
Bosnia and Herzegovina	1
Botswana	1
Brazil	1
Bulgaria	1
Cuba	1
Egypt	1
Ethiopia	1
Gambia	1
Georgia	1
Germany	5
Ghana	1
Guinea-Bissau	1
Hungary	2
India	1
Indonesia	1
Italy	1
Lebanon	1
Netherlands	1
Philippines	1
Poland	3
Portugal	1
Romania	2
Serbia	3
Sierra Leone	1
Somalia	1
Spain	2
Syrian Arab Republic	1
Thailand	1
Turkey	2
Ukraine	2
United Kingdom of Great Britain	1
Unknown	3
Venezuela	1

HIV diagnosis 2021 N=183	
Afghanistan	1
Armenia	1
Austria	127
Bosnia and Herzegovina	1
Brazil	1
Bulgaria	1
China	1
Croatia	2
Egypt	1
Germany	4
Ghana	2
Haiti	1
Hungary	3
Italy	3
Kenya	1
Lithuania	1
Nigeria	1
Philippines	1
Poland	1
Portugal	3
Republic of Korea	1
Romania	6
Russian Federation	1
Saint Vincent and the Grenadines	1
Serbia	2
Slovakia	2
Slovenia	1
Somalia	1
Switzerland	1
Syrian Arab Republic	1
Thailand	2
Turkey	2
Ukraine	2
Unknown	2
Zimbabwe	1

HIV diagnosis 2022 N=107	
Afghanistan	3
Austria	75
Bosnia and Herzegovina	2
Brazil	1
Croatia	2
Czech Republic	1
Georgia	1
Greece	1
Italy	3
Romania	5
Russian Federation	1
Serbia	3
Slovakia	2
Slovenia	1
Turkey	1
Ukraine	4
Unknown	1

5.5.3 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%.

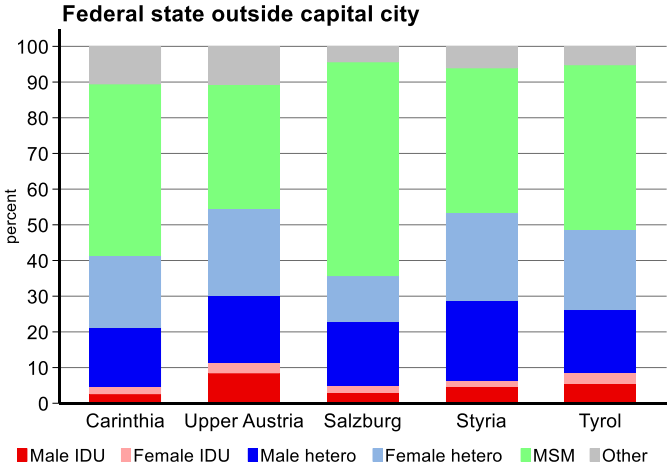
5.5.4 Refugees from Ukraine (March 1st to September 1st)

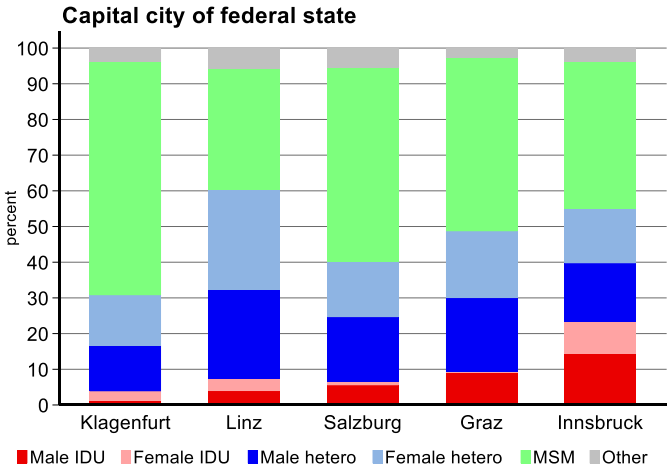
Center	Men	Women	Children	ART	Total
Penzing	**1**	**4**	**0**	**5**	5
AKH Vienna	**4**	**5**	**0**	**9**	9
Favoriten	**3**	**1**	**0**	**4**	4
Linz	**5**	**7**	**2**	**14**	14
Salzburg	**1**	**3**	**0**	**4**	4
Innsbruck	**1**	**3**	**3**	**7**	7
Feldkirch	**1**	**1**	**0**	**2**	2
Graz	**3**	**6**	**0**	**9**	9
Total	**19**	**30**	**5**	**54**	**54**

5.6 Residence

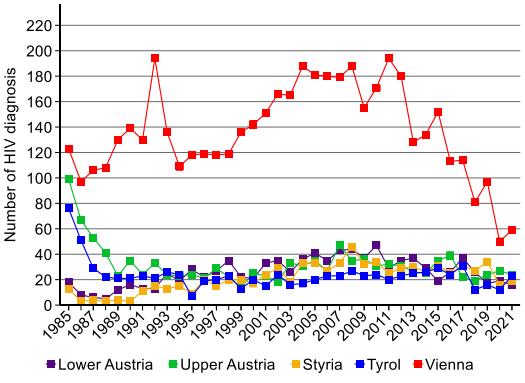
5.6.1 Population size of area of residence

	Living with HIV/AIDS						Deceased					
	< 100 000		≥ 100 000		> 1 million		< 100 000		≥ 100 000		> 1 million	
	N (% women)		N (% women)		N (% women)		N (% women)		N (% women)		N (% women)	
B	110	30.9%	**0**		-		20	20.0%	-		-	
C	235	24.3%	**78**	16.7%	-		26	19.2%	8	12.5%	-	
LA	770	26.0%	-		-		170	18.8%	-		-	
UA	500	29.8%	307	32.9%	-		182	30.2%	197	32.0%	-	
S	202	15.8%	199	17.6%	-		28	17.9%	43	11.6%	-	
St	407	27.8%	267	20.2%	-		60	25.0%	41	19.5%	-	
T	398	26.1%	209	25.8%	-		116	21.6%	133	25.6%	-	
Vo	259	26.3%	-		-		67	26.9%	-		-	
Vie	-		-		3593	21.3%	-		-		1496	20.5%





5.6.2 Residence: Federal states



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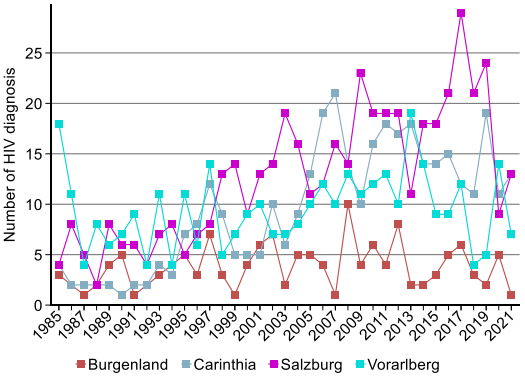
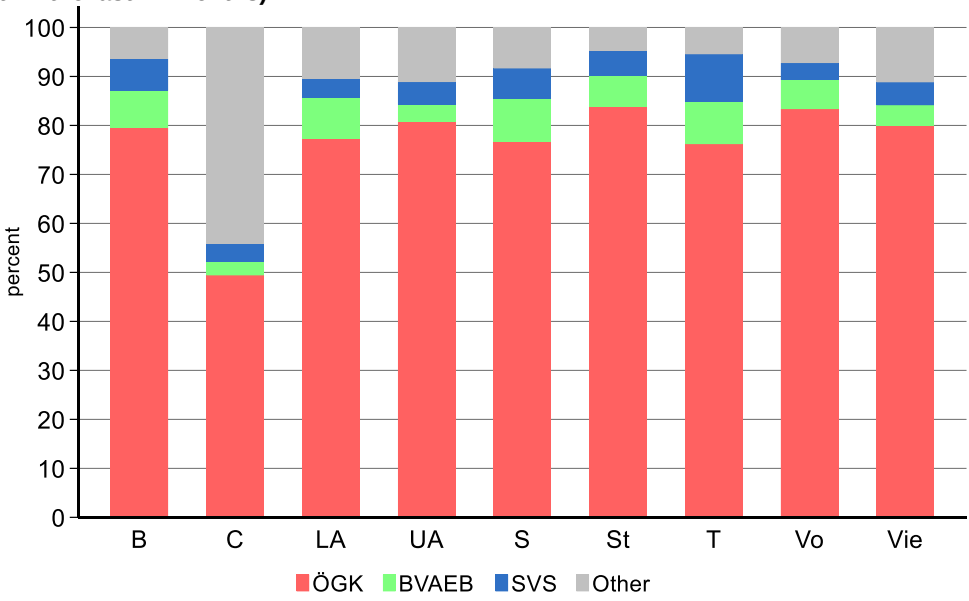


5.7 Health insurance

In the framework of statutory health insurance, all gainfully active persons must become insured. Approximately 99% of the Austrian population are protected by statutory health insurance. Depending on the type of employment there are different kinds of mandatory health insurance: e.g. BVAEB for civil servants, SVS for businessmen and businesswomen, and ÖGK for most employees.

Providers of health insurance according to the federal state (patients with a follow-up within the last 12 months)



5.8 Providers of health care

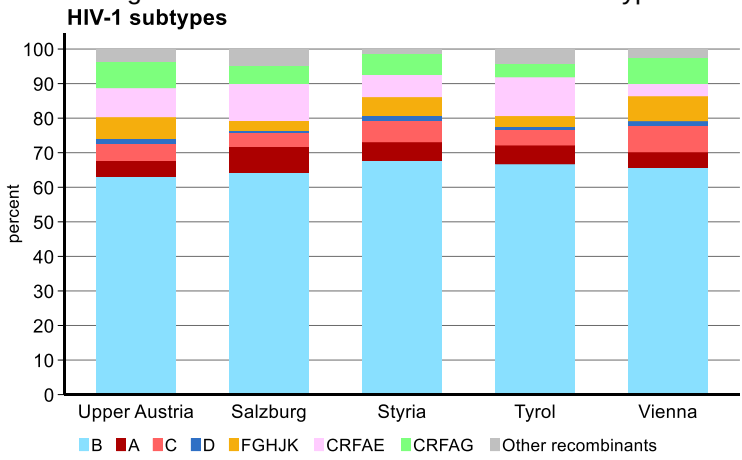
Included are patients from the HIV centers in Linz and Innsbruck with a follow-up in the last 12 months.

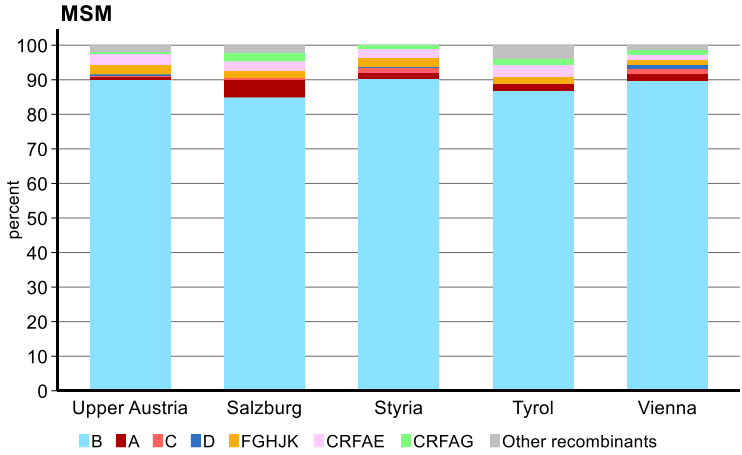
	N of patients	General practice		Psychiatry		Internal medicine		Dermatology		Pulmo-nology		Others	
Innsbruck	754	538	71.40%	52	6.90%	43	5.70%	14	1.90%	7	0.90%	85	11.30%
Linz	672	320	47.60%	20	3.00%	46	6.80%	8	1.20%	15	2.20%	138	20.50%
Age < 50	656	327	49.80%	22	3.40%	20	3.00%	10	1.50%	5	0.80%	86	13.10%
Age ≥ 50	770	531	69.00%	50	6.50%	69	9.00%	12	1.60%	17	2.20%	137	17.80%
< 100 000	942	582	61.80%	44	4.70%	64	6.80%	12	1.30%	17	1.80%	135	14.30%
≥ 100 000	484	276	57.00%	28	5.80%	25	5.20%	10	2.10%	5	1.00%	88	18.20%
Total	1426	858	60.20%	72	5.00%	89	6.20%	22	1.50%	22	1.50%	223	15.60%

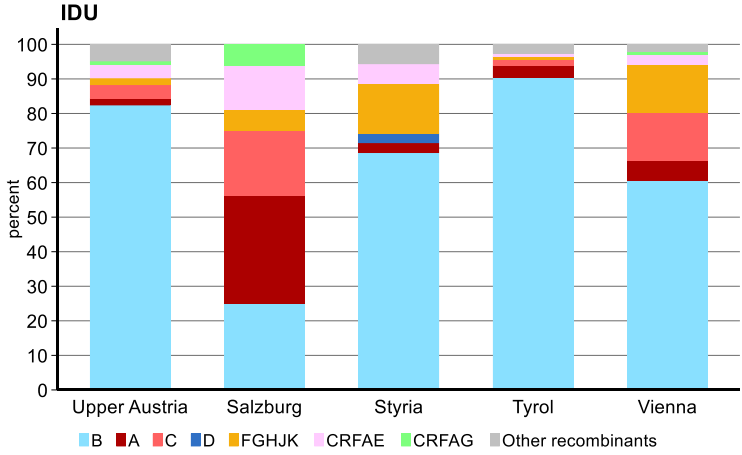
	N of patients	No doctors outside centre		GP, no specialist		Specialist, no GP		GP, + specialist	
Innsbruck	754	178	23.60%	401	53.20%	38	5.00%	137	18.20%
Linz	672	300	44.60%	183	27.20%	52	7.70%	137	20.40%
Patients without ART	9	2	22.20%	5	55.60%	0	0.00%	2	22.20%
Patients with ART	1417	476	33.60%	579	40.90%	90	6.40%	272	19.20%
HIV RNA > 50 (with ART)	79	33	41.80%	26	32.90%	5	6.30%	15	19.00%
HIV RNA ≤ 50 (with ART)	1336	442	33.10%	552	41.30%	85	6.40%	257	19.20%
Chronic hepatitis C	14	10	71.40%	4	28.60%	0	0.00%	0	0.00%
Use of antidepressants	246	49	19.90%	112	45.50%	13	5.30%	72	29.30%
MSM	599	228	38.10%	271	45.20%	25	4.20%	75	12.50%
Male IDU	93	23	24.70%	49	52.70%	5	5.40%	16	17.20%
Female IDU	58	8	13.80%	24	41.40%	5	8.60%	21	36.20%
Male hetero	271	109	40.20%	110	40.60%	9	3.30%	43	15.90%
Female hetero	314	67	21.30%	100	31.80%	39	12.40%	108	34.40%
Age < 50	656	291	44.40%	235	35.80%	38	5.80%	92	14.00%
Age ≥ 50	770	187	24.30%	349	45.30%	52	6.80%	182	23.60%
< 100 000	942	309	32.80%	402	42.70%	51	5.40%	180	19.10%
≥ 100 000	484	169	34.90%	182	37.60%	39	8.10%	94	19.40%
Total	1426	478	33.50%	584	41.00%	90	6.30%	274	19.20%

5.9 HIV-1 subtypes

Subtypes were determined by genotypic resistance testing of Reverse Transcriptase and Protease according to Stanford database. Overall 3818 subtypes were available.



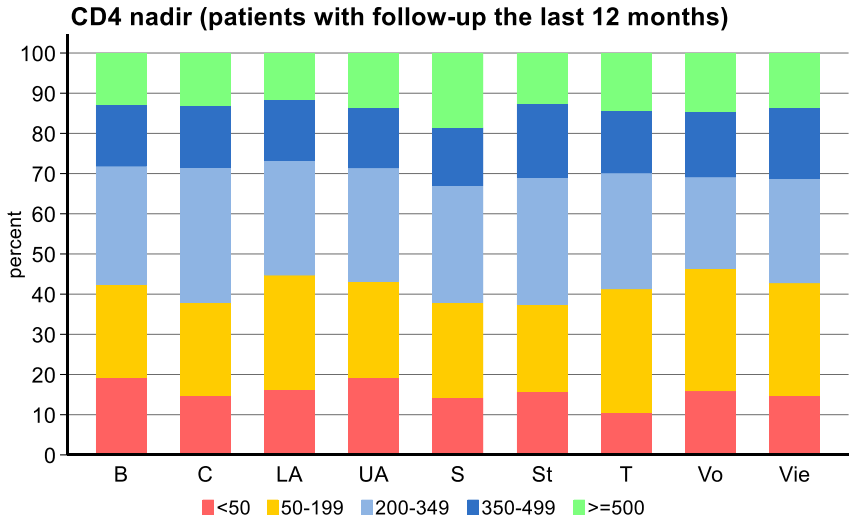




5.10 Stage of HIV disease

5.10.1 Lowest ever measured CD4 cell count

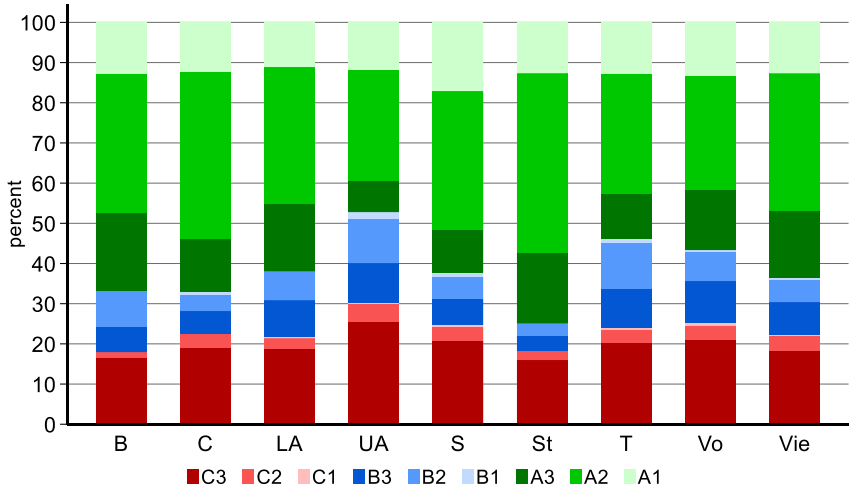
The median of the lowest CD4 cell count ever measured („CD4 nadir“) in the patients with follow-up in the last 12 months is 240/µl.



5.10.2 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**



5.11 „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.

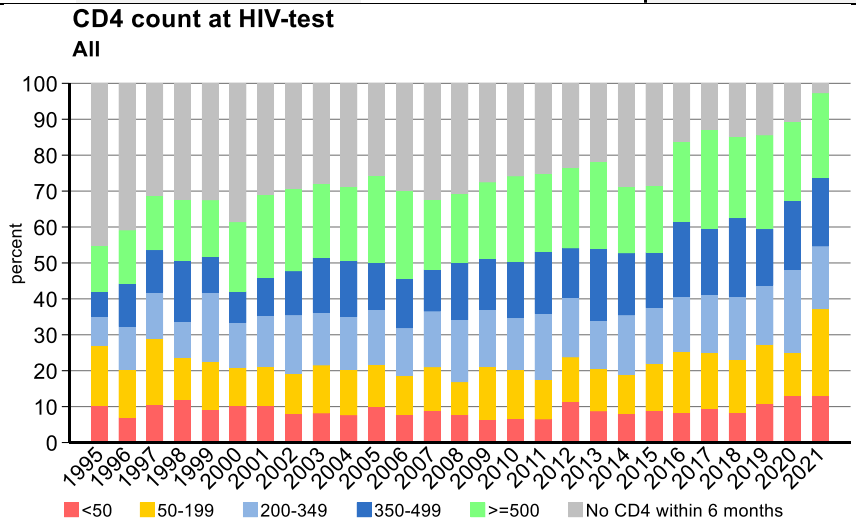
	HIV-infected up to 10 years N=1790		**HIV-infected for over 10 years N=3111**	
Being ART naive	**N**	**%**	**N**	**%**
HIV RNA ≤ 50 copies/ml	14	0.78%	4	0.13%
HIV RNA < 400 copies/ml	16	0.90%	7	0.23%
CD4 > 500 cells/µl	4	0.22%	10	0.32%
CD4 > 500 cells/µl and HIV RNA ≤ 50 copies/ml	2	0.11%	3	0.10%
CD4 > 500 cells/µl and HIV RNA < 400 copies/ml	4	0.22%	6	0.19%

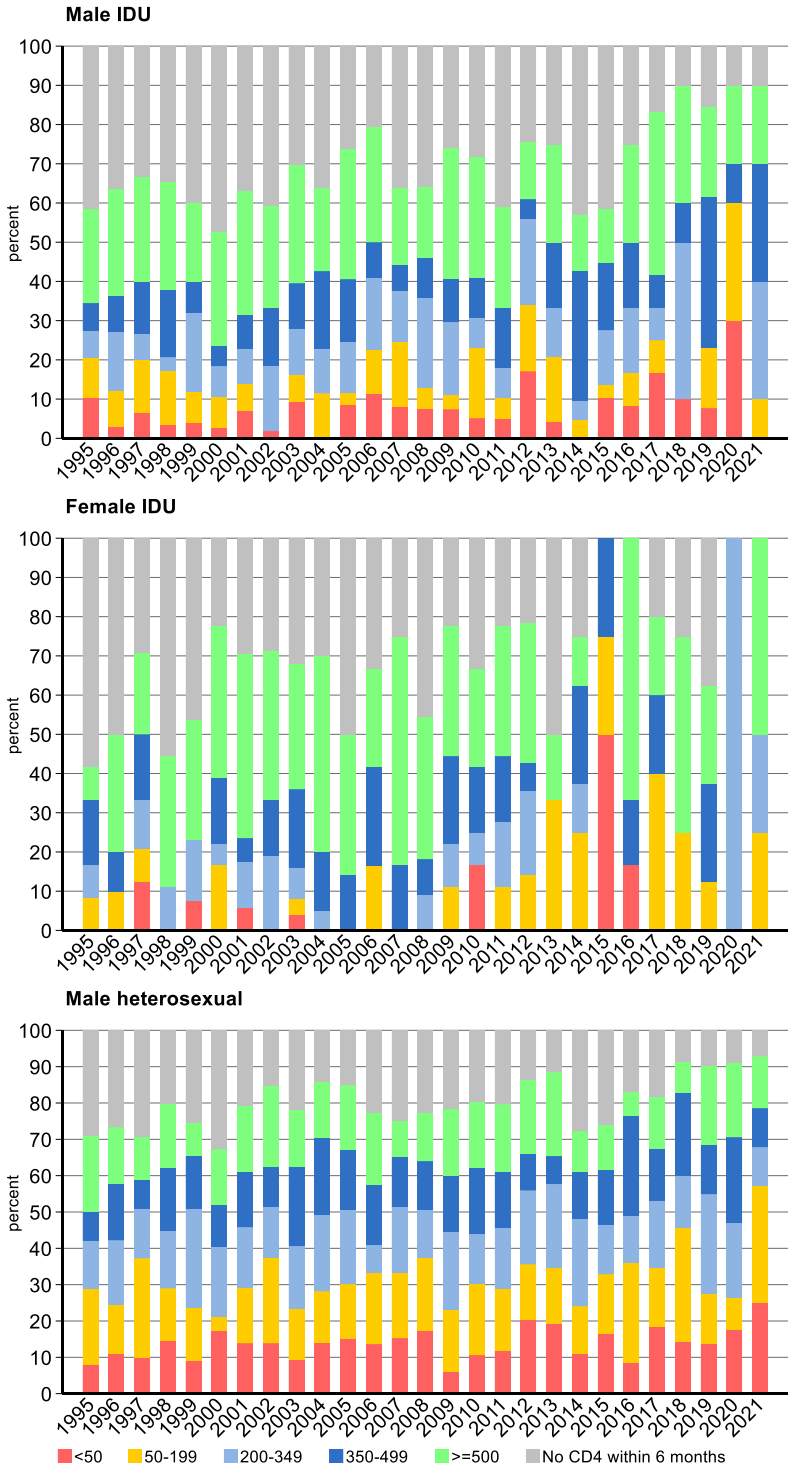
6 Diagnosis of HIV and presentation to an HIV centre

6.1 Presentation to an HIV centre

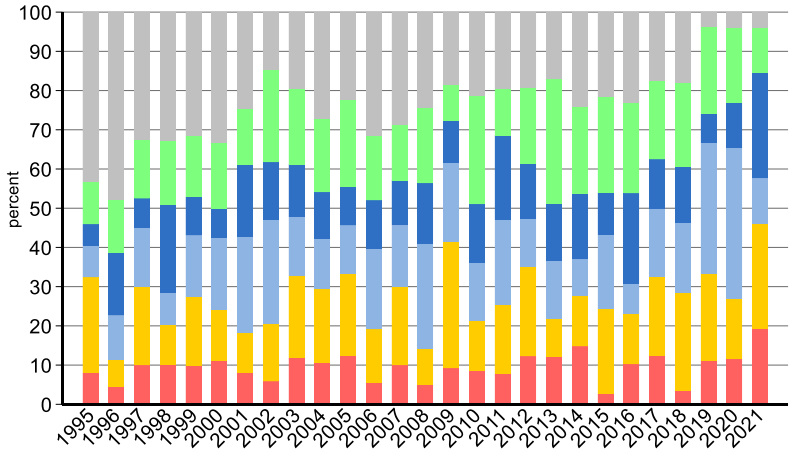
Austria has one of the highest rates of HIV tests in Europe (more than 75 tests per year per 1000 population). Nevertheless, a substantial portion of the patients (>40%) are diagnosed late (CD4 cell count <350/µl).

Year of HIV diagnosis	Time between HIV test and first CD4 cell count measurement in months						First CD4 cell count (all patients, 447 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	216	2.6	96.7	39	4.2	101.4	238.5	86.0	473.0
2000	257	1.1	135.8	56	2.3	92.0	361.0	156.0	566.0
2005	353	0.7	80.0	83	1.1	48.3	351.0	165.0	535.0
2006	354	0.7	64.7	56	1.0	30.6	369.0	193.0	579.0
2007	375	0.7	78.9	72	1.8	52.9	327.0	154.0	549.0
2008	399	0.8	74.3	50	1.7	90.1	395.0	227.0	568.0
2009	342	0.6	69.9	36	0.9	49.0	342.5	197.0	538.0
2010	364	0.5	66.5	51	0.7	59.4	398.5	199.5	641.0
2011	360	0.6	50.8	55	1.9	38.8	380.0	221.0	567.5
2012	374	0.6	42.8	55	0.9	47.0	362.5	159.0	580.0
2013	309	0.5	34.1	29	1.5	40.9	401.0	209.0	623.0
2014	303	0.6	39.7	29	2.0	50.6	381.0	202.0	581.0
2015	321	0.5	29.4	33	1.6	38.5	378.0	178.0	566.0
2016	292	0.4	11.0	17	0.7	7.7	368.5	160.5	555.0
2017	308	0.4	7.9	17	1.2	9.4	389.0	185.0	573.0
2018	212	0.3	14.8	14	0.5	38.9	373.5	206.0	574.5
2019	245	0.4	9.2	21	1.4	9.2	367.0	160.0	577.0
2020	165	0.4	5.0	12	0.6	4.0	338.0	184.0	539.0
2021	180	0.3	1.7	13	0.4	1.9	276.5	106.5	502.0
2022	101	0.3	1.6	5	0.1	0.6	299.0	93.0	530.0

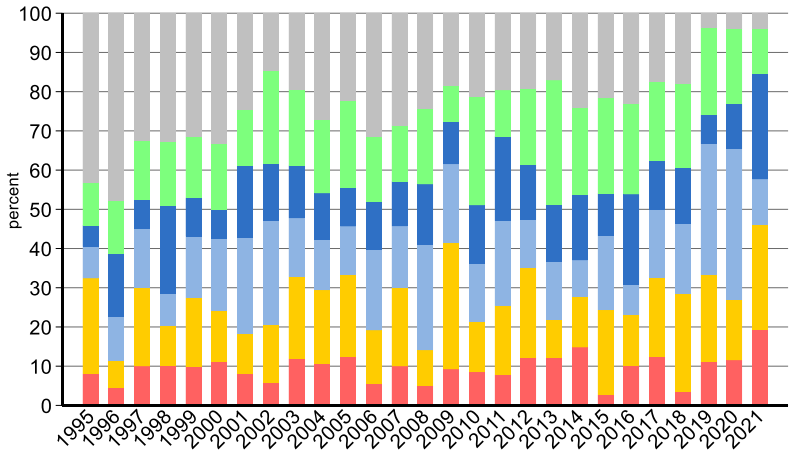



Male IDU
Female IDU
Male heterosexual
percent
0
10
20
30
40
50
60
70
80
90
100
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
<50
50-199
200-349
350-499
>=500
No CD4 within 6 months

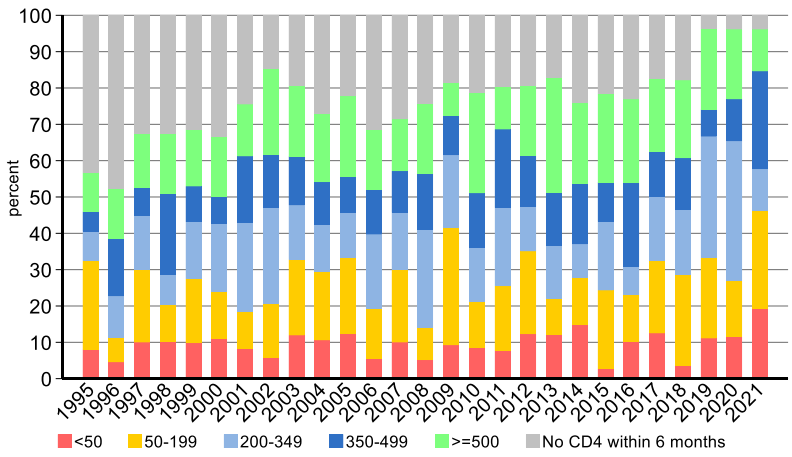
Female heterosexual



MSM



Other



6.2 Patients diagnosed since 2001

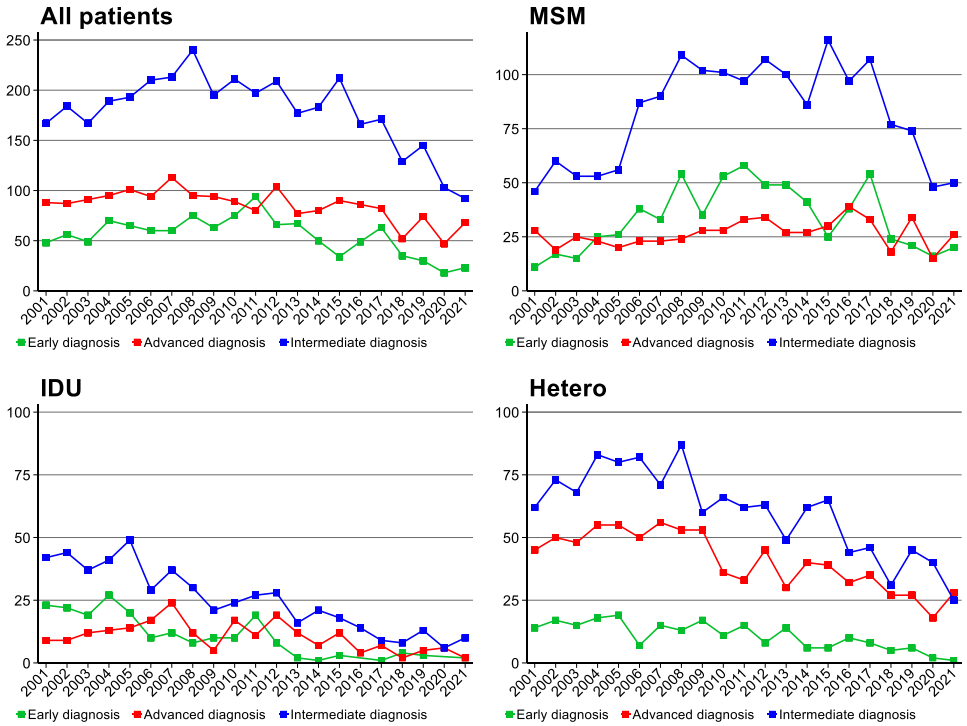
6.2.1 Frequency of early and late diagnoses

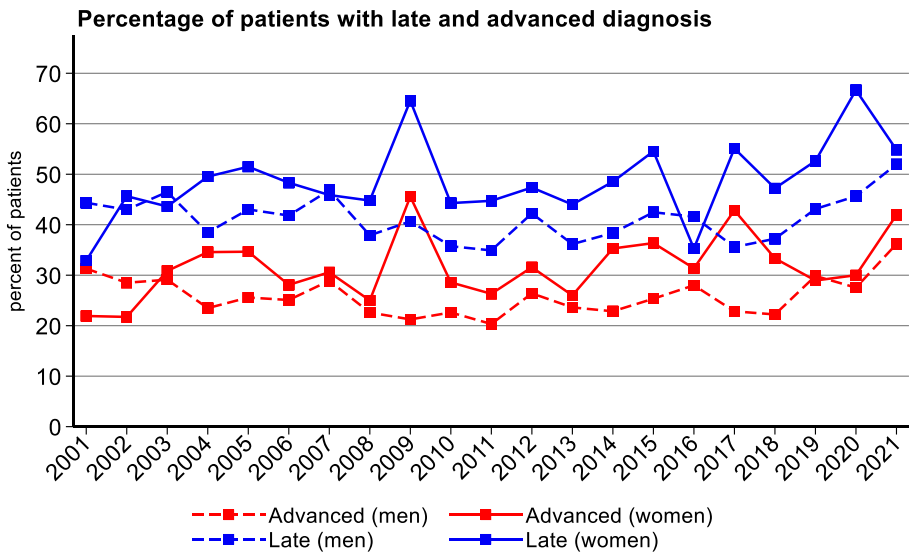
“Early” diagnosis or **„recent“ infection** is defined as: acute HIV infection (westernblot pattern or antigen/HIV RNA combined with clinical presentation) or documented seroconversion with negative HIV test not more than 3 years before the first positive test.

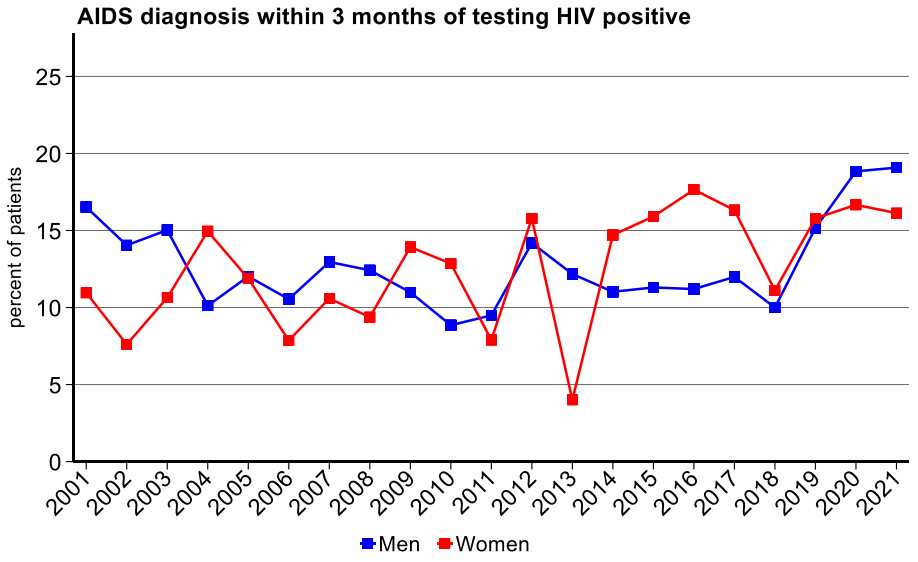
“Late” diagnosis is defined as: CD4 cell count below 350 at time of HIV diagnosis and/or AIDS within 3 months of HIV diagnosis

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

“Intermediate” diagnosis: CD4 cell count > 200, however not early diagnosed




Percentage of patients with late and advanced diagnosis
percent of patients
0
10
20
30
40
50
60
70
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Advanced (men)
Advanced (women)
Late (men)
Late (women)


AIDS diagnosis within 3 months of testing HIV positive
percent of patients
0
5
10
15
20
25
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Men
Women

6.2.2 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	1157	6797	17.02%	**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	469	2349	19.97%	1.92	[1.52,2.42]	0.000	1.89	[1.47,2.42]	0.000
30-50 years	588	3580	16.42%	1.51	[1.20,1.89]	0.000	1.42	[1.12,1.81]	0.003
≥ 50	100	868	11.52%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	138	720	19.17%	0.78	[0.64,0.96]	0.016	0.77	[0.62,0.96]	0.018
Female IDU	66	233	28.33%	1.30	[0.96,1.75]	0.085	1.10	[0.81,1.51]	0.532
Male heterosexual	116	1254	9.25%	0.33	[0.27,0.41]	0.000	0.39	[0.31,0.48]	0.000
Female heterosexual	111	1118	9.93%	0.36	[0.29,0.45]	0.000	0.42	[0.34,0.53]	0.000
Other	18	438	4.11%	0.14	[0.09,0.23]	0.000	0.17	[0.10,0.27]	0.000
MSM	708	3034	23.34%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Federal state									
Carinthia	29	289	10.03%	0.65	[0.44,0.96]	0.032			
Upper Austria	117	640	18.28%	1.30	[1.04,1.63]	0.022			
Salzburg	89	366	24.32%	1.87	[1.44,2.42]	0.000			
Styria	92	607	15.16%	1.04	[0.81,1.32]	0.763			
Tyrol	148	460	32.17%	2.76	[2.21,3.43]	0.000			
Other federal states	187	996	18.78%	1.34	[1.11,1.62]	0.002			
Missing	0	7	0.00%	1.00	[1.00,1.00]	.			
Foreign countries	45	367	12.26%	0.81	[0.59,1.13]	0.213			
Vienna	450	3065	14.68%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Missing value	5	89	5.62%	0.35	[0.14,0.86]	0.023	0.55	[0.22,1.40]	0.211
< 100 000	522	2696	19.36%	1.41	[1.22,1.61]	0.000	1.73	[1.49,2.00]	0.000
≥ 100 000	178	913	19.50%	1.42	[1.17,1.72]	0.000	1.79	[1.46,2.19]	0.000
> 1 million	452	3099	14.59%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing value	4	38	10.53%	0.45	[0.16,1.26]	0.127	0.50	[0.17,1.45]	0.200
Low prevalence countries	198	1619	12.23%	0.53	[0.45,0.62]	0.000	0.53	[0.45,0.63]	0.000
High prevalence countries	39	759	5.14%	0.20	[0.15,0.29]	0.000	0.30	[0.21,0.42]	0.000
Austria	916	4381	20.91%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	260	1519	17.12%	0.99	[0.81,1.20]	0.913	0.96	[0.78,1.18]	0.711
2009-2012	298	1477	20.18%	1.21	[1.00,1.47]	0.051	1.09	[0.89,1.33]	0.416
2013-2016	200	1271	15.74%	0.89	[0.73,1.10]	0.295	0.79	[0.63,0.99]	0.037
≥ 2017	176	1239	14.21%	0.79	[0.64,0.98]	0.035	0.67	[0.54,0.85]	0.001
2001-2004	223	1291	17.27%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

6.2.3 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

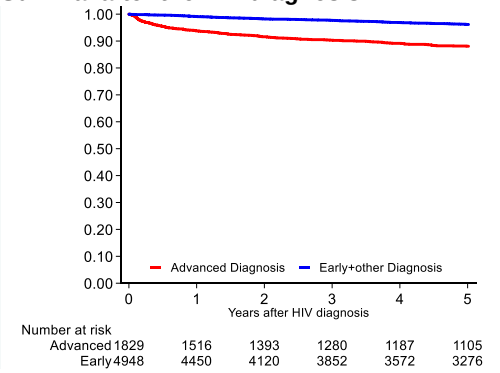
All centres	2893	6797	42.56%	**Univariable logistic Regression**			**Multivariable logistic Regression**		
	Frequencies		**%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Demographic characteristics									
Age at time of HIV diagnosis									
< 30 years	742	2349	31.59%	0.32	[0.27,0.38]	0.000	0.33	[0.28,0.40]	0.000
30-50 years	1640	3580	45.81%	0.59	[0.51,0.69]	0.000	0.62	[0.53,0.72]	0.000
≥ 50	511	868	58.87%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	293	720	40.69%	1.35	[1.14,1.59]	0.000	1.49	[1.25,1.77]	0.000
Female IDU	62	233	26.61%	0.71	[0.53,0.96]	0.026	0.91	[0.67,1.23]	0.533
Male heterosexual	710	1254	56.62%	2.56	[2.24,2.93]	0.000	2.05	[1.78,2.36]	0.000
Female heterosexual	576	1118	51.52%	2.09	[1.81,2.40]	0.000	1.88	[1.62,2.20]	0.000
Other	228	438	52.05%	2.13	[1.74,2.61]	0.000	1.88	[1.52,2.33]	0.000
MSM	1024	3034	33.75%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Federal state									
Carinthia	138	289	47.75%	1.30	[1.02,1.65]	0.034			
Upper Austria	298	640	46.56%	1.24	[1.04,1.47]	0.014			
Salzburg	151	366	41.26%	1.00	[0.80,1.24]	0.986			
Styria	272	607	44.81%	1.15	[0.97,1.37]	0.110			
Tyrol	176	460	38.26%	0.88	[0.72,1.08]	0.216			
Other federal states	448	996	44.98%	1.16	[1.01,1.34]	0.041			
Missing	1	7	14.29%	0.24	[0.03,1.97]	0.183			
Foreign countries	143	367	38.96%	0.91	[0.73,1.13]	0.389			
Vienna	1266	3065	41.31%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Missing value	30	89	33.71%	0.72	[0.46,1.13]	0.153	0.63	[0.39,1.00]	0.049
< 100 000	1213	2696	44.99%	1.16	[1.05,1.29]	0.005	1.02	[0.91,1.13]	0.790
≥ 100 000	370	913	40.53%	0.97	[0.83,1.13]	0.675	0.86	[0.73,1.00]	0.052
> 1 million	1280	3099	41.30%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/Unknown	8	38	21.05%	0.39	[0.18,0.84]	0.017	0.38	[0.17,0.86]	0.021
Low prevalence countries	658	1619	40.64%	0.99	[0.88,1.11]	0.893	1.08	[0.96,1.22]	0.205
High prevalence countries	438	759	57.71%	1.98	[1.69,2.31]	0.000	1.71	[1.43,2.04]	0.000
Austria	1789	4381	40.84%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	663	1519	43.65%	1.02	[0.88,1.19]	0.789	1.03	[0.88,1.21]	0.696
2009-2012	603	1477	40.83%	0.91	[0.78,1.06]	0.217	0.96	[0.82,1.12]	0.598
2013-2016	517	1271	40.68%	0.90	[0.77,1.06]	0.206	0.95	[0.80,1.12]	0.517
≥ 2017	553	1239	44.63%	1.06	[0.91,1.24]	0.451	1.07	[0.90,1.26]	0.447
2001-2004	557	1291	43.14%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

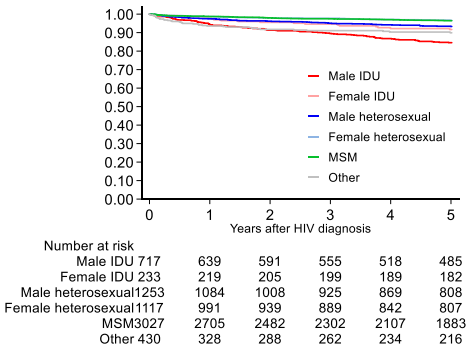
6.2.4 Factors associated with mortality in patients diagnosed since 2001

Date of censoring: last contact with the HIV centre (32 missing)

All centres	726	6797	10.68%	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	180	2349	7.66%	0.25	[0.20,0.30]	0.000	0.17	[0.14,0.22]	0.000
30-50 years	337	3580	9.41%	0.32	[0.27,0.38]	0.000	0.28	[0.23,0.34]	0.000
≥ 50	209	868	24.08%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	198	720	27.50%	3.81	[3.12,4.66]	0.000	4.37	[3.53,5.41]	0.000
Female IDU	62	233	26.61%	3.28	[2.45,4.37]	0.000	4.05	[2.98,5.49]	0.000
Male heterosexual	158	1254	12.60%	1.82	[1.47,2.26]	0.000	1.23	[0.98,1.53]	0.072
Female heterosexual	67	1118	5.99%	0.78	[0.59,1.03]	0.085	0.78	[0.58,1.04]	0.096
Other	57	438	13.01%	2.51	[1.87,3.38]	0.000	1.94	[1.43,2.64]	0.000
MSM	184	3034	6.06%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Missing value	6	89	6.74%	1.01	[0.45,2.27]	0.978	1.32	[0.57,3.05]	0.510
< 100 000	227	2696	8.42%	0.62	[0.53,0.73]	0.000	0.67	[0.56,0.79]	0.000
≥ 100 000	77	913	8.43%	0.60	[0.47,0.77]	0.000	0.77	[0.60,0.98]	0.037
> 1 million	416	3099	13.42%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/Unknown	4	38	10.53%	1.04	[0.39,2.77]	0.943	1.03	[0.37,2.84]	0.957
Low prevalence countries	89	1619	5.50%	0.51	[0.40,0.63]	0.000	0.66	[0.53,0.83]	0.000
High prevalence countries	45	759	5.93%	0.45	[0.33,0.61]	0.000	0.75	[0.54,1.04]	0.082
Austria	588	4381	13.42%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Stage of disease									
Advanced diagnosis									
Yes	313	1830	17.10%	2.21	[1.91,2.56]	0.000	2.00	[1.72,2.33]	0.000
No	413	4967	8.31%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Calendar period of HIV test									
2005-2008	203	1519	13.36%	0.73	[0.61,0.88]	0.001	0.83	[0.68,1.00]	0.046
2009-2012	140	1477	9.48%	0.68	[0.55,0.85]	0.000	0.77	[0.62,0.95]	0.015
2013-2016	67	1271	5.27%	0.55	[0.42,0.73]	0.000	0.63	[0.47,0.83]	0.001
≥ 2017	33	1239	2.66%	0.51	[0.35,0.74]	0.000	0.55	[0.37,0.80]	0.002
2001-2004	283	1291	21.92%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

Survival after the HIV diagnosis





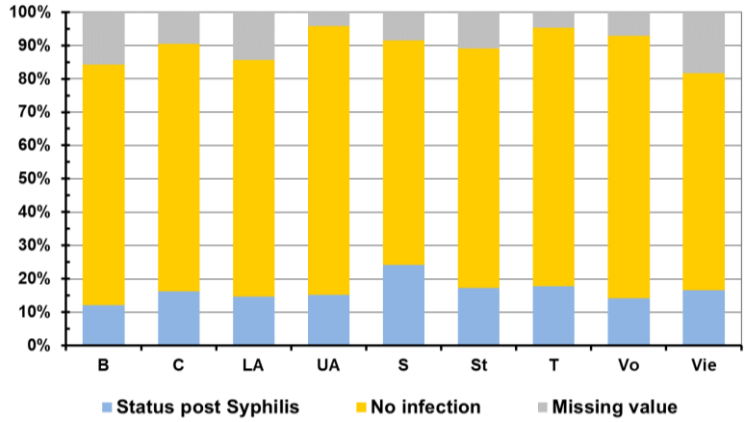
7 Co-infections

7.1 Syphilis

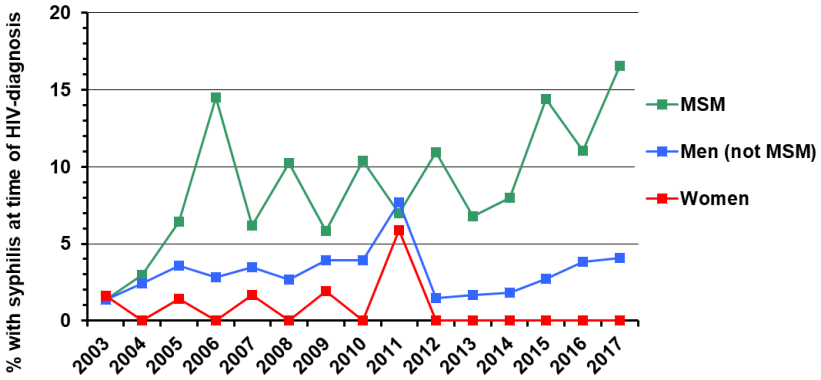
Syphilis can persist for several years when it is not treated, and reinfection with syphilis is possible because there is no protective immunity.

7.1.1 Status post syphilis diagnoses

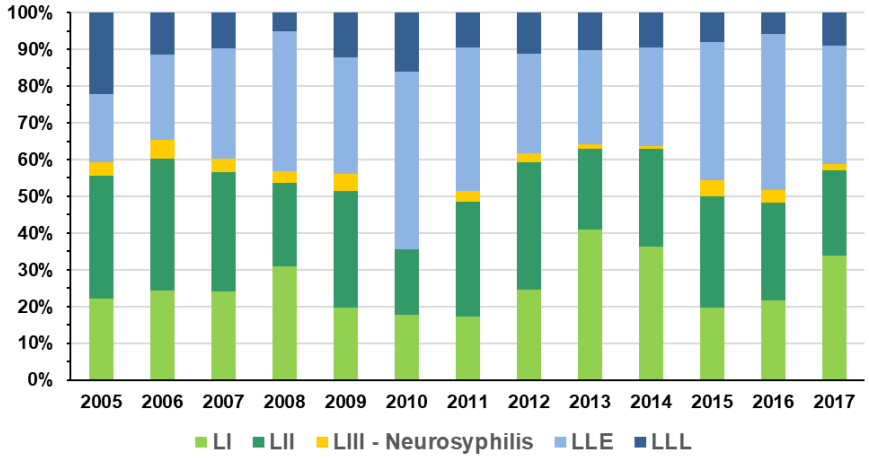
Included are all patients seen since 1.1.2001.



7.1.2 Syphilis at time of HIV diagnosis

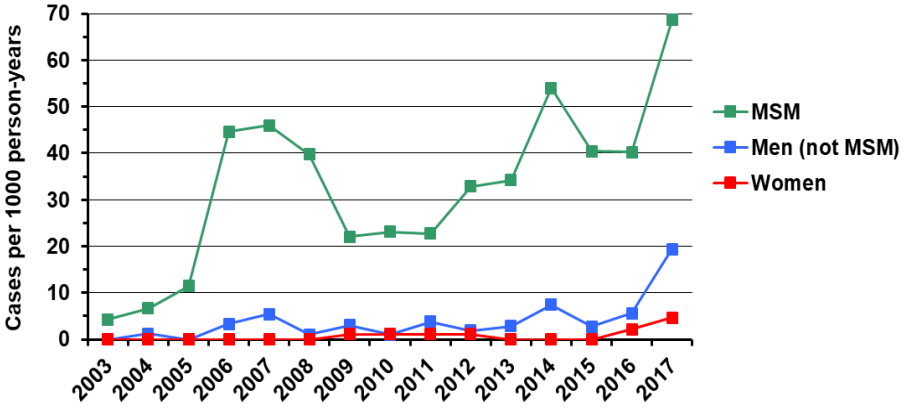


7.1.3 Stages of syphilis among HIV-infected MSM



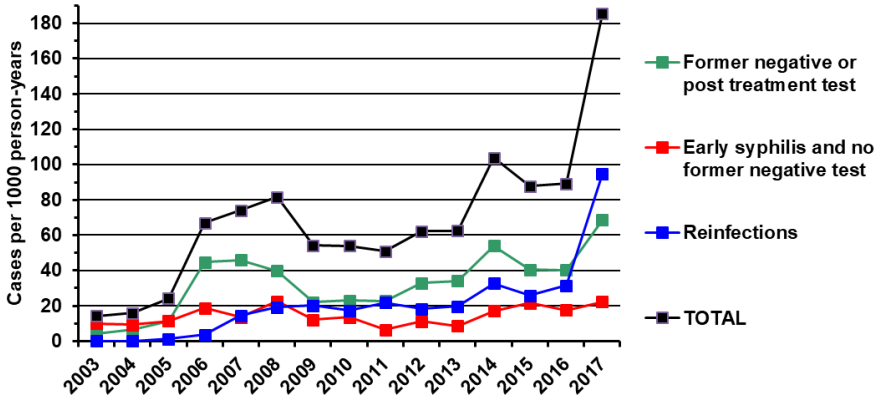
7.1.4 „Recent“ syphilis infections: Incidence

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).



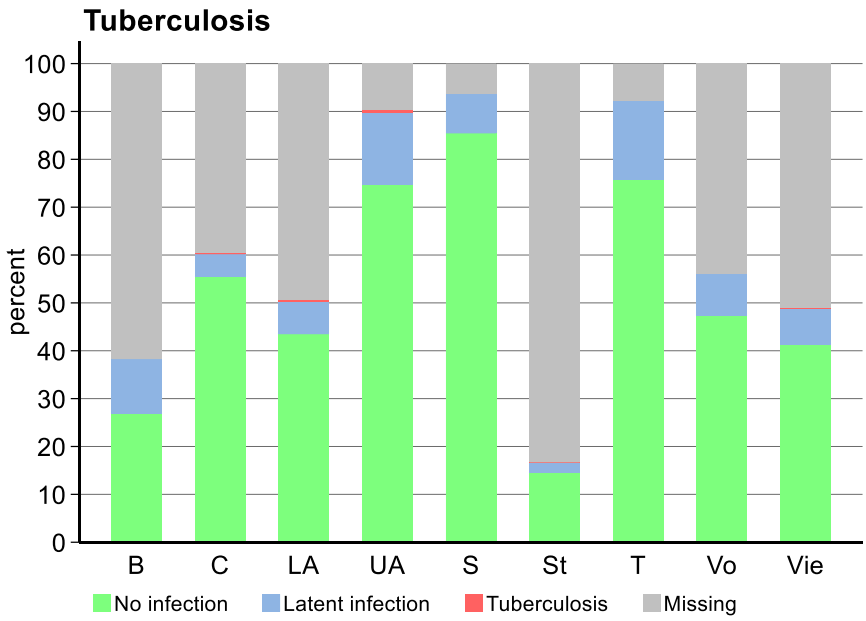
	MSM with incident syphilis	MSM without syphilis	Odds ratio	± 95% C.I.
N	533 (100.0%)	1825 (100.0%)		
Patients not on ART	105 (19.7%)	313 (17.2%)		
Patients on ART	428 (80.3%)	1512 (82.8%)	0.84	0.66 to 1.08
ART interruptions	95 (22.2%)	274 (18.1%)	1.29	0.99 to 1.68
Mean duration of ART in months (± SD)	34.4 (± 66.5)	61.6 (± 67.9)	p<0.001	
Patients on ART since 2.5 m	339 (63.6%)	1372 (75.2%)	0.43	0.32 to 0.58
HIV RNA <50 copies/ml	299 (88.2%)	1223 (89.1%)	0.77	0.51 to 1.15
Chronic hepatitis B	22 (4.1%)	42 (2.3%)	1.83	1.08 to 3.09
Chronic hepatitis C	20 (3.8%)	25 (1.4%)	2.81	1.55 to 5.09
Resistance				
Any (on ART)	86 (20.1%)	206 (13.6%)	1.51	1.15 to 1.99
Any transmitted	34 (6.4%)	97 (5.3%)	1.21	0.81 to 1.82
Mean CD4 nadir (± SD)	283.2 (± 175.3)	308.9 (± 219.9)	p=0.014	
Mean age (± SD)	40.6 (± 10.0)	44.3 (± 12.6)	p<0.001	

Incident cases of syphilis among HIV-infected MSM



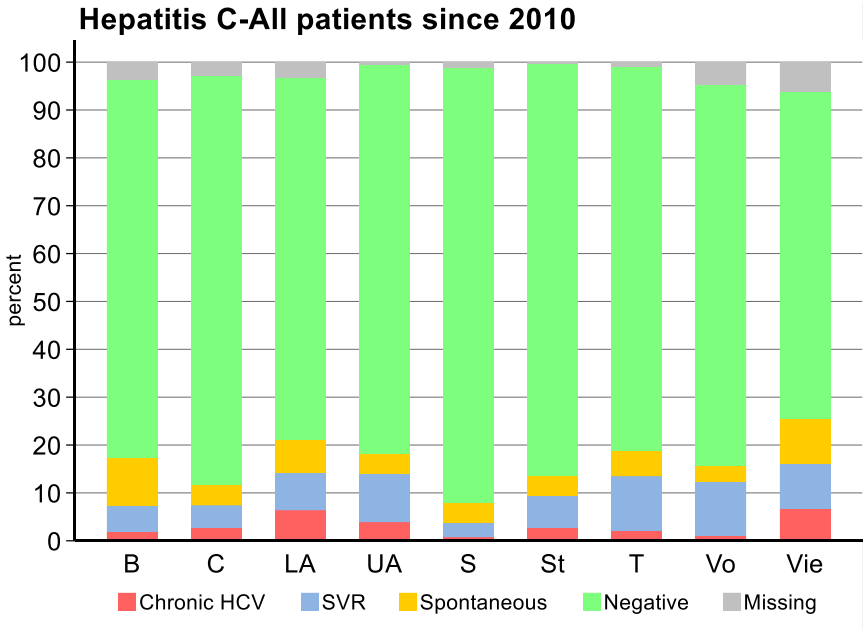
7.2 Tuberculosis in patients seen since 1.1.2010

Tuberculosis is incompletely recorded in the *HIV Patient Management System*.



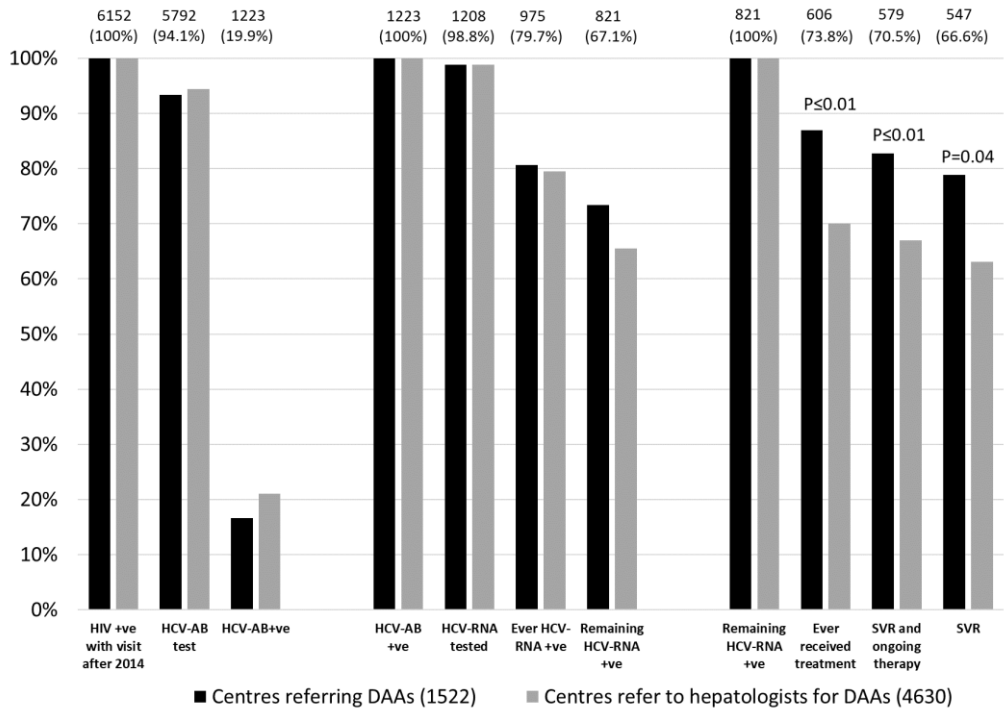
7.3 Hepatitis C

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



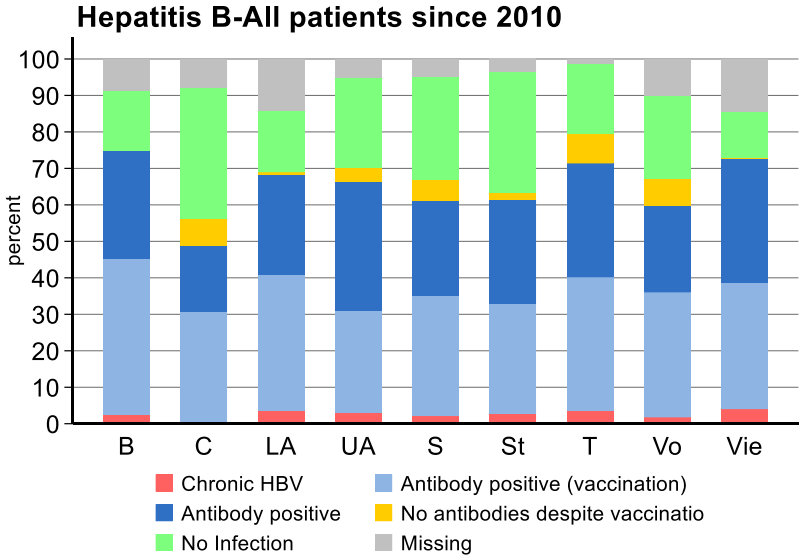
7.3.1 Cascade of Care in patients seen since 1.1.2014

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 01.09.2017
Stage 8: Cured (SVR)	HCV-RNA negative test at least 12 or 24 weeks post-treatment (for IFN-free and IFN-based therapy, respectively)



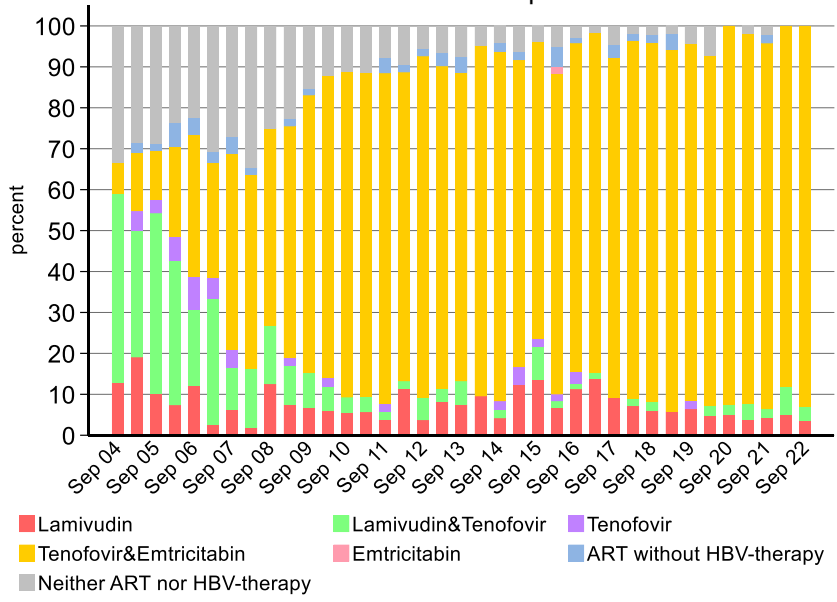
7.4 Hepatitis B in patients seen since 1.1.2010

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: 03/2022)

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 2021 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 3741 of 5986 patients had an amplifiable resistance test. The overall prevalence of TDR was 7.2 (268 of 3741 patients; 95% CI: 6.4%-8.0%). The prevalence of NRTI resistance was 3.0% (2.5%-3.6%), the prevalence of NNRTI resistance was 2.9% (2.4%-3.5%), and the prevalence of PI resistance was 1.7% (1.4%-2.2%). The relative risk of TDR in men who have sex with men compared to heterosexual contacts was 1.5 (95% CI: 1.2-2.0). The prevalence rate of TDR in the 1108 patients with acute/recent infection was 7.7% (64 of 831 patients; 6.1%-9.8%). One patient (0.1%) showed TDR against 3 drug classes (K70R; K103N; L90M). The prevalence rate of TDR in the 4854 patients with chronic infection was 7.0% (204 of 2910 patients; 6.1%-8.0%).
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 2003-2021 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	1570	1196	38	606	124	813	14	235	66	**4662**
2003-2021	1172	2020	212	603	402	643	110	575	249	**5986**

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	304	61	252
2004	354	64	282
2005	356	77	287
2006	364	57	302
2007	383	83	310
2008	404	66	326
2009	352	68	286
2010	368	97	282
2011	368	99	265
2012	376	62	304
2013	317	67	243
2014	307	46	254
2015	332	48	295
2016	297	54	246
2017	310	50	243
2018	208	42	173
2019	245	30	210
2020	166	25	147
2021	175	12	147
Total	**5986**	**1132**	**4854**

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

„Recent" infection means:

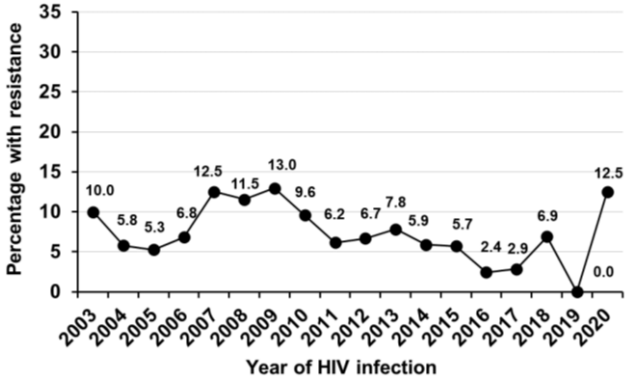
- Acute HIV infection (westernblot pattern or antigen/HIV RNA with clinical symptoms)
- Documented seroconversion with a negative HIV test not more than 3 years before the first positive test

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	54	7
2010	97	73	7
2011	99	81	5
2012	62	45	3
2013	67	51	4
2014	46	34	2
2015	48	35	2
2016	54	41	1
2017	50	35	1
2018	42	29	2
2019	30	12	-
2020	25	16	2
2021	12	6	-
Sex/ mode of transmission			
MSM	717	541	50
Male IDU	112	80	3
Female IDU	46	30	3
Male heterosexual	108	87	6
Female heterosexual	104	82	2
Other	21	11	-
Total	**1108**	**831**	**64**

Overall rate of transmitted drug resistance in recent infection was 7.7% (64 of 831).



The year 2021 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

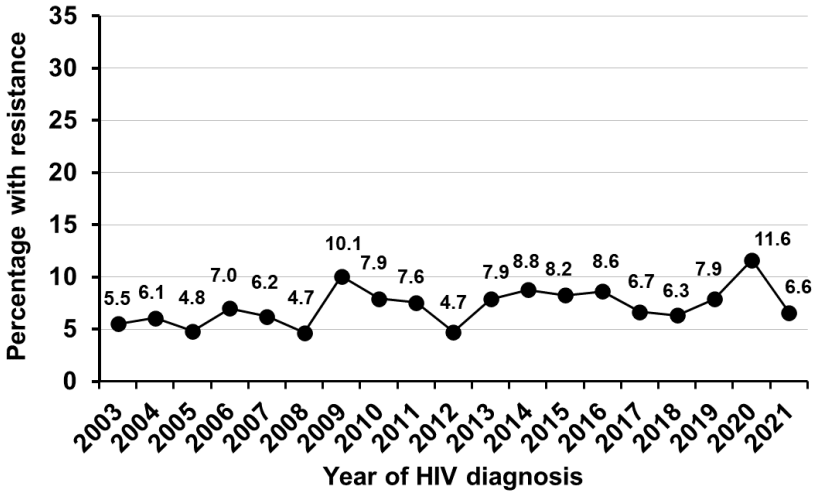
	Number of HIV infections	Available resistance tests	Wild type	Any resistance	Resistance to						
					NRTI	NNRTI	PI	NRTI and PI	NRTI and NNRTI	NNRTI and PI	3-class-resistance
Year of HIV infection											
2003	61	50	45	5	4	1	-	-	-	-	-
2004	64	52	49	3	-	3	-	-	-	-	-
2005	77	57	54	3	1	2	-	-	-	-	-
2006	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	54	47	7	2	3	4	1	-	1	-
2010	97	73	66	7	1	5	1	-	-	-	-
2011	99	81	76	5	1	4	1	-	-	1	-
2012	62	45	42	3	3	-	-	-	-	-	-
2013	67	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	50	35	34	1	-	-	1	-	-	-	-
2018	42	29	27	2	-	1	1	-	-	-	-
2019	30	12	12	-	-	-	-	-	-	-	-
2020	25	16	14	2	-	2	-	-	-	-	-
2021	12	6	6	-	-	-	-	-	-	-	-
Population size of area of residence											
Rural areas	497	384	356	28	10	16	6	1	1	3	1
Capital cities	172	136	123	13	3	5	6	1	-	-	-
Vienna	436	310	287	23	11	11	3	1	1	-	-
Missing value	3	1	1	-	-	-	-	-	-	-	-
Sex/ mode of transmission											
MSM	717	541	491	50	18	25	14	3	2	3	1
Male IDU	112	80	77	3	2	1	-	-	-	-	-
Female IDU	46	30	27	3	-	3	-	-	-	-	-
Male heterosexual	108	87	81	6	2	3	1	-	-	-	-
Female heterosexual	104	82	80	2	2	-	-	-	-	-	-
Others	21	11	11	-	-	-	-	-	-	-	-
Age at time of HIV-test											
< 35 years	639	469	423	46	16	25	8	1	1	1	-
≥ 35 years	469	362	344	18	8	7	7	2	1	2	1
Total	**1108**	**831**	**767**	**64**	**24**	**32**	**15**	**3**	**2**	**3**	**1**

Younger patients (<35 years) had a higher risk for transmitted resistance (OR=2.2, 95% CI: 1.2-4.1).

8.5 Unknown time of infection (not “recent”)

Men who had been infected through intravenous drug use (OR=0.4, 95% CI: 0.2-0.7) or heterosexually (OR=0.6, 95% CI: 0.4-0.9) had a lower risk of transmitted resistance, younger patients (<35 years) had a higher risk (OR=1,4, 95 %-CI: 1,03–1,9).

	Number of HIV diagnoses	Available resistance tests before ART	Any resistance
Year of HIV diagnosis			
2003	252	145	8
2004	282	181	11
2005	287	187	9
2006	302	186	13
2007	310	193	12
2008	326	193	9
2009	286	189	19
2010	282	189	15
2011	265	172	13
2012	304	190	9
2013	243	152	12
2014	254	148	13
2015	295	170	14
2016	246	162	14
2017	243	150	10
2018	173	95	6
2019	210	89	7
2020	147	43	5
2021	147	76	5
Mode of transmission			
MSM	2057	1271	109
Male IDU	485	299	10
Female IDU	140	81	7
Male heterosexual	970	588	27
Female heterosexual	863	540	40
Other	339	131	11
Total	**4854**	**2910**	**204**



Transmission of drug resistant HIV according to the time of the HIV diagnosis, residence, mode of transmission, gender and age

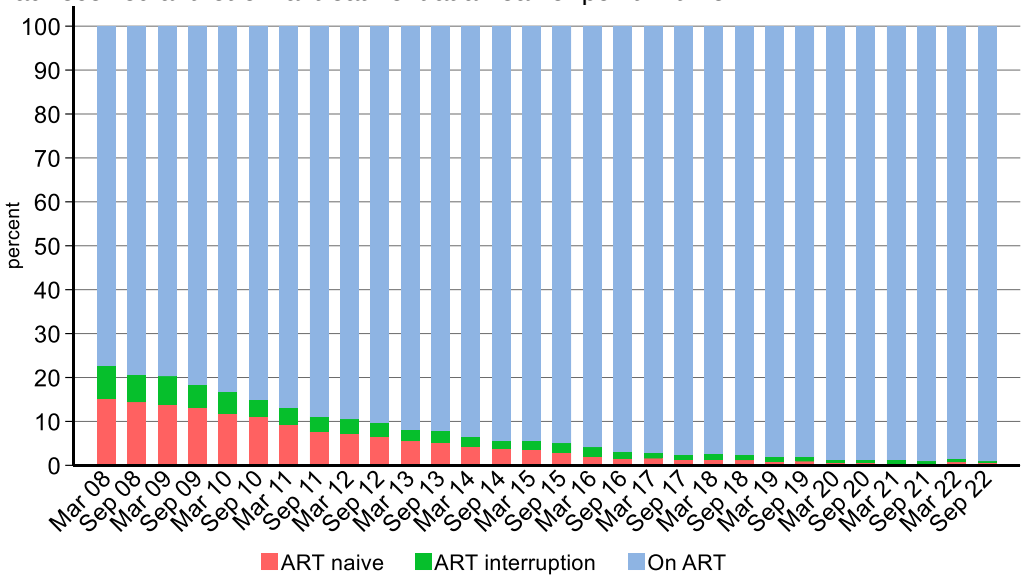
Not-"recent" infections

	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	252	145	137	8	4	3	1	-	-	-	-
2004	282	181	170	11	6	2	4	1	-	-	-
2005	287	187	178	9	7	1	4	3	-	-	-
2006	302	186	173	13	6	2	5	-	-	-	-
2007	310	193	181	12	7	2	3	-	-	-	-
2008	326	193	184	9	4	2	3	-	-	-	-
2009	286	189	170	19	7	4	9	-	1	-	-
2010	282	189	174	15	4	8	4	1	-	-	-
2011	265	172	159	13	3	6	4	-	-	-	-
2012	304	190	181	9	7	2	1	-	1	-	-
2013	243	152	140	12	7	5	-	-	-	-	-
2014	254	148	135	13	3	6	4	-	-	-	-
2015	295	170	156	14	5	6	4	-	-	1	-
2016	246	162	148	14	3	10	1	-	-	-	-
2017	243	150	140	10	4	6	-	-	-	-	-
2018	173	95	89	6	4	1	2	1	-	-	-
2019	210	89	82	7	2	4	1	-	-	-	-
2020	147	43	38	5	2	4	-	-	1	-	-
2021	147	76	71	5	2	3	-	-	-	-	-
Population size of area of residence											
Rural areas	1864	1175	1085	90	40	31	20	0	1	-	-
Capital cities	637	454	421	33	9	18	8	-	2	-	-
Vienna	2288	1264	1186	78	37	27	21	6	-	1	-
Missing value	65	17	14	3	1	1	1	-	-	-	-
Sex/ mode of transmission											
MSM	2057	1271	1162	109	42	42	28	2	-	1	-
Male IDU	485	299	289	10	3	7	-	-	-	-	-
Female IDU	140	81	74	7	2	4	1	-	-	-	-
Male heterosexual	970	588	561	27	13	7	9	1	1	-	-
Female heterosexual	863	540	500	40	23	12	10	3	2	-	-
Others	339	131	120	11	4	5	2	-	-	-	-
Age at time of HIV-test											
< 35 years	2446	1396	1286	110	48	46	24	6	2	-	-
≥ 35 years	2408	1514	1420	94	39	31	26	-	1	1	-
Total	**4854**	**2910**	**2706**	**204**	**87**	**77**	**50**	**6**	**3**	**1**	**0**

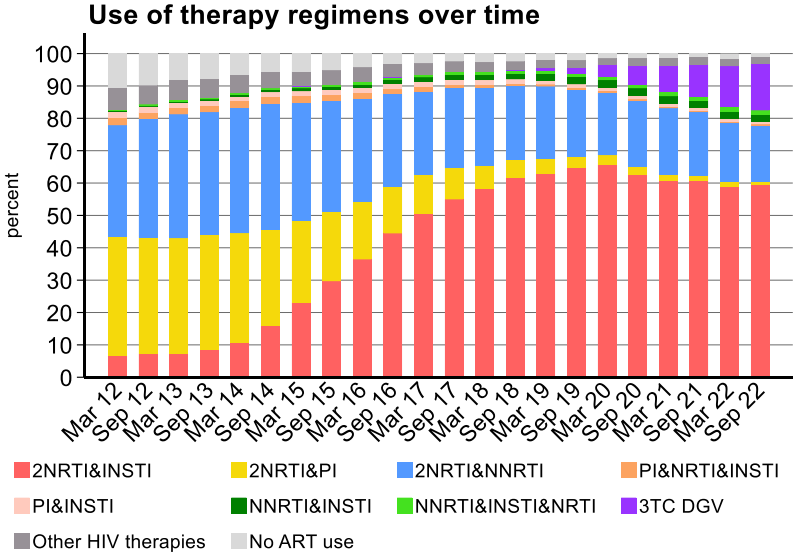
9 Antiretroviral therapy (ART)

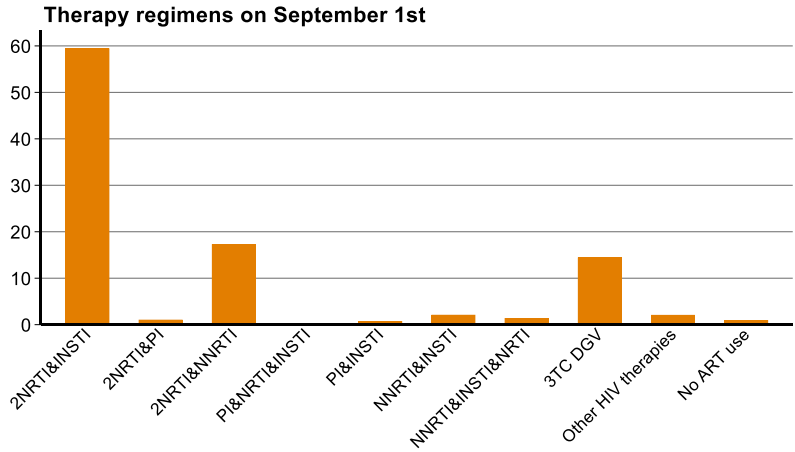
9.1 Patients currently in care regarding treatment status

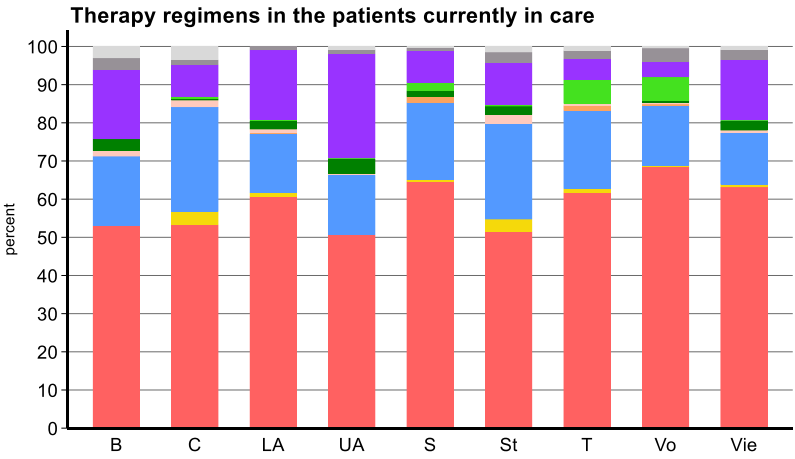
On September 1st, 2022 4494 (99.0%) patients were on antiretroviral therapy in the 9 HIV treatment centres. Of the 44 patients not on treatment on September 1st, 2022, 12 had received antiretroviral treatment at an earlier point in time.

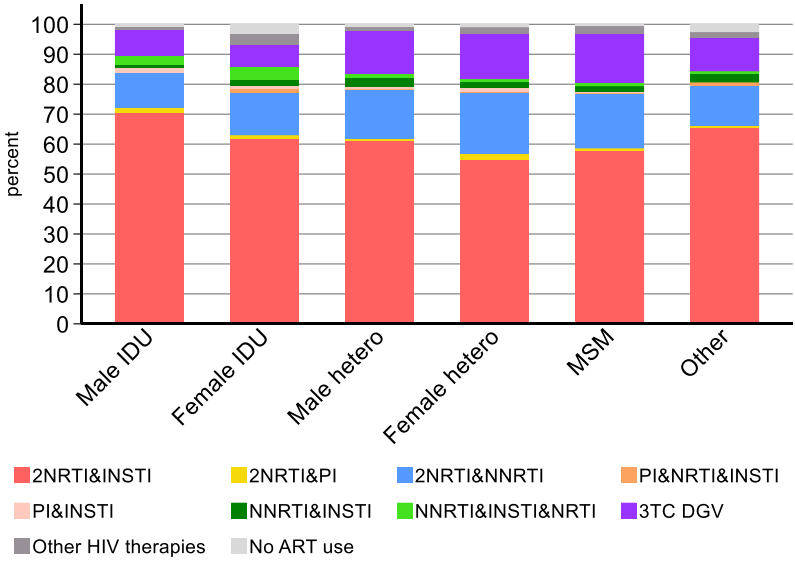


9.2 Regimens of antiretroviral therapy



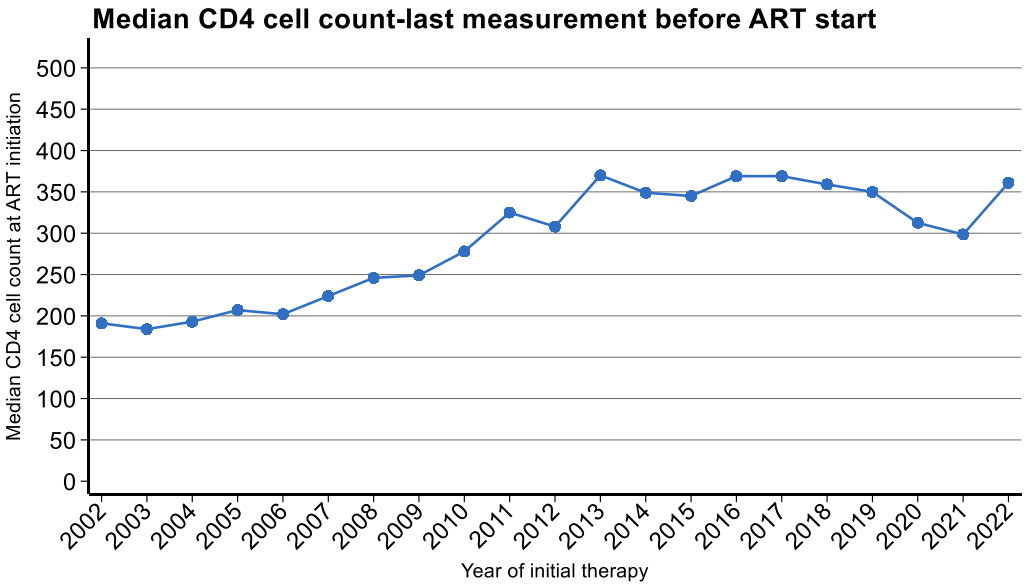

Therapy regimens on September 1st
60
50
40
30
20
10
0
2NRTI&INSTI
2NRTI&PI
2NRTI&NNRTI
PI&NRTI&INSTI
PI&INSTI
NNRTI&INSTI
NNRTI&INSTI&NRTI
3TC DGV
Other HIV therapies
No ART use


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

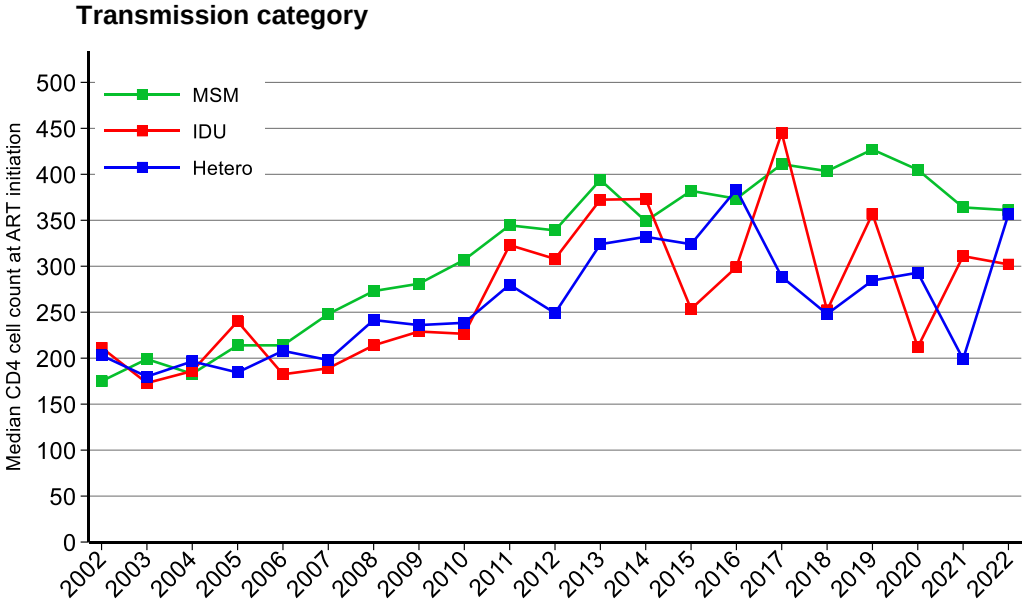

percent
100
90
80
70
60
50
40
30
20
10
0
Male IDU
Female IDU
Male hetero
Female hetero
MSM
Other
2NRTI&INSTI
2NRTI&PI
2NRTI&NNRTI
PI&NRTI&INSTI
PI&INSTI
NNRTI&INSTI
NNRTI&INSTI&NRTI
3TC DGV
Other HIV therapies
No ART use

9.3 CD4 cell counts at initiation of ART

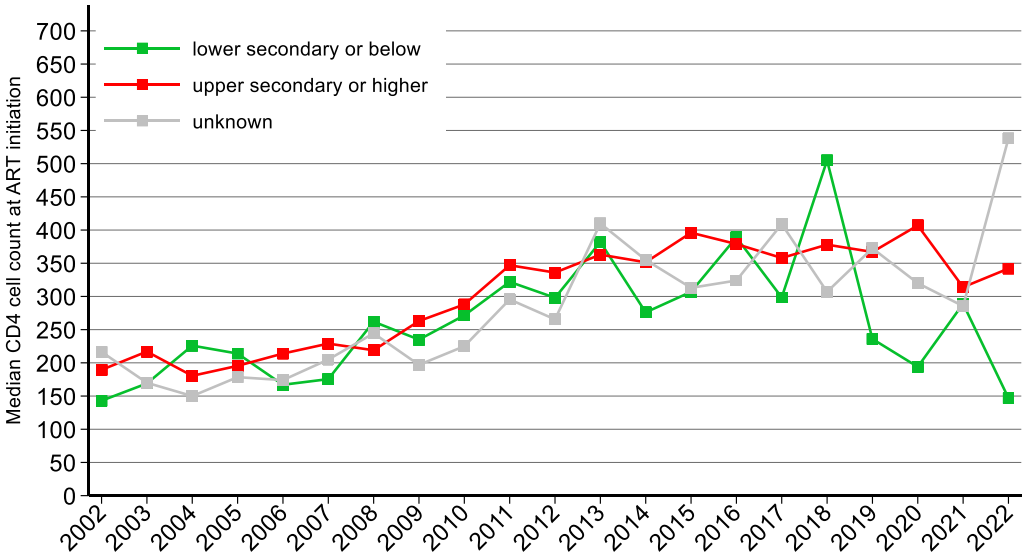
9.3.1 CD4 cell counts at initiation of ART



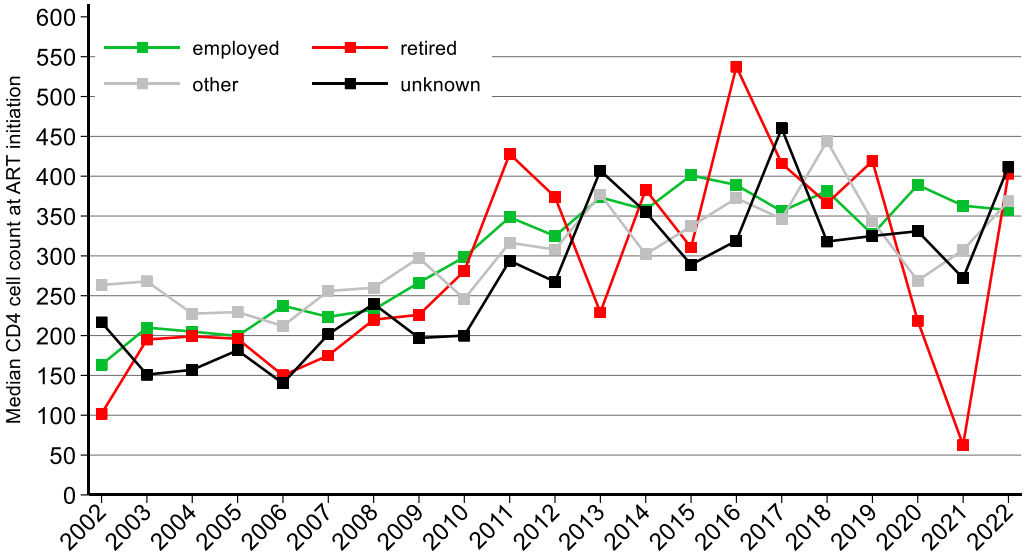
9.3.2 Median CD4 count at ART initiation



Level of education

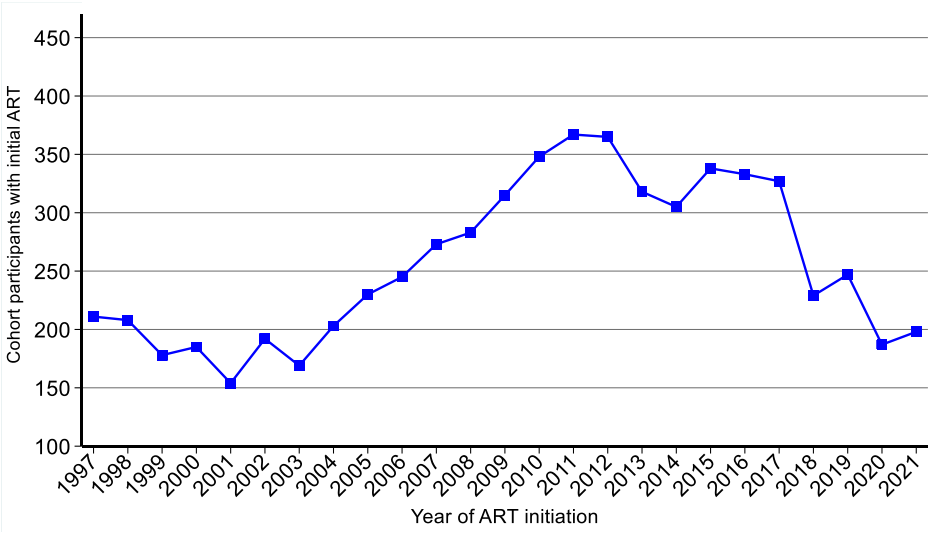


Status of employment



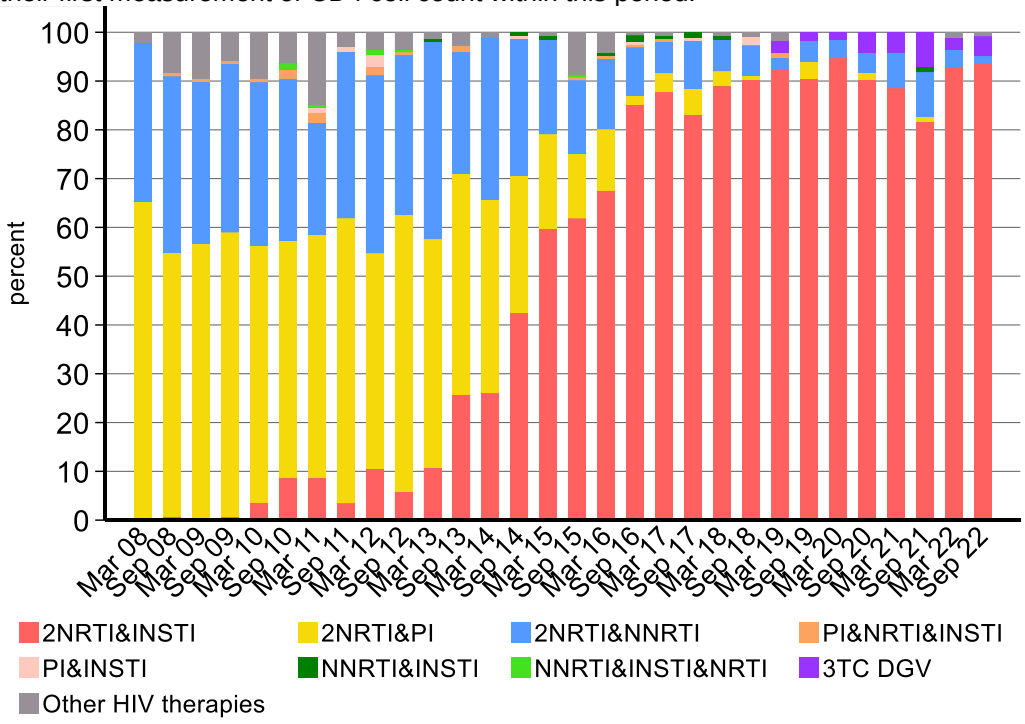
9.4 Initial therapy

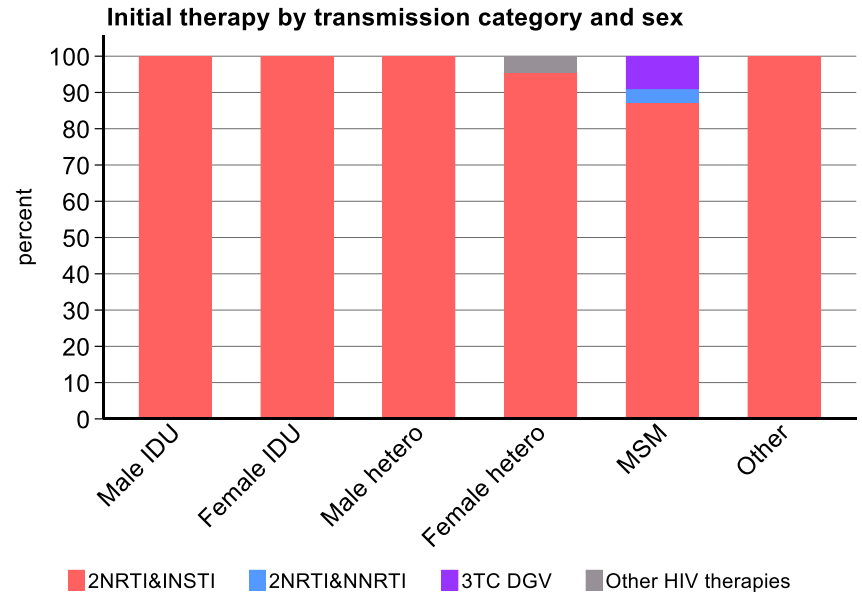
9.4.1 Number of persons who started ART in the respective year



9.4.2 Regimens of the initial therapy

After March 1st, 2022, 123 patients started antiretroviral therapy. 110 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
3TC DGV
Other HIV therapies

,

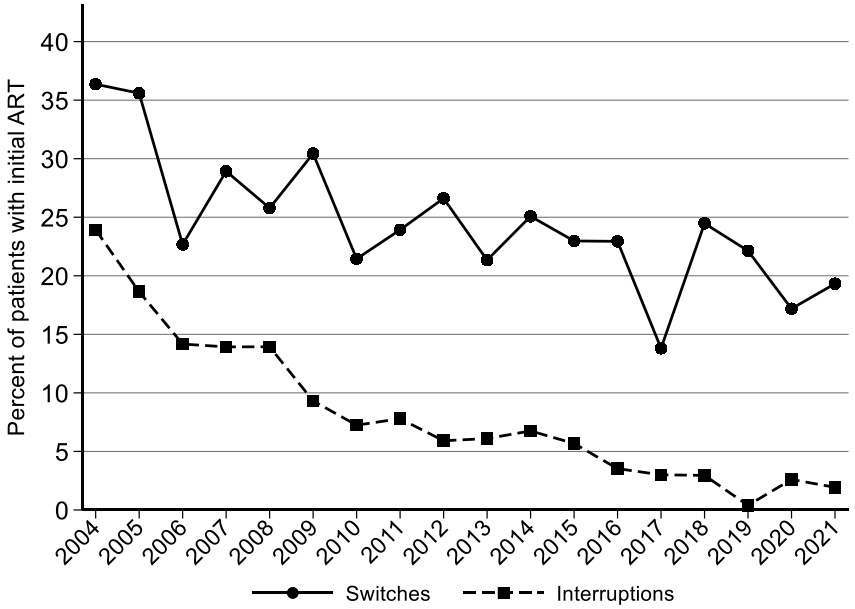
9.5 ART switches and interruptions

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	35.6	18.6
2006	22.7	14.2
2007	28.9	13.9
2008	25.8	13.9
2009	30.4	9.3
2010	21.4	7.2
2011	23.9	7.8
2012	26.6	5.9
2013	21.3	6.1
2014	25.1	6.8
2015	23.0	5.7
2016	22.9	3.5
2017	13.8	3.0
2018	24.5	3.0
2019	22.1	0.4
2020	17.2	2.6
2021	19.3	1.9

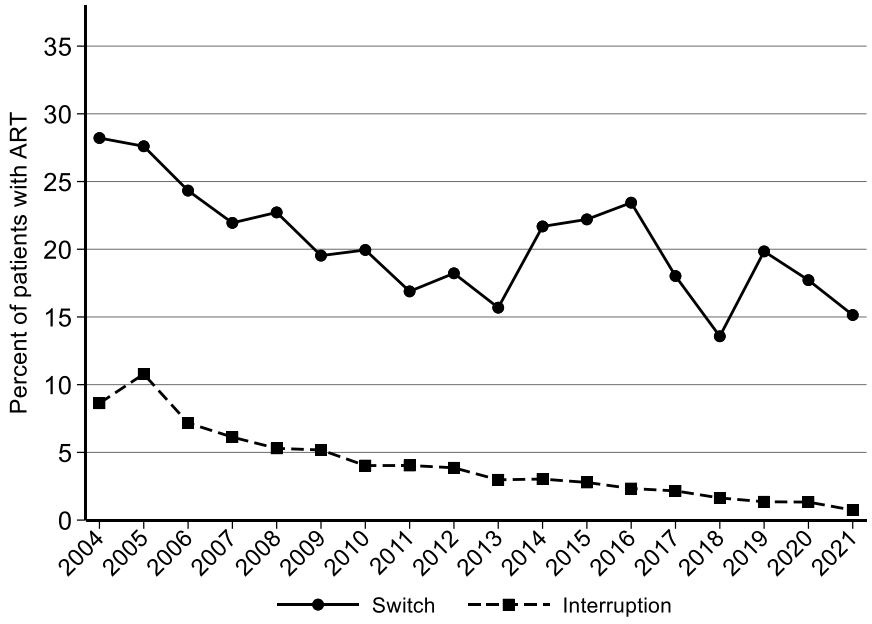


9.5.2 ART switches and interruptions per calendar year

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	28.2	8.6
2005	27.6	10.8
2006	24.3	7.2
2007	21.9	6.1
2008	22.7	5.3
2009	19.5	5.2
2010	19.9	4.0
2011	16.9	4.0
2012	18.2	3.9
2013	15.7	3.0
2014	21.7	3.0
2015	22.2	2.8
2016	23.4	2.3
2017	18.0	2.2
2018	13.6	1.6
2019	19.8	1.4
2020	17.7	1.3
2021	15.1	0.7



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

	Switch	All		Univariable logistic regression			Multivariable logistic regression		
	1278	5255	24.32%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	128	573	22.34%	1.01	[0.81,1.26]	0.915	0.91	[0.72,1.14]	0.400
Female IDU	43	206	20.87%	0.93	[0.65,1.32]	0.676	0.87	[0.60,1.24]	0.430
Male heterosexual	226	972	23.25%	1.07	[0.89,1.27]	0.482	0.88	[0.73,1.06]	0.184
Female heterosexual	285	866	32.91%	1.73	[1.45,2.05]	0.000	1.53	[1.28,1.83]	0.000
Other	71	266	26.69%	1.28	[0.96,1.71]	0.092	1.10	[0.81,1.47]	0.549
MSM	525	2372	22.13%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Age at baseline									
< 30 years	299	1314	22.75%	0.77	[0.64,0.94]	0.011	0.81	[0.66,1.00]	0.045
30-50 years	743	3085	24.08%	0.83	[0.70,0.99]	0.037	0.82	[0.69,0.98]	0.029
≥ 50	236	856	27.57%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
AIDS at baseline									
Yes	281	793	35.44%	1.91	[1.62,2.24]	0.000			
No	997	4462	22.34%	1.00	[1.00,1.00]	.			
CD4 count at baseline									
< 50	200	587	34.07%	2.17	[1.77,2.67]	0.000	2.03	[1.63,2.51]	0.000
50-199	302	1033	29.24%	1.74	[1.45,2.07]	0.000	1.60	[1.33,1.93]	0.000
200-349	302	1371	22.03%	1.19	[1.00,1.41]	0.053	1.10	[0.91,1.31]	0.321
Missing	125	449	27.84%	1.62	[1.28,2.05]	0.000	1.72	[1.35,2.19]	0.000
≥ 350	349	1815	19.23%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV-RNA at baseline									
10.000-99.999	373	1844	20.23%	0.87	[0.72,1.06]	0.171			
≥ 100.000	521	1873	27.82%	1.33	[1.10,1.60]	0.003			
Missing	187	663	28.21%	1.35	[1.07,1.70]	0.011			
≤ 9.999	197	875	22.51%	1.00	[1.00,1.00]	.			
Nationality									
High prevalence countries	198	682	29.03%	1.32	[1.11,1.58]	0.002			
Low prevalence countries	1080	4573	23.62%	1.00	[1.00,1.00]	.			
Population size of area of residence									
Rural areas	514	2071	24.82%	1.13	[0.99,1.30]	0.075	1.13	[0.98,1.31]	0.086
Capital cities	208	720	28.89%	1.39	[1.16,1.68]	0.000	1.45	[1.19,1.75]	0.000
Vienna	556	2464	22.56%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Year of ART Initiation									
2004-2007	297	972	30.56%	1.77	[1.47,2.13]	0.000	1.65	[1.35,2.00]	0.000
2008-2011	338	1340	25.22%	1.36	[1.14,1.62]	0.001	1.39	[1.16,1.66]	0.000
2012-2015	332	1381	24.04%	1.27	[1.07,1.52]	0.007	1.32	[1.10,1.57]	0.003
2016-2021	311	1562	19.91%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

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

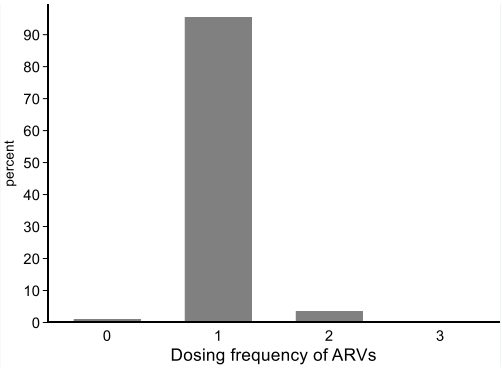
	TI	All		Univariable logistic regression			Multivariable logistic regression		
	416	5255	7.92%	OR	[95% CI]	p value	OR	[95% CI]	p value
HIV transmission category									
Male IDU	90	573	15.71%	4.95	[3.63,6.76]	0.000	3.55	[2.56,4.91]	0.000
Female IDU	53	206	25.73%	9.21	[6.30,13.46]	0.000	6.44	[4.31,9.61]	0.000
Male heterosexual	72	972	7.41%	2.13	[1.54,2.94]	0.000	1.73	[1.22,2.45]	0.002
Female heterosexual	103	866	11.89%	3.59	[2.66,4.83]	0.000	2.42	[1.73,3.39]	0.000
Other	12	266	4.51%	1.26	[0.68,2.33]	0.470	1.22	[0.64,2.30]	0.547
MSM	86	2372	3.63%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Age at baseline									
< 30 years	168	1314	12.79%	2.58	[1.84,3.62]	0.000	1.75	[1.21,2.54]	0.003
30-50 years	202	3085	6.55%	1.23	[0.89,1.72]	0.212	0.92	[0.65,1.30]	0.632
≥ 50	46	856	5.37%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
AIDS at baseline									
Yes	66	793	8.32%	1.07	[0.81,1.40]	0.645			
No	350	4462	7.84%	1.00	[1.00,1.00]	.			
CD4 count at baseline									
< 50	48	587	8.18%	1.12	[0.79,1.58]	0.527			
50-199	85	1033	8.23%	1.12	[0.85,1.49]	0.416			
200-349	114	1371	8.32%	1.14	[0.88,1.48]	0.331			
Missing	35	449	7.80%	1.06	[0.72,1.56]	0.766			
≥ 350	134	1815	7.38%	1.00	[1.00,1.00]	.			
HIV-RNA at baseline									
10.000-99.999	143	1844	7.75%	0.84	[0.63,1.11]	0.218			
≥ 100.000	134	1873	7.15%	0.77	[0.57,1.02]	0.071			
Missing	59	663	8.90%	0.97	[0.68,1.38]	0.869			
≤ 9.999	80	875	9.14%	1.00	[1.00,1.00]	.			
Nationality									
High prevalence countries	87	682	12.76%	1.89	[1.47,2.43]	0.000	1.35	[1.00,1.84]	0.053
Low prevalence countries	329	4573	7.19%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Rural areas	124	2071	5.99%	0.64	[0.51,0.81]	0.000	0.84	[0.66,1.07]	0.168
Capital cities	70	720	9.72%	1.09	[0.82,1.44]	0.560	1.41	[1.04,1.90]	0.027
Vienna	222	2464	9.01%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Year of ART Initiation									
2004-2007	168	972	17.28%	8.16	[5.70,11.68]	0.000	5.84	[4.04,8.45]	0.000
2008-2011	125	1340	9.33%	4.02	[2.78,5.80]	0.000	3.12	[2.15,4.54]	0.000
2012-2015	84	1381	6.08%	2.53	[1.72,3.72]	0.000	2.23	[1.51,3.30]	0.000
2016-2021	39	1562	2.50%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

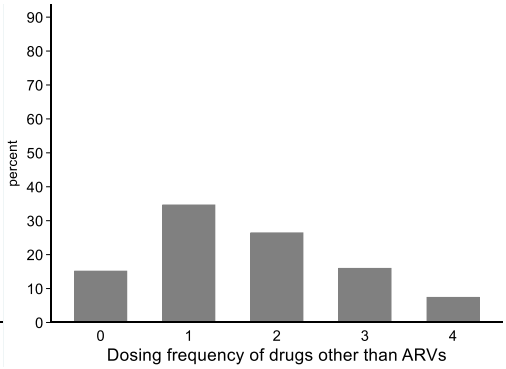
9.7 Frequency of drug dosing

9.7.1 Overview

22 of 4538 (0.5%) patients do not take any drugs at all and 22 (0.5%) patients have no ART but take other drugs. 669 (14.7%) patients are receiving ART only.

	Number of patients					
Dosing frequency	**0**	**1**	**2**	**3**	**4**	**Total**
Antiretrovirals (ARVs)	44	4333	159	2	0	4538
Drugs other than ARVs	691	1576	1203	728	340	4538
Overall dosing frequency	22	1517	1688	916	395	4538
Overall dosing frequency in patients with once daily ARVs	0	1509	1596	865	363	4333





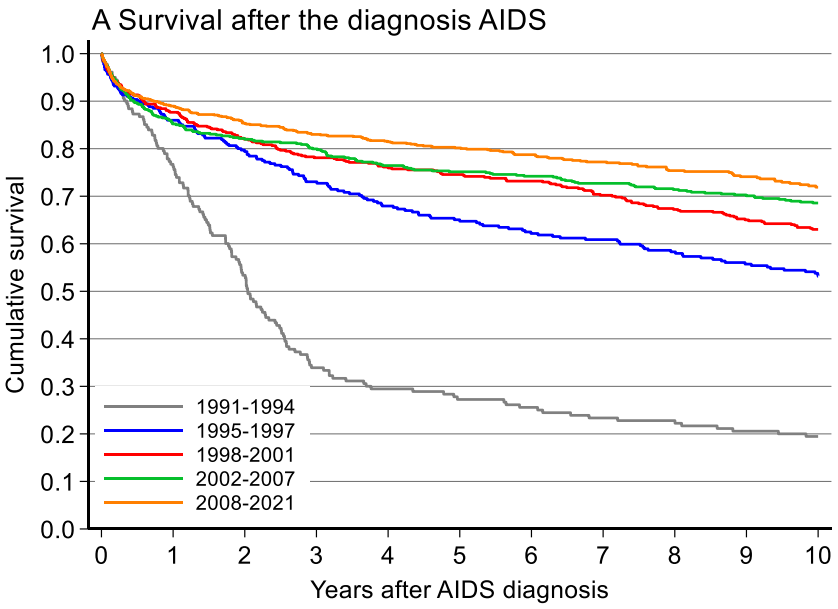
9.7.2 Most frequent used regimen to treat HIV (September 2022)

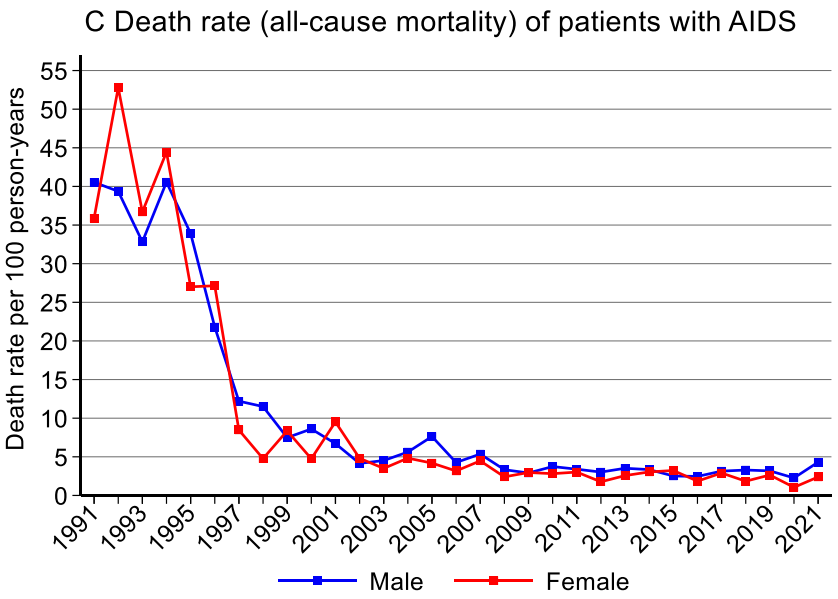
Regimen	Frequency	Percent
BGV FTC TAF	1,665	37.05
3TC DGV	656	14.6
3TC ABC DGV	481	10.7
FTC RPV TAF	363	8.08
3TC DOR TDF	209	4.65
EVG FTC TAF	170	3.78
DGV FTC TDF	139	3.09
3TC ABC RAL	73	1.62
DGV FTC TAF	73	1.62
DGV RPV	65	1.45
3TC ABC NVP	60	1.34
FTC RAL TDF	55	1.22
FTC RPV TDF	44	0.98
FTC RAL TAF	37	0.82
BLIND	35	0.78
EFV FTC TDF	35	0.78
Others	334	7.21
Total	**4494**	**100.00**

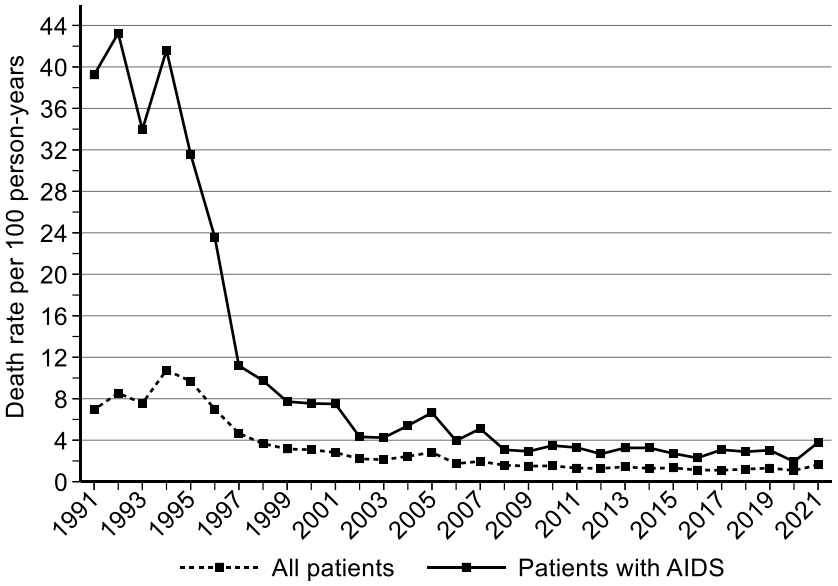
10 Disease progression and Response to ART

10.1 Mortality of patients with AIDS since 1985

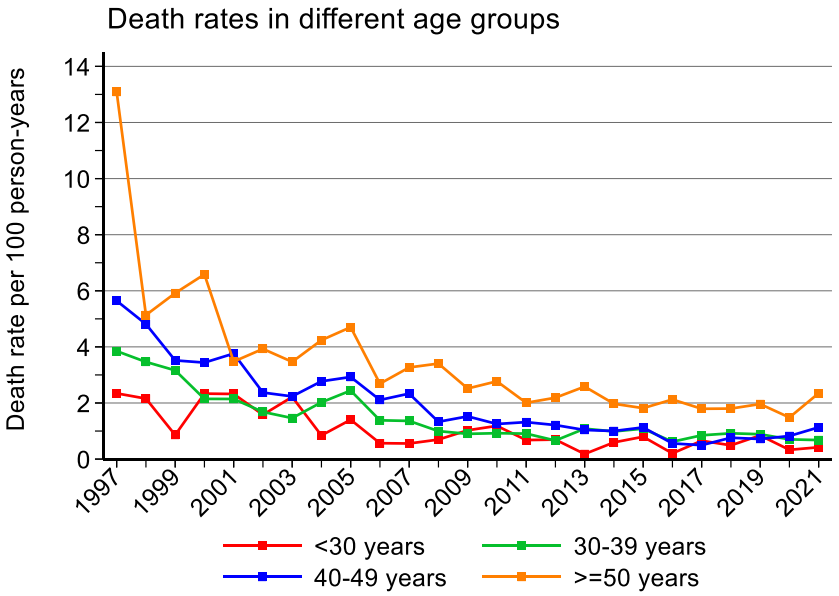
The documentation of death is partially incomplete in the HIV Patient Management System (e.g. considerable proportion of patients without follow-up since 2001 are not documented dead but presumed dead, see chapter 4).

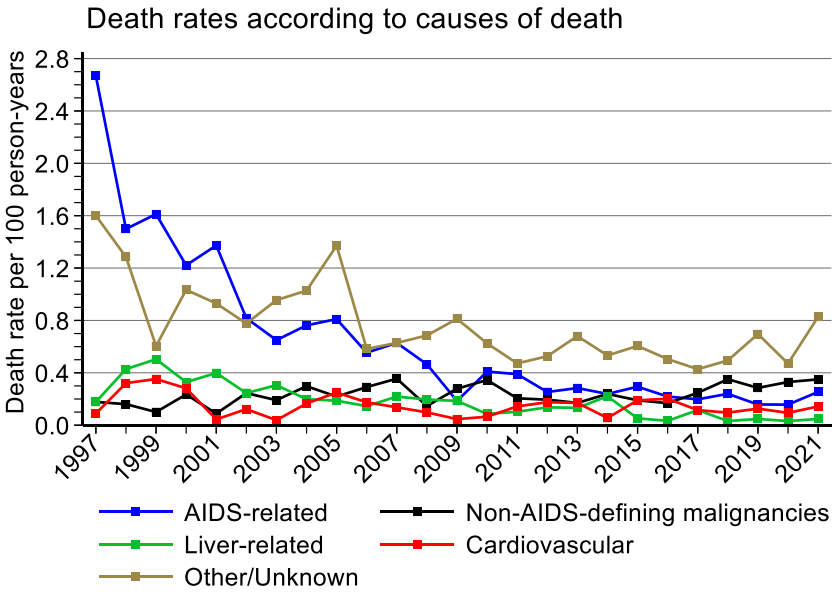


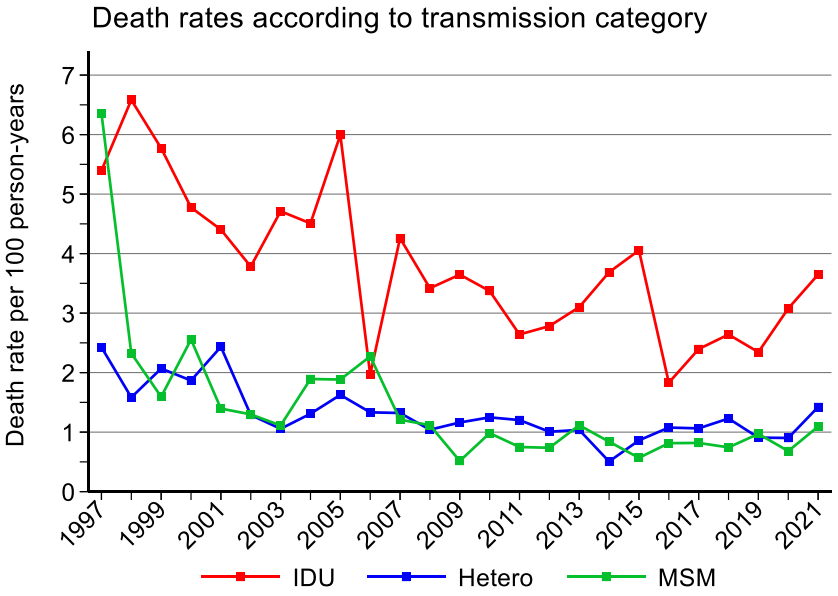




10.2 Mortality in combination ART era (years 1997-2017)



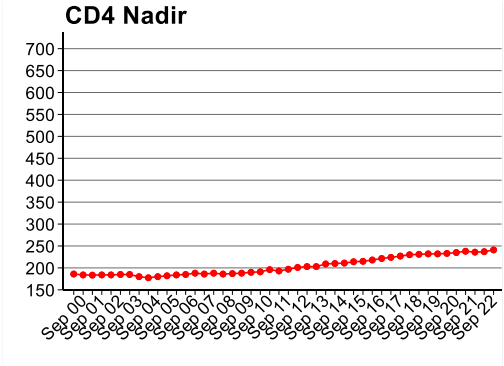

Death rates according to causes of death
Death rate per 100 person-years
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
AIDS-related
Non-AIDS-defining malignancies
Liver-related
Cardiovascular
Other/Unknown

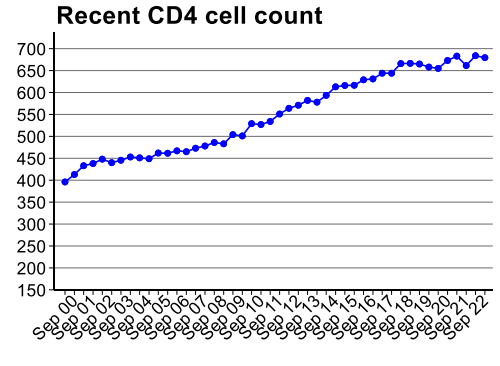

Death rates according to transmission category
Death rate per 100 person-years
7
6
5
4
3
2
1
0
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
IDU
Hetero
MSM

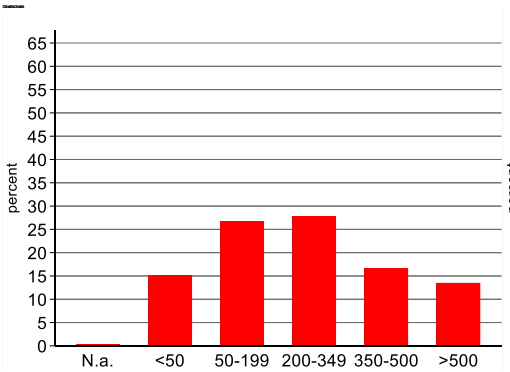
10.3 CD4 cell counts

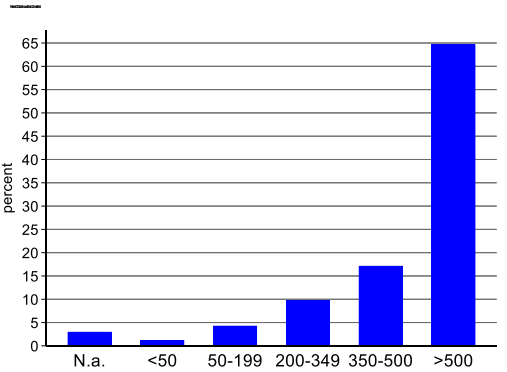
10.3.1 CD4 cell counts: nadir and most recent

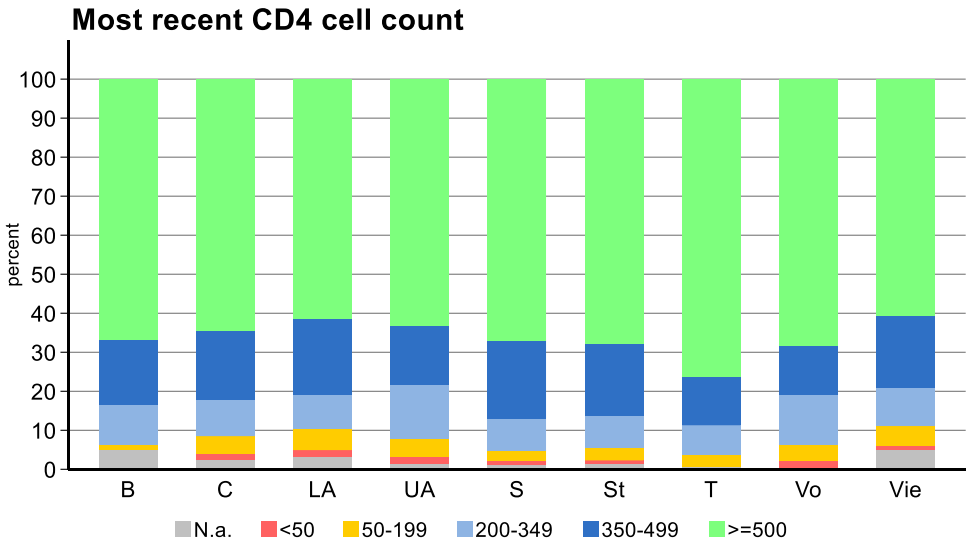
Median CD4 cell counts







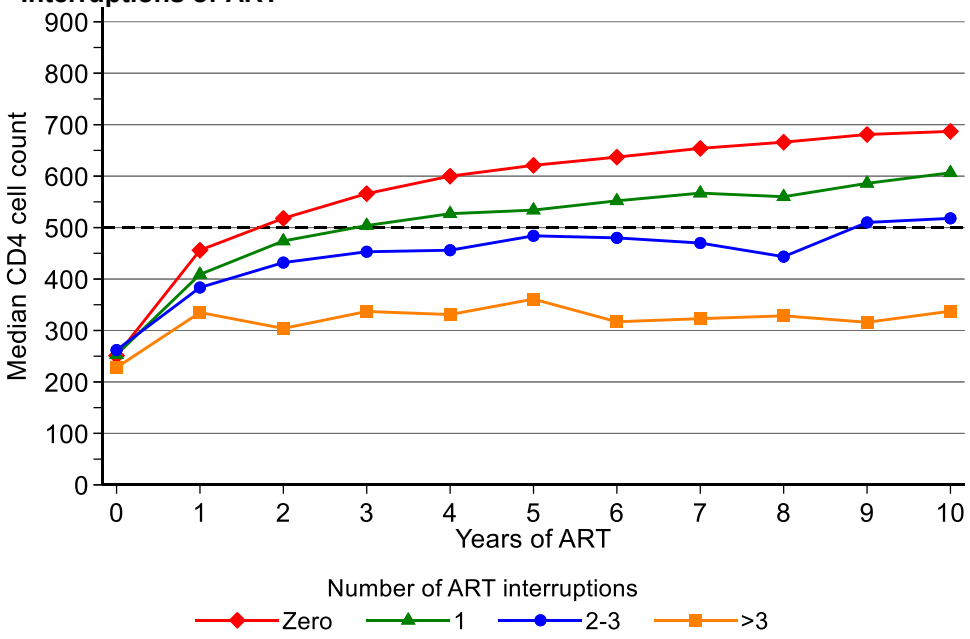




10.3.2 Median CD4 cell counts after initiating ART

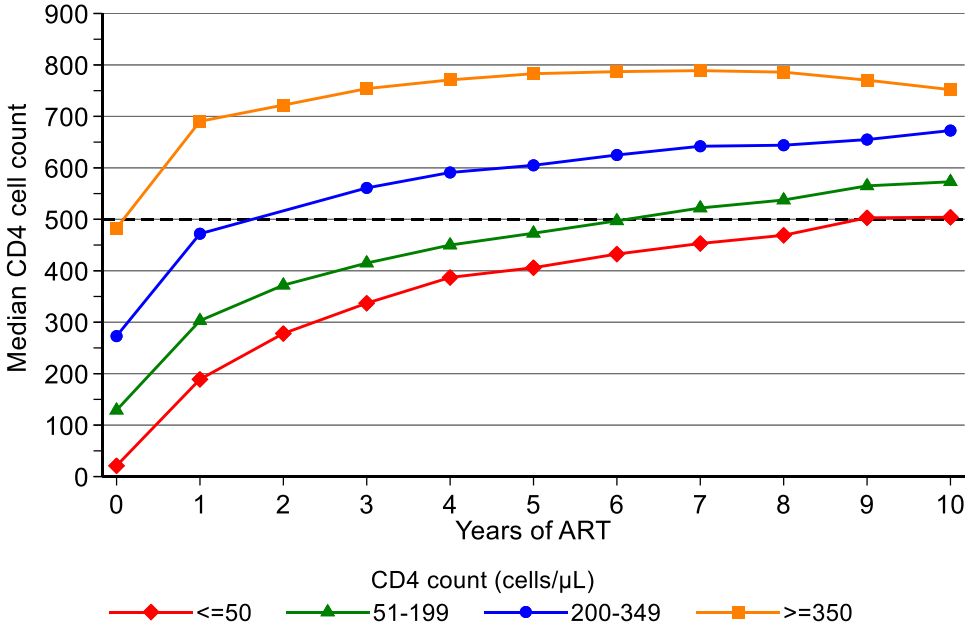
The analyses include only patients who initiated ART after January 1, 1997.

a) Interruptions of ART



b) Baseline CD4 count

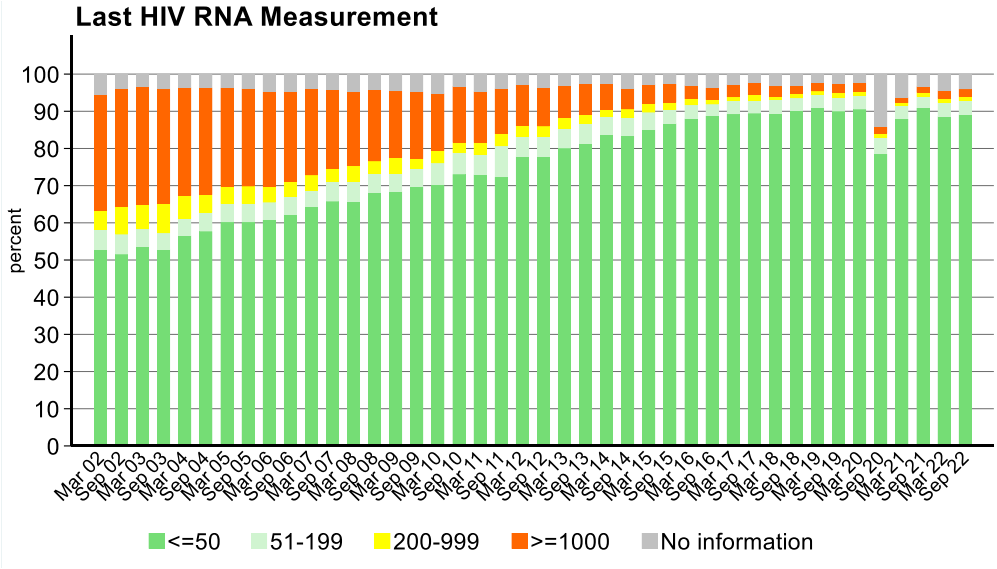
Patients were included until treatment interruption.

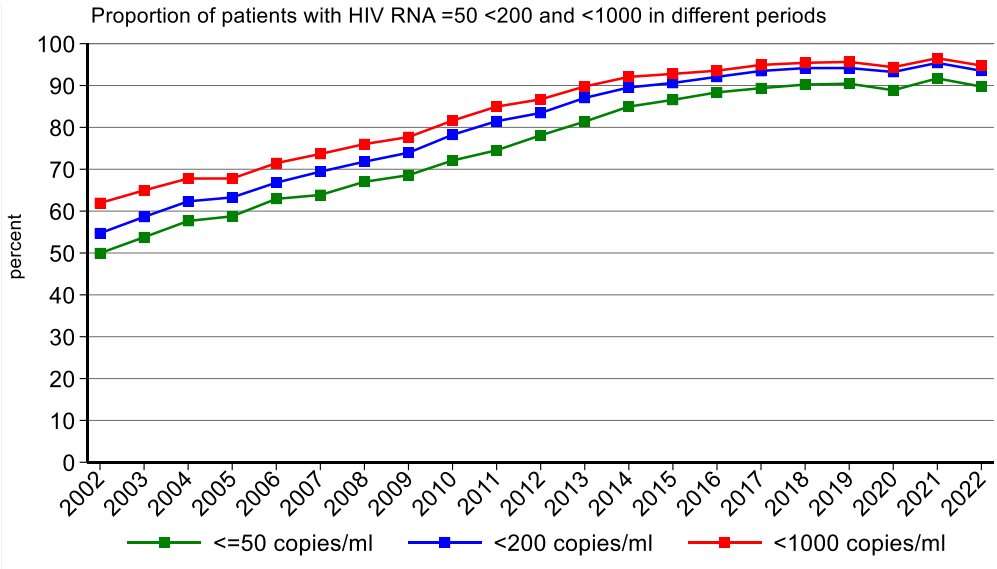


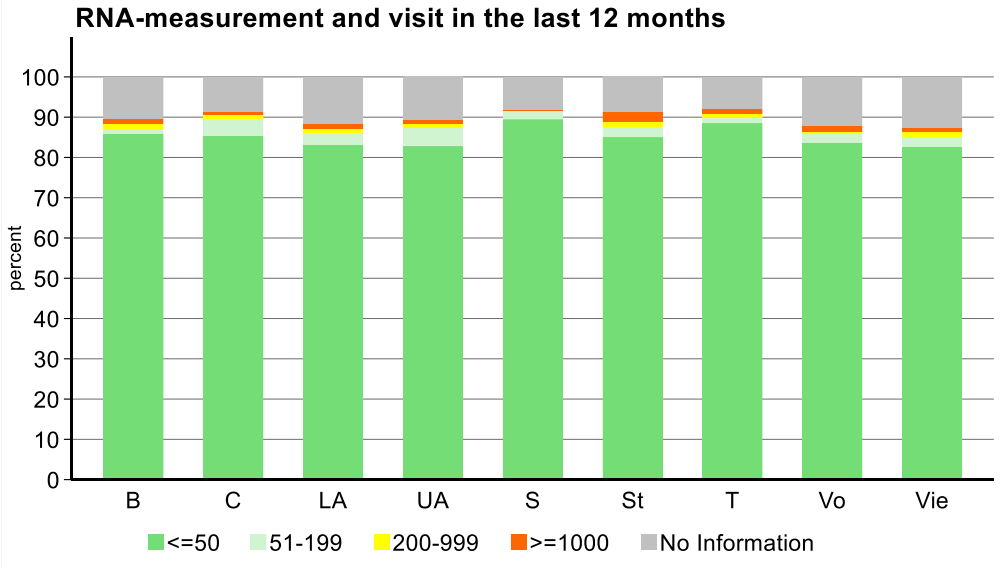
10.4 HIV RNA (viral load)

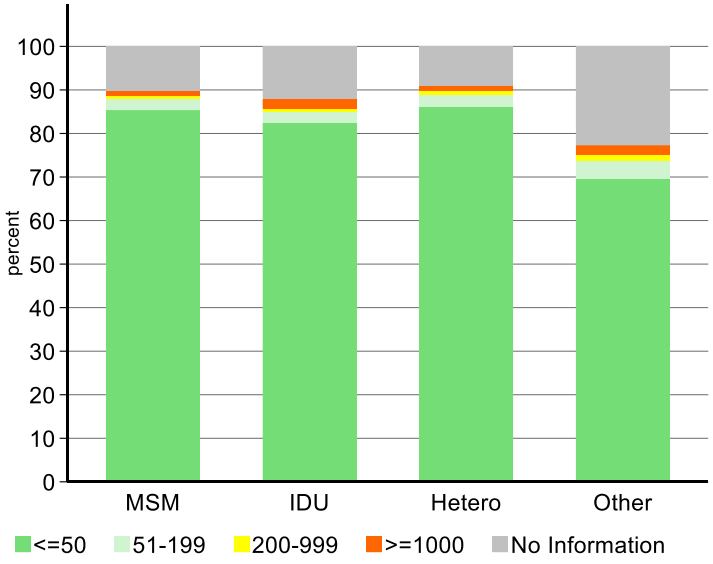
10.4.1 Last HIV RNA in patients currently in care regardless of ART

93.5% of the patients currently in care (4244 of 4538) 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

10.4.2 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 2016.

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

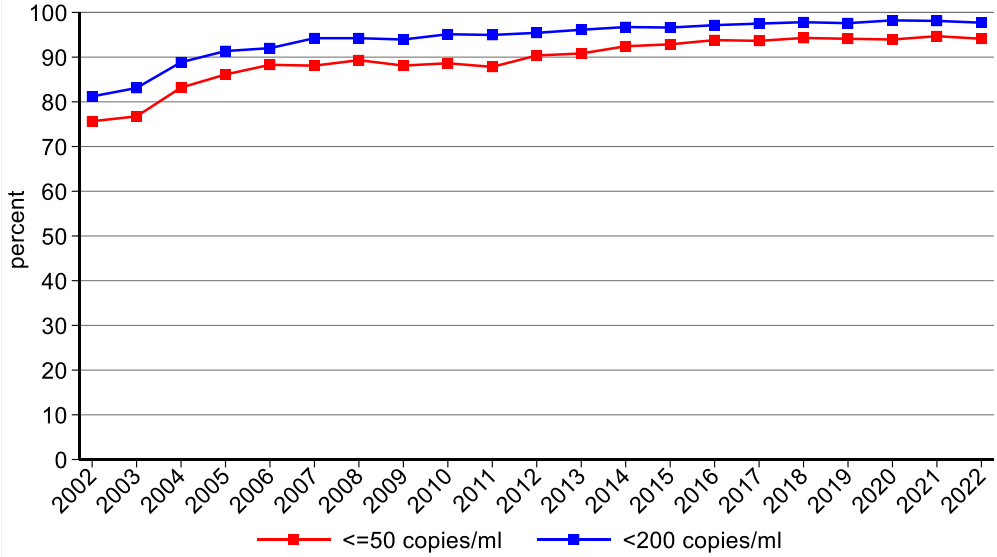
For high estimates patients lost to follow-up (LTFU, no contact 1.5 years before the end of the respective year) were excluded and for low estimates they were included. The preferred estimate was the mid-point between the high and low estimate.
Missing HIV-RNA was considered as unsuppressed.

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%**

We conclude that Austria is nearing the 90-90-90 target of UNAIDS. Viral suppression was comparatively low and maybe explained substantially by transfer of care in Vienna and out-migration. This and the decrease in HIV incidence supports 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 have to be included.

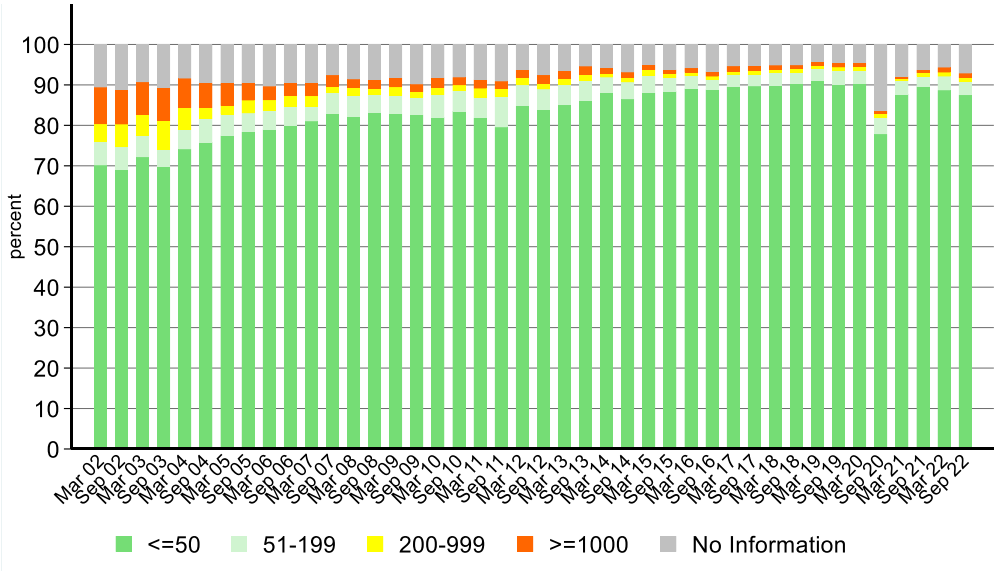
10.4.3 Last HIV RNA in patients on ART

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



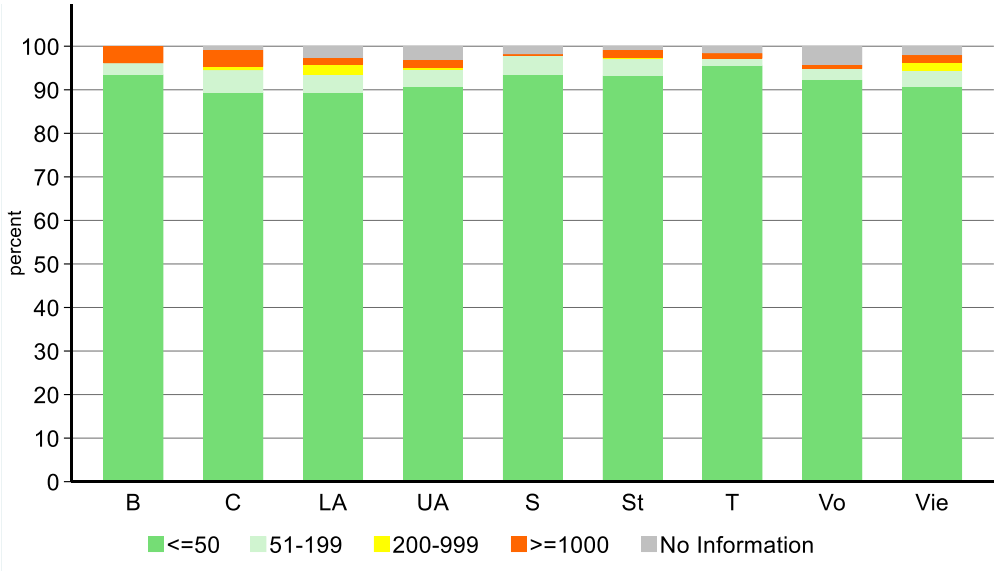
10.4.3.1 Last HIV RNA of patients on ART at different points in time

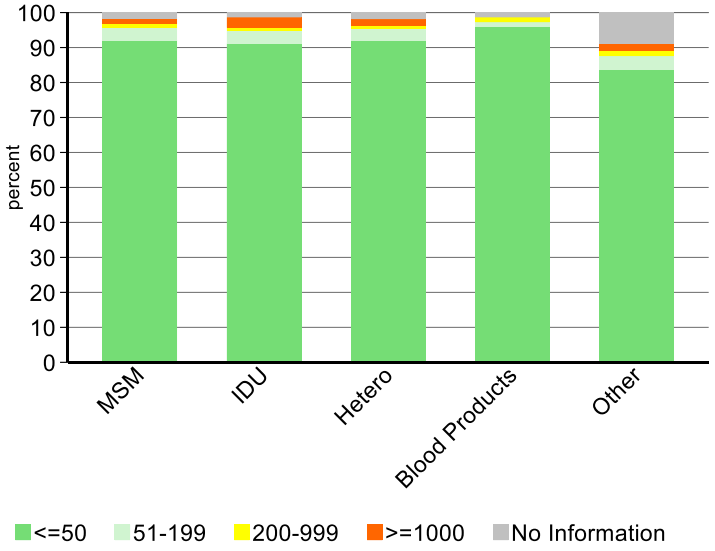
Patients currently in care, currently on ART and measurement of viral load at least 2.5 months after ART initiation



10.4.3.2 Last HIV RNA of patientst on ART according to transmission category

Patients in care and on ART within the last 12 months and measurement of viral load at least 2.5 months after ART initiation





10.4.4 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		
	134	**4755**	**2.82%**	**OR**	**[95% CI]**	**p value**	**OR**	**[95% CI]**	**p value**
Age									
< 30 years	12	173	6.94%	3.51	[1.83,6.71]	0.000	4.06	[1.98,8.33]	0.000
30-50 years	71	2130	3.33%	1.62	[1.13,2.34]	0.009	1.64	[1.11,2.44]	0.014
≥ 50	51	2452	2.08%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
HIV transmission category									
Male IDU	11	394	2.79%	1.08	[0.56,2.09]	0.814	0.75	[0.38,1.49]	0.412
Female IDU	11	183	6.01%	2.41	[1.24,4.69]	0.010	1.48	[0.72,3.02]	0.286
Male heterosexual	20	891	2.24%	0.87	[0.51,1.45]	0.585	0.93	[0.54,1.61]	0.795
Female heterosexual	30	943	3.18%	1.24	[0.79,1.95]	0.355	1.03	[0.62,1.69]	0.923
Other	8	255	3.14%	1.22	[0.57,2.59]	0.604	1.11	[0.51,2.44]	0.787
MSM	54	2089	2.58%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Nationality									
Missing/unknown	1	12	8.33%	3.21	[0.41,25.14]	0.266	2.75	[0.33,22.71]	0.347
High prevalence	14	407	3.44%	1.26	[0.71,2.23]	0.429	0.95	[0.50,1.80]	0.872
Low prevalence	23	847	2.72%	0.99	[0.62,1.56]	0.954	0.89	[0.55,1.45]	0.637
Austria	96	3489	2.75%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Population size of area of residence									
Rural areas	57	2160	2.64%	0.73	[0.51,1.05]	0.090			
Capital cities	13	806	1.61%	0.44	[0.24,0.81]	0.008			
Vienna	64	1789	3.58%	1.00	[1.00,1.00]	.			
AIDS									
Yes	17	747	2.28%	0.77	[0.46,1.30]	0.331			
No	117	4008	2.92%	1.00	[1.00,1.00]	.			
CD4 Nadir									
<50	27	739	3.65%	1.39	[0.89,2.17]	0.152	1.30	[0.81,2.09]	0.275
50-199	33	1268	2.60%	0.98	[0.64,1.48]	0.917	0.91	[0.59,1.42]	0.689
≥200	73	2745	2.66%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
ART initiation									
Before 1.1.1997	7	375	1.87%	0.64	[0.30,1.37]	0.250	0.35	[0.15,0.80]	0.012
After 1.1.1997	127	4380	2.90%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Ever ART interruptions									
None	68	3581	1.90%	0.24	[0.16,0.36]	0.000	0.17	[0.10,0.27]	0.000
1	28	662	4.23%	0.55	[0.33,0.91]	0.020	0.46	[0.28,0.78]	0.004
≥2	38	512	7.42%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.
Art duration									
< 9 months	3	80	3.75%	1.38	[0.43,4.42]	0.592	1.55	[0.47,5.17]	0.475
9-18 months	6	134	4.48%	1.66	[0.72,3.83]	0.238	1.87	[0.78,4.53]	0.163
> 18 months	125	4541	2.75%	1.00	[1.00,1.00]	.	1.00	[1.00,1.00]	.

11 Development of resistance to ART (data: 03/2022)

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 "2019 Update of the Drug Resistance Mutations in HIV-1" from the International Antiviral-Society-USA (https://www.iasusa.org/wp-content/uploads/2019/07/2019-drug-resistance-mutations-figures.pdf).
Results: Overall 4410 patients have ever received ART, 1190 had a resistance test after ART (27.0%). The overall prevalence of development of drug resistance was 69.4% (828 of 1190 patients), the prevalence of NRTI resistance was 33.0%, the prevalence of NNRTI resistance was 27.1%, and the prevalence of PI resistance was 62.2%. The prevalence of 3-class-resistance was 16.4% (195 of 1190 patients). The risk factors for developing a 3-class-resistance were a CD4 nadir <50 (OR=3.3; 95% CI: 2.1-5.0), a CD4 nadir between 50 and 200 (OR=1.9; 95% CI: 1.3-2.9) and initial therapy before 1997 (OR=34.4; 95% CI: 22.2-53.3) as well as from 1997 to 2003 (OR=8.6; 95% CI: 5.5-13.5) and an age at ART-start <30 (OR=2.7; 95% CI: 1.2-6.0). The risk to develop a 3-class-resistance was lower in patients with a low viral load (for <50 copies/ml OR=0.3; 95% CI: 0.2-0.7).
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 “2019 Update of the Drug Resistance Mutations in HIV-1” from the International AIDS-Society-USA (https://www.iasusa.org/wp-content/uploads/2019/07/2019-drug-resistance-mutations-figures.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, C
A62	V	A98	G	V11	I
K65	R, E, N	L100	I	G16	E
D67	N	K101	H, E, P	K20	R, M, I, T, V
T69	ins	K103	N, S	L24	I
K70	R, E	V106	A, M, I, T	D30	N
L74	V	V108	I	V32	I
V75	I	E138	A, G, K, Q, R	L33	I, F, V
F77	L	V179	D, F, T, L	E34	Q
Y115	F	Y181	C, I, V	M36	I, L, V
F116	Y	Y188	L, H, C	K43	T
Q151	M	G190	A, S, E	M46	I, L
M184	V, I	H221	Y	I47	V, A
L210	W	P225	H	G48	V
T215	Y, F	F227	C, L, R	I50	V, L
K219	Q, E	M230	I, L	F53	L, Y
		L234	I	I54	V, M, L, T, S, A
				Q58	E
				D60	E
				I62	V
				L63	P
				I64	L, M, V
				H69	K, R
				A71	V, I, T, L
				G73	S, T, C, A
				T74	P
				L76	V
				V77	I
				V82	A, T, F, S, I, L
				N83	D
				I84	V
				I85	V
				N88	D, S
				L89	V, I, M
				L90	M
				I93	L, 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 = 1363	N = 4403
Resistance to NRTI	222 (16.3%)	393 (8.9%)
Codon 41	82 (6.0%)	148 (3.4%)
Codon 62	10 (0.7%)	19 (0.4%)
Codon 65	11 (0.8%)	24 (0.5%)
Codon 67	70 (5.1%)	129 (2.9%)
Codon 69	3 (0.2%)	3 (0.1%)
Codon 70	49 (3.6%)	108 (2.5%)
Codon 74	31 (2.3%)	36 (0.8%)
Codon 75	5 (0.4%)	6 (0.1%)
Codon 77	2 (0.1%)	7 (0.2%)
Codon 115	7 (0.5%)	12 (0.3%)
Codon 116	2 (0.1%)	5 (0.1%)
Codon 151	2 (0.1%)	6 (0.1%)
Codon 184	173 (12.7%)	277 (6.3%)
Codon 210	54 (4.0%)	76 (1.7%)
Codon 215	92 (6.7%)	159 (3.6%)
Codon 219	45 (3.3%)	73 (1.7%)

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 = 8464)**		
	Frequencies N=			Univariable regression		**Multivariable regression***		
Variable	47 /	8464	(0.6%)	OR (95% CI)	p-value	**OR (95% CI)**		**p-value**
Demographic characteristics								
Age at ART start								
<30 years	12 /	2272	(0.5%)	2.1 0.6 - 7.4	0.257			
30-50 years	32 /	5014	(0.6%)	2.5 0.8 - 8.2	0.127			
>50 years	3 /	1178	(0.3%)	1				
Sex/ mode of transmission								
Male IDU	7 /	1005	(0.7%)	2.3 0.9 - 5.9	0.087	**1.4**	**0.5 – 3.6**	**0.512**
Female IDU	6 /	431	(1.4%)	4.6 1.7 - 12.5	0.003	**2.7**	**1.0 – 7.5**	**0.060**
Male heterosexual	10 /	1496	(0.7%)	2.2 0.9 - 5.2	0.072	**1.8**	**0.7 – 4.3**	**0.196**
Female heterosexual	13 /	1432	(0.9%)	3.0 1.3 - 6.7	0.008	**2.5**	**1.1 – 5.7**	**0.027**
Other	0 /	496	(0.0%)	- -	-	**-**	**-**	**-**
MSM	11 /	3604	(0.3%)	1		**1**		
Population size of area of residence								
Missing value	0 /	76	(0.0%)	- -	-			
Rural areas	16 /	3252	(0.5%)	0.7 0.4 - 1.4	0.359			
Capital cities	5 /	1185	(0.4%)	0.6 0.2 - 1.7	0.361			
Vienna	26 /	3951	(0.7%)	1				
Stage of disease								
AIDS								
Yes	26 /	2406	(1.1%)	3.1 1.8 - 5.6	<0.001			
No	21 /	6058	(0.3%)	1				
CD4 nadir								
Missing value	0 /	82	(0.0%)	- -	-	**-**	**-**	**-**
<50 cells/µl	22 /	1522	(1.4%)	8.2 3.6 - 18.3	<0.001	**6.6**	**2.9 – 15.3**	**<0.001**
50-199 cells/µl	17 /	2406	(0.7%)	4.0 1.7 - 9.2	0.001	**3.2**	**1.3 – 7.5**	**0.008**
≥200 cells/µl	8 /	4454	(0.2%)	1		**1**		
ART								
Abacavir use ever								
Yes	20 /	3311	(0.6%)	1.2 0.6 - 2.1	0.629			
No	27 /	5153	(0.5%)	1				
Tenofovir use ever								
Yes	44 /	5850	(0.8%)	6.6 2.0 - 21.3	0.002	**5.6**	**1.7 – 18.1**	**0.004**
No	3 /	2614	(0.1%)	1		**1**		
ART initiation								
Before 1.1.1997	9 /	818	(1.1%)	2.2 1.1 - 4.6	0.032			
After 1.1.1997	38 /	7646	(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 = 801	N = 2397
Resistance to NNRTI	168 (21.0%)	270 (11.3%)
Codon 90	6 (0.7%)	21 (0.9%)
Codon 98	16 (2.0%)	16 (0.7%)
Codon 100	4 (0.5%)	8 (0.3%)
Codon 101	27 (3.4%)	35 (1.5%)
Codon 103	84 (10.5%)	142 (5.9%)
Codon 106	16 (2.0%)	24 (1.0%)
Codon 108	26 (3.2%)	28 (1.2%)
Codon 138	7 (0.9%)	30 (1.3%)
Codon 179	6 (0.7%)	13 (0.5%)
Codon 181	67 (8.4%)	82 (3.4%)
Codon 188	10 (1.2%)	13 (0.5%)
Codon 190	43 (5.4%)	47 (2.0%)
Codon 221	10 (1.2%)	15 (0.6%)
Codon 225	6 (0.7%)	8 (0.3%)
Codon 227	5 (0.6%)	6 (0.3%)
Codon 230	3 (0.4%)	7 (0.3%)
Codon 234	0 (0.0%)	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 = 1073		Patients currently in care and PI use ever N = 2218	
Any minor resistance to PI	392	(36.5%)	657	(29.6%)
Codon 10	102	(9.5%)	184	(8.3%)
Codon 11	5	(0.5%)	4	(0.2%)
Codon 16	6	(0.6%)	37	(1.7%)
Codon 20	68	(6.3%)	131	(5.9%)
Codon 24	7	(0.7%)	11	(0.5%)
Codon 33	26	(2.4%)	56	(2.5%)
Codon 34	1	(0.1%)	0	(0.0%)
Codon 36	158	(14.7%)	284	(12.8%)
Codon 43	3	(0.3%)	6	(0.3%)
Codon 53	10	(0.9%)	12	(0.5%)
Codon 60	9	(0.8%)	23	(1.0%)
Codon 62	40	(3.7%)	79	(3.6%)
Codon 63	255	(23.8%)	358	(16.1%)
Codon 64	24	(2.2%)	82	(3.7%)
Codon 69	25	(2.3%)	97	(4.4%)
Codon 71	137	(12.8%)	163	(7.3%)
Codon 73	18	(1.7%)	18	(0.8%)
Codon 77	119	(11.1%)	195	(8.8%)
Codon 85	0	(0.0%)	2	(0.1%)
Codon 89	26	(2.4%)	95	(4.3%)
Codon 93	55	(5.1%)	104	(4.7%)

Major mutations:	All centers	Deceased since 1997, PI use N = 1073	Patients currently in care and PI use ever N = 2218
	Any major resistance to PI	112 (10.4%)	171 (7.7%)
	Codon 30	10 (0.9%)	29 (1.3%)
	Codon 32	11 (1.0%)	5 (0.2%)
	Codon 46	56 (5.2%)	74 (3.3%)
	Codon 47	7 (0.7%)	6 (0.3%)
	Codon 48	4 (0.4%)	8 (0.4%)
	Codon 50	1 (0.1%)	5 (0.2%)
	Codon 54	34 (3.2%)	48 (2.2%)
	Codon 58	6 (0.6%)	11 (0.5%)
	Codon 74	0 (0.0%)	1 (0.0%)
	Codon 76	1 (0.1%)	0 (0.0%)
	Codon 82	43 (4.0%)	66 (3.0%)
	Codon 83	1 (0.1%)	1 (0.0%)
	Codon 84	18 (1.7%)	20 (0.9%)
	Codon 88	14 (1.3%)	24 (1.1%)
	Codon 90	56 (5.2%)	71 (3.2%)

11.3.4 Resistance to single or multiple drug classes

All centres	Deceased since 1997, ever ART N = 1371	Patients currently in care and ever ART N = 4410
Resistance test available	589 (43.0%)	1190 (27.0%)
Wild type	137 (10.0%)	362 (8.2%)
"Any" resistance	452 (33.0%)	828 (18.8%)
NRTI	223 (16.3%)	393 (8.9%)
NNRTI	191 (13.9%)	323 (7.3%)
PI	418 (30.5%)	740 (16.8%)
NRTI and PI	197 (14.4%)	331 (7.5%)
NRTI and NNRTI	134 (9.8%)	220 (5.0%)
NNRTI and PI	176 (12.8%)	272 (6.2%)
3-class-resistance	127 (9.3%)	195 (4.4%)

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	226	183	8	175	146	87	157	128	81	83	77
1996	138	96	19	77	58	32	71	53	30	29	28
1997	108	70	14	56	31	27	50	27	20	23	18
1998	106	54	3	51	19	16	46	14	10	13	7
1999	93	49	9	40	14	16	34	9	8	14	7
2000	101	58	9	49	18	15	47	16	9	15	9
2001	76	35	10	25	9	6	25	9	5	6	5
2002	103	49	17	32	17	12	31	16	10	12	10
2003	95	39	15	24	3	7	22	3	2	5	2
2004	119	38	17	21	6	7	21	6	2	7	2
2005	125	45	13	32	9	8	31	9	4	7	4
2006	144	39	15	24	6	9	21	4	6	6	4
2007	150	43	16	27	9	8	25	7	4	7	3
2008	156	36	22	14	7	5	10	4	3	3	2
2009	212	49	26	23	7	12	20	6	6	9	5
2010	208	48	21	27	5	8	21	3	3	3	2
2011	232	40	18	22	6	8	18	3	5	4	2
2012	227	41	20	21	7	10	19	5	6	8	4
2013	231	38	22	16	2	2	13	-	-	1	-
2014	207	27	12	15	3	4	13	2	1	3	1
2015	227	28	16	12	5	5	8	3	2	2	1
2016	219	21	7	14	4	5	12	3	1	4	1
2017	234	22	10	12	1	7	11	1	1	6	1
2018	160	12	9	3	-	2	2	-	-	1	-
2019	184	13	8	5	-	1	4	-	-	-	-
2020	148	10	3	7	1	3	5	-	1	1	-
2021	181	7	4	3	-	-	3	-	-	-	-
Federal state											
Burgenland	68	17	6	11	6	5	10	5	4	5	4
Carinthia	212	36	10	26	12	9	22	9	6	6	4
Lower Austria	436	108	22	86	46	39	76	37	27	36	25
Upper Austria	597	179	52	127	79	54	107	64	47	40	38
Salzburg	261	74	20	54	23	26	47	18	13	22	11
Styria	448	107	42	65	20	23	60	19	15	19	15
Tyrol	545	180	36	144	76	47	135	69	28	44	27
Vorarlberg	218	51	9	42	15	11	38	11	7	10	6
Vienna	1571	425	161	264	112	104	240	98	69	89	64
Foreign countries	54	13	5	8	4	4	5	1	4	1	1
Missing value	-	-	-	-	-	-	-	-	-	-	-
Total	**4410**	**1190**	**363**	**827**	**393**	**322**	**740**	**331**	**220**	**272**	**195**

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	76	35	10	25	9	6	25	9	5	6	5
2002	103	49	17	32	17	12	31	16	10	12	10
2003	95	39	15	24	3	7	22	3	2	5	2
2004	119	38	17	21	6	7	21	6	2	7	2
2005	125	45	13	32	9	8	31	9	4	7	4
2006	144	39	15	24	6	9	21	4	6	6	4
2007	150	43	16	27	9	8	25	7	4	7	3
2008	156	36	22	14	7	5	10	4	3	3	2
2009	212	49	26	23	7	12	20	6	6	9	5
2010	208	48	21	27	5	8	21	3	3	3	2
2011	232	40	18	22	6	8	18	3	5	4	2
2012	227	41	20	21	7	10	19	5	6	8	4
2013	231	38	22	16	2	2	13	-	-	1	-
2014	207	27	12	15	3	4	13	2	1	3	1
2015	227	28	16	12	5	5	8	3	2	2	1
2016	219	21	7	14	4	5	12	3	1	4	1
2017	234	22	10	12	1	7	11	1	1	6	1
2018	160	12	9	3	-	2	2	-	-	1	-
2019	184	13	8	5	-	1	4	-	-	-	-
2020	148	10	3	7	1	3	5	-	1	1	-
2021	181	7	4	3	-	-	3	-	-	-	-
Population size of area of residence											
Missing value	1	-	-	-	-	-	-	-	-	-	-
Rural areas	1710	295	126	169	53	65	151	42	32	52	26
Capital cities	617	125	37	88	24	25	76	18	10	15	6
Vienna	1310	260	138	122	30	39	108	24	20	28	17
Sex/ mode of transmission											
MSM	1692	227	107	120	25	42	101	18	15	26	11
Male IDU	267	89	42	47	15	17	43	13	9	14	8
Female IDU	104	40	17	23	2	6	22	2	1	5	1
Male heterosexual	712	124	55	69	29	24	62	24	17	19	14
Female heterosexual	696	181	75	106	32	36	94	24	18	27	13
Others	167	19	5	14	4	4	13	3	2	4	2
Age at time of HIV-test											
< 35 years	1828	447	198	249	68	87	223	54	43	66	34
≥ 35 years	1810	233	103	130	39	42	112	30	19	29	15
Total	**3638**	**680**	**301**	**379**	**107**	**129**	**335**	**84**	**62**	**95**	**49**

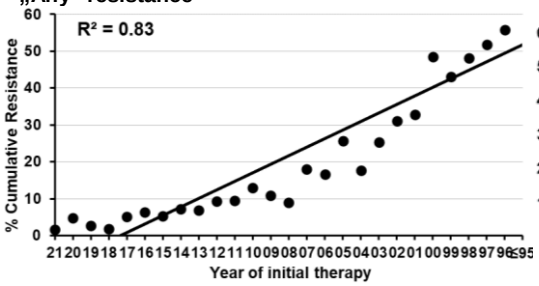
11.3.6 Cumulative resistance related to different time periods of ART initiation

	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	345	95.0%	427	72.9%	969	28.1%
At least 5 HIV RNA ≥ 200 copies/ml	291	80.2%	241	41.1%	1223	35.4%
No resistance test after ART	85	23.4%	271	46.2%	2858	82.8%
Resistance test after ART	278	76.6%	315	53.8%	595	17.2%
Total	**363**	**100%**	**586**	**100%**	**3453**	**100%**
Number of NRTI-associated resistance mutations						
0 mutations	74	20.4%	207	35.3%	514	14.9%
1 mutation	33	9.1%	56	9.6%	55	1.6%
2 mutations	28	7.7%	21	3.6%	14	0.4%
3 mutations	32	8.8%	12	2.0%	7	0.2%
4 mutations	47	12.9%	10	1.7%	3	0.1%
5 mutations	32	8.8%	9	1.5%	1	0.0%
6 mutations	19	5.2%			1	0.0%
7 mutations	10	2.8%				
8 mutations	2	0.6%				
9 mutations	1	0.3%				
Number of NNRTI-associated resistance mutations						
0 mutations	159	43.8%	223	38.1%	484	14.0%
1 mutation	53	14.6%	44	7.5%	66	1.9%
2 mutations	38	10.5%	39	6.7%	30	0.9%
3 mutations	15	4.1%	7	1.2%	9	0.3%
4 mutations	7	1.9%	2	0.3%	5	0.1%
5 mutations	3	0.8%			1	0.0%
6 mutations	2	0.6%				
7 mutations	1	0.3%				
Number of PI-associated resistance mutations						
0 mutations	51	14.0%	82	14.0%	317	9.2%
1 mutation	46	12.7%	54	9.2%	59	1.7%
2 mutations	48	13.2%	64	10.9%	43	1.2%
3 mutations	33	9.1%	41	7.0%	48	1.4%
4 mutations	16	4.4%	38	6.5%	60	1.7%
5 mutations	22	6.1%	19	3.2%	30	0.9%
6 mutations	19	5.2%	8	1.4%	20	0.6%
7 mutations	14	3.9%	2	0.3%	12	0.3%
8 mutations	6	1.7%	1	0.2%	2	0.1%
9 mutations	2	0.6%	3	0.5%	2	0.1%
10 mutations	5	1.4%	2	0.3%	0	0.0%
11 mutations	5	1.4%	1	0.2%	1	0.0%
12 mutations	3	0.8%			0	0.0%
13 mutations	1	0.3%			1	
14 mutations	4	1.1%				
15 mutations	2	0.6%				
16 mutations	1	0.3%				

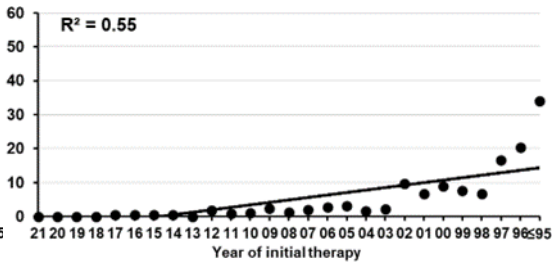
11.3.7 Probability of development of resistance

11.3.7.1 Any ART regimen

„Any“ resistance

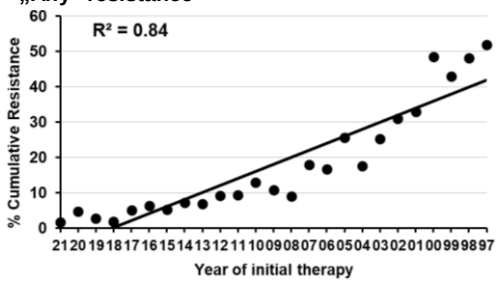


3-class-resistance

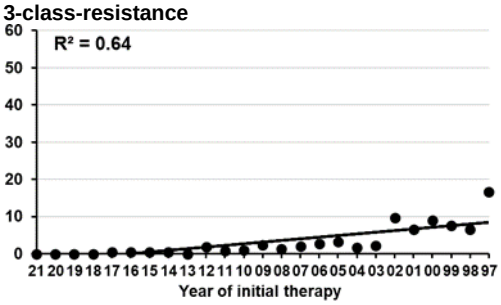


11.3.7.2 Any ART regimen and initial ART after January 1, 1997

„Any“ resistance

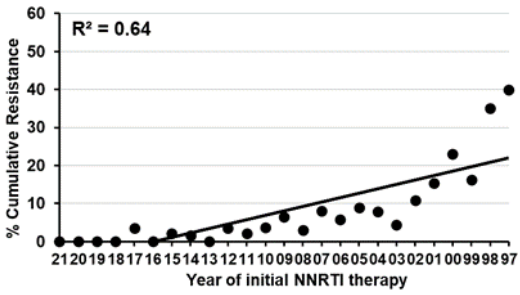


3-class-resistance

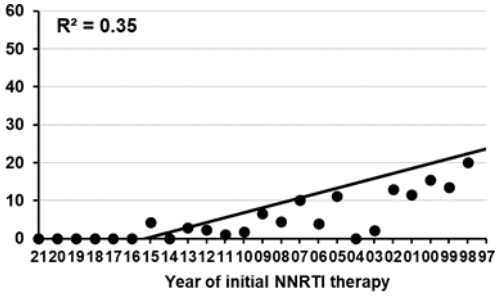


11.3.7.3 Initial ART with 2 NRTI + 1 NNRTI

Resistance to NNRTI

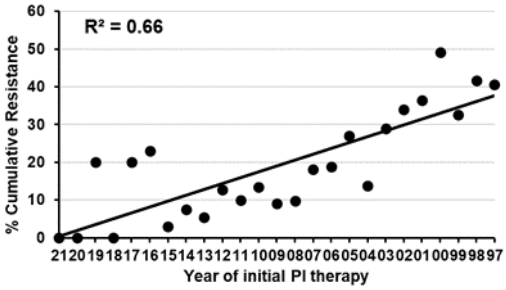


Resistance to NRTI

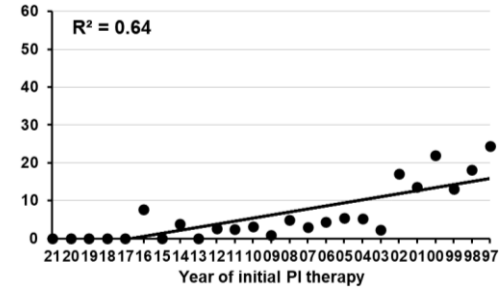


11.3.7.4 Initial ART with 2 NRTI + 1 PI

Resistance to PI



Resistance to NRTI



11.3.8 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 = 1733	N = 487	N = 417	N = 4410
3-class-resistance	127 (7.3%)	35 (7.2%)	35 (8.4%)	195 (4.4%)

3-class-resistance	Patients currently in care and ART use ever N = 195
Age (years; mean ± S. D.)	56.4 ± 10.8
Federal states	
Carinthia	4 (2.1%)
Upper Austria	38 (19.5%)
Salzburg	11 (5.6%)
Styria	15 (7.7%)
Tyrol	27 (13.8%)
Vienna	64 (32.8%)
Other federal states	35 (17.9%)
Foreign countries	1 (0.5%)
Sex/ Mode of transmission	
MSM	65 (33.3%)
Male IDU	18 (9.2%)
Female IDU	11 (5.6%)
Male heterosexual	42 (21.5%)
Female heterosexual	43 (22.1%)
Others	16 (8.2%)
AIDS	104 (53.3%)
CD4 nadir (cells/µl; mean ± S. D.)	125.9 ± 125.7
Current CD4 cell counts (cells/µl; mean ± S. D.)	648.2 ± 336.7
Last HIV-RNA	
≤50 copies/ml	173 ± (88.7%)
51-199 copies/ml	13 (5.6%)
≥200 copies/ml	20 (5.6%)
Duration of ART (months; mean ± S. D.)	285.5 ± 70.6

All centres							**Model 1 (N = 4410)**		
	Frequencies N=			Univariable regression			**Multivariable regression***		
Variable	195 /	4410	(4.4%)	OR (95% CI)		p-value	**OR (95% CI)**		**p-value**
Demographic characteristics									
Age at ART start									
<30 years	72 /	1112	(6.5%)	5.1	2.5 - 10.8	<0.001	**2.7**	**1.2 - 6.0**	**0.013**
30-50 years	115 /	2695	(4.3%)	3.3	1.6 - 6.8	0.001	**2.0**	**0.9 - 4.2**	**0.081**
>50 years	8 /	603	(1.3%)	1			**1**		
Sex/ mode of transmission									
Male IDU	18 /	352	(5.1%)	1.6	0.9 - 2.7	0.101			
Female IDU	11 /	164	(6.7%)	2.1	1.1 - 4.0	0.029			
Male heterosexual	42 /	845	(5.0%)	1.5	1.0 - 2.3	0.039			
Female heterosexual	43 /	872	(4.9%)	1.5	1.0 - 2.2	0.041			
Other	16 /	224	(7.1%)	2.2	1.3 - 3.9	0.005			
MSM	65 /	1953	(3.3%)	1					
Population size of area of residence									
Missing value	0 /	1	(0.0%)	-	-	-			
Rural areas	83 /	2061	(4.0%)	1.0	0.7 - 1.4	0.953			
Capital cities	48 /	774	(6.2%)	1.6	1.1 - 2.3	0.023			
Vienna	64 /	1574	(4.1%)	1					
Stage of disease									
AIDS									
Yes	104 /	1076	(9.7%)	3.8	2.9 - 5.1	<0.001			
No	91 /	3334	(2.7%)	1					
CD4 nadir									
Missing value	0 /	9	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	69 /	679	(10.2%)	6.2	4.2 - 9.2	<0.001	**3.3**	**2.1 - 5.0**	**<0.001**
50-199 cells/µl	81 /	1195	(6.8%)	4.0	2.8 - 5.8	<0.001	**1.9**	**1.3 - 2.9**	**0.002**
≥200 cells/µl	45 /	2527	(1.8%)	1			**1**		
Current HIV RNA									
Missing value	0 /	5	(0.0%)	-	-	-	**-**	**-**	**-**
≤50 copies/ml	173 /	4113	(4.2%)	0.5	0.2 - 0.9	0.014	**0.3**	**0.2 - 0.7**	**0.004**
51-199 copies/ml	11 /	168	(6.5%)	0.7	0.3 - 1.7	0.459	**1.0**	**0.4 - 2.7**	**0.962**
≥200 copies/ml	11 /	124	(8.9%)	1			**1**		
ART									
ART initiation									
Before 1.1.1997	105 /	364	(28.8%)	40.8	27.2 - 61.3	<0.001	**34.4**	**22.2 - 53.3**	**<0.001**
1.1.1997 to 31.12.2002	56 /	587	(9.5%)	10.6	6.9 - 16.4	<0.001	**8.6**	**5.5 - 13.5**	**<0.001**
Since 1.1.2003	34 /	3459	(1.0%)	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 = 1399		N = 401		N = 332		N = 4046	
Any resistance	280	(20.0%)	78	(19.5%)	78	(23.5%)	576	(14.2%)

Any resistance	Patients currently in care and ART use ever after 1996 N = 576	
Age (years; mean ± S. D.)	34.3 ± 9.3	
Federal states		
Carinthia	21	(3.6%)
Upper Austria	85	(14.8%)
Salzburg	47	(8.2%)
Styria	53	(9.2%)
Tyrol	83	(14.4%)
Vienna	189	(32.8%)
Other federal states	92	(16.0%)
Foreign countries/ missing	6	(1.0%)
Sex/ Mode of transmission		
MSM	185	(32.1%)
Male IDU	71	(12.3%)
Female IDU		
Male heterosexual	110	(19.1%)
Female heterosexual	152	(26.4%)
Others	22	(3.8%)
AIDS	215	(37.3%)
CD4 nadir (cells/µl; mean ± S. D.)	115.8 ± 157.4	
Current CD4 cell counts (cells/µl; mean ± S. D.)	665.5 ± 414.6	
Last HIV-RNA		
≤50 copies/ml	509	(88.4%)
51-199 copies/ml	25	(4.3%)
≥200 copies/ml	42	(7.3%)
Duration of ART (months; mean ± S. D.)	199.9 ± 76.9	

All centres						**Model 1 (N = 4046)**		
	Frequencies N=			Univariable regression			**Multivariable regression**	
Variable	576 /	4046	(14.2%)	OR (95% CI)		p-value	**OR (95% CI)**	**p-value**
Demographic characteristics								
Age at ART start								
<30 years	191 /	982	(19.5%)	4.0	2.7 – 5.9	<0.001	**3.4**	**2.3 – 5.1**	**<0.001**
30-50 years	352 /	2479	(14.2%)	2.8	1.9 – 4.0	<0.001	**2.2**	**1.5 – 3.2**	**<0.001**
>50 years	33 /	585	(5.6%)	1			**1**		
Sex/ mode of transmission								
Male IDU	71 /	306	(23.2%)	2.7	2.0 – 3.6	<0.001	**2.2**	**1.6 – 3.1**	**<0.001**
Female IDU	36 /	130	(27.7%)	3.4	2.2 – 5.1	<0.001	**2.2**	**1.4 – 3.5**	**<0.001**
Male heterosexual	110 /	798	(13.8%)	1.4	1.1 – 1.8	0.007	**1.2**	**0.9 – 1.6**	**0.159**
Female heterosexual	152 /	795	(19.1%)	2.1	1.7 – 2.6	<0.001	**1.6**	**1.2 – 2.1**	**<0.001**
Other	22 /	190	(11.6%)	1.2	0.7 – 1.9	0.530	**0.8**	**0.5 – 1.4**	**0.461**
MSM	185 /	1827	(10.1%)	1			**1**		
Population size of area of residence								
Missing value	0 /	1	(0.0%)	-	-	-	**-**	**-**	**-**
Rural areas	258 /	1896	(13.6%)	1.1	0.9 – 1.3	0.624	**1.1**	**0.9 – 1.4**	**0.301**
Capital cities	129 /	698	(18.5%)	1.5	1.2 – 1.9	0.001	**1.7**	**1.3 – 2.2**	**<0,001**
Vienna	189 /	1451	(13.0%)	1			**1**		
Stage of disease								
AIDS								
Yes	215 /	908	(23.7%)	2.4	2.0 – 2.9	<0.001			
No	361 /	3138	(11.5%)	1					
CD4 nadir								
Missing value	0 /	9	(0.0%)	-	-	-	**-**	**-**	**-**
<50 cells/µl	141 /	587	(24.0%)	2.9	2.3 – 3.6	<0.001	**2.4**	**1.9 – 3.1**	**<0.001**
50-199 cells/µl	194 /	1029	(18.9%)	2.1	1.7 – 2.6	<0.001	**1.5**	**1.2 – 1.9**	**<0.001**
≥200 cells/µl	241 /	2421	(10.0%)	1			**1**		
Current HIV RNA								
Missing value	0 /	5	(0.0%)	-	-	-	**-**	**-**	**-**
≤50 copies/ml	509 /	3762	(13.5%)	0.3	0.2 – 0.4	<0.001	**0.2**	**0.2 – 0.4**	**<0.001**
51-199 copies/ml	25 /	162	(15.4%)	0.3	0.2 – 0.6	<0,001	**0.3**	**0.2 – 0.6**	**<0.001**
≥200 copies/ml	42 /	117	(35.9%)	1			**1**		
ART								
ART initiation								
1.1.1997 to 31.12.2002	253 /	587	(43.1%)	7.4	6.0 – 9.0	<0.001	**6.4**	**5.1 – 7.9**	**<0.001**
Since 1.1.2003	323 /	3459	(9.3%)	1			**1**		

12 Co-morbidities and Co-medication

12.1 Co-morbidities

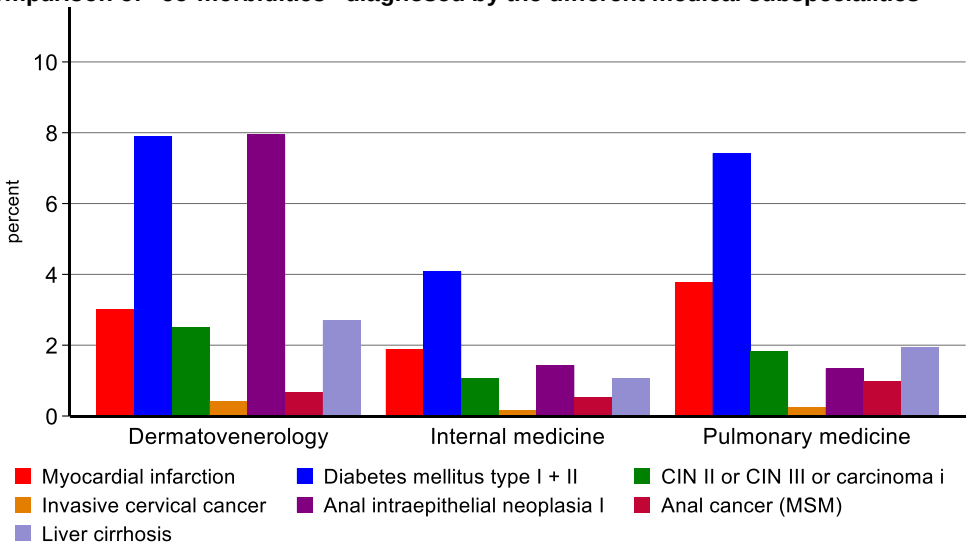
One aim of the Austrian HIV Cohort Study is to document co-morbidities and adverse drug reactions, as well as to investigate possible associations with ART. As a first step, important co-morbidities are illustrated.

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

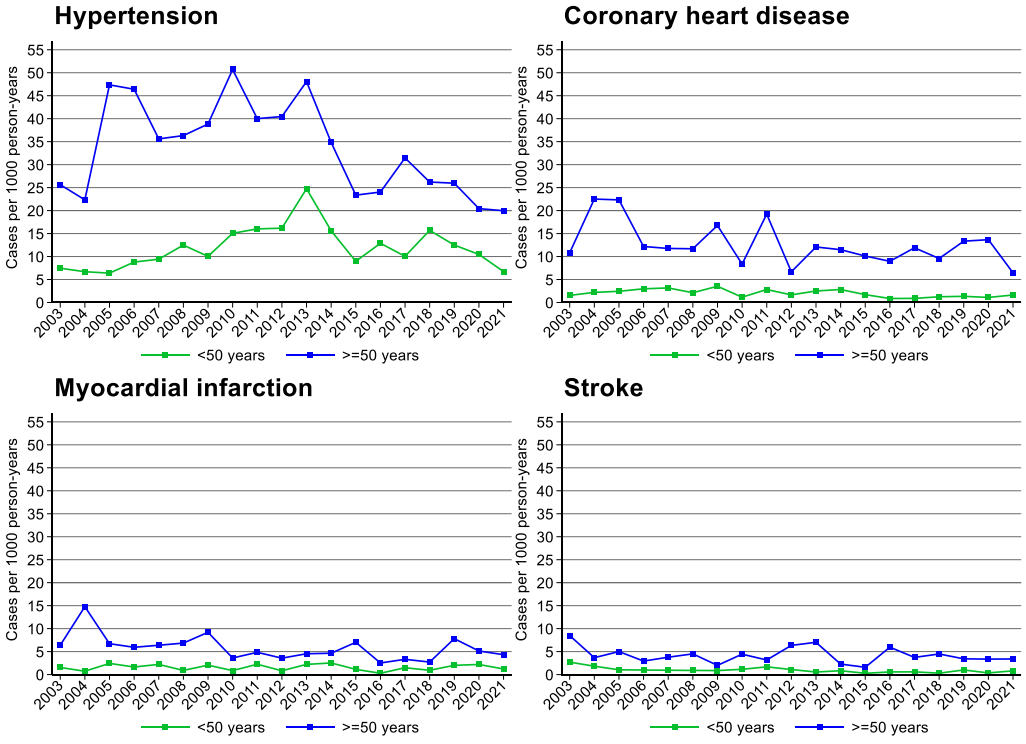
	< 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Number of patients	220	%	89	%	314	%	511	%	1152	%
Hypertension	17	7.7	3	3.4	46	14.6	61	11.9	96	8.3
Coronary heart disease	2	0.9	2	2.2	2	0.6			9	0.8
Myocardial infarction			1	1.1	2	0.6			11	1.0
Stroke	3	1.4	1	1.1	1	0.3	4	0.8	3	0.3
Diabetes mellitus type I + II	6	2.7	3	3.4	17	5.4	14	2.7	23	2.0
CIN II or CIN III or carcinoma in situ			4	4.5			39	7.6		
Invasive cervical cancer							3	0.6		
St. p. hysterectomy			1	1.1			4	0.8		
Anal intraepithelial neoplasia II, III	5	2.3			7	2.2	2	0.4	135	11.7
Anal cancer									4	0.3
Osteoporosis	3	1.4	1	1.1	4	1.3	8	1.6	17	1.5
Liver cirrhosis	6	2.7	1	1.1	1	0.3	2	0.4	4	0.3
Attempted suicide or suicide	8	3.6	1	1.1	1	0.3	2	0.4	17	1.5
Drug overdose (mainly opiates)	8	3.6	4	4.5	1	0.3	1	0.2	5	0.4
Renal failure stage 3, 4, 5	1	0.5	3	3.4	9	2.9	10	2.0	10	0.9

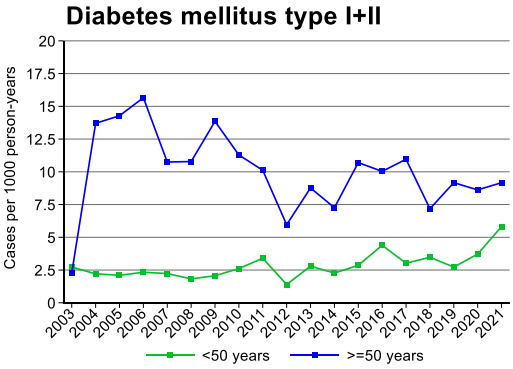
	≥ 50 years									
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Number of patients	183	%	99	%	600	%	460	%	987	%
Hypertension	53	29	19	19.2	204	34.0	130	28.3	306	31.0
Coronary heart disease	27	14.8	13	13.1	74	12.3	27	5.9	113	11.4
Myocardial infarction	12	6.6	7	7.1	26	4.3	11	2.4	62	6.3
Stroke	13	7.1	5	5.1	20	3.3	14	3.0	22	2.2
Diabetes mellitus type I + II	16	8.7	4	4.0	92	15.3	44	9.6	92	9.3
CIN II or CIN III or carcinoma in situ			14	14.1			40	8.7		
Invasive cervical cancer			5	5.1			6	1.3		
St. p. hysterectomy			12	12.1			28	6.1		
Anal intraepithelial neoplasia II, III	2	1.1	3	3.0	14	2.3	9	2.0	114	11.6
Anal cancer			3	3.0	4	0.7	2	0.4	29	2.9
Osteoporosis	36	19.7	28	28.3	60	10.0	86	18.7	100	10.1
Liver cirrhosis	26	14.2	17	17.2	11	1.8	7	1.5	23	2.3
Attempted suicide or suicide	9	4.9	4	4.0	7	1.2	2	0.4	9	0.9
Drug overdose (mainly opiates)	7	3.8	4	4.0	3	0.5	1	0.2	3	0.3
Renal failure stage 3, 4, 5	8	4.4	21	21.2	41	6.8	62	13.5	52	5.3

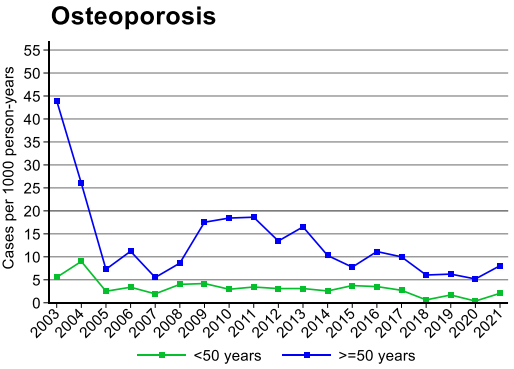
Comparison of “co-morbidities” diagnosed by the different medical subspecialities

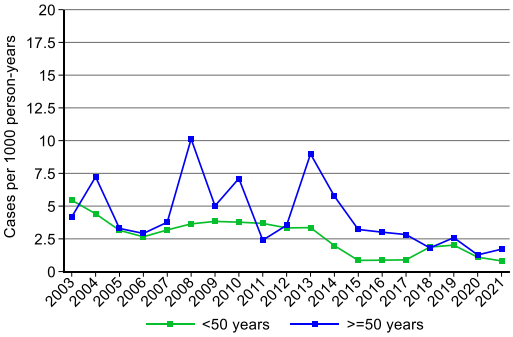


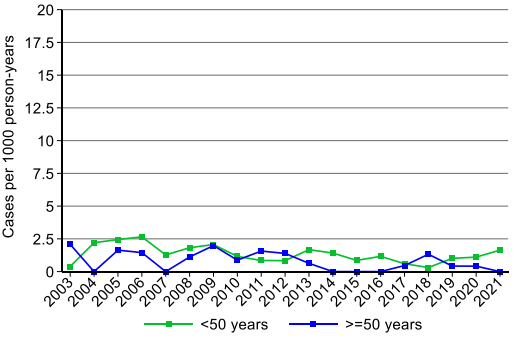
12.2 Incidence of Co-morbidities related to age

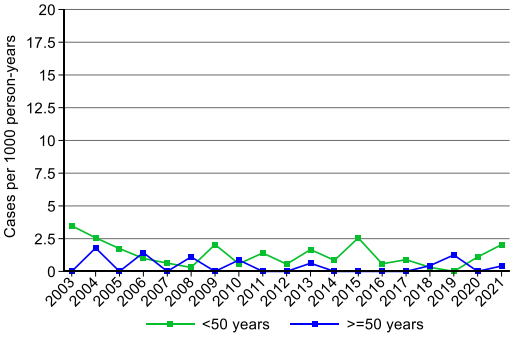


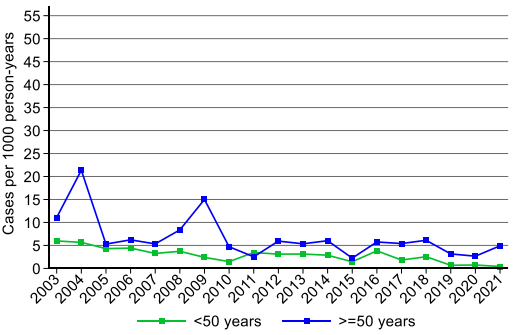

Diabetes mellitus type I+II
Cases per 1000 person-years
<50 years
>=50 years


Osteoporosis
Cases per 1000 person-years
<50 years
>=50 years


Liver cirrhosis
Cases per 1000 person-years
<50 years
>=50 years


Attempted suicide or suicide
Cases per 1000 person-years
<50 years
>=50 years


Drug overdose (mainly opiates)
Cases per 1000 person-years
<50 years
>=50 years


Renal failure stage 3 or 4 or 5
Cases per 1000 person-years
<50 years
>=50 years

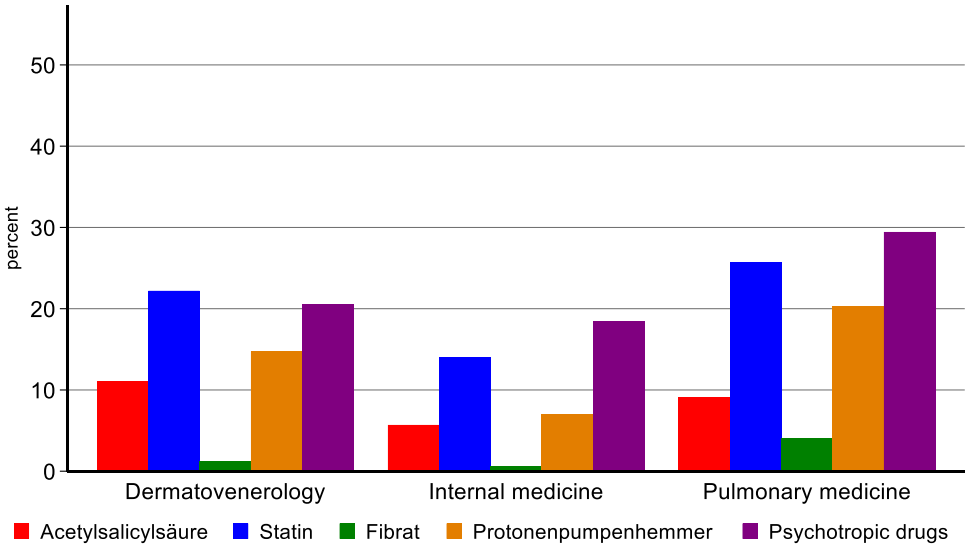
12.3 Co-medication related to age

< 50 years										
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	220	%	89	%	314	%	511	%	1152	%
Acetylsalicylic acid	7	3.2	4	4.5	10	3.2	4	0.8	25	2.2
ACE inhibitors/angiotensin antagonists	17	7.7	3	3.4	36	11.5	45	8.8	84	7.3
Beta blocker	11	5.0	2	2.2	18	5.7	19	3.7	48	4.2
Statin	10	4.5	1	1.1	23	7.3	31	6.1	90	7.8
Fibrate	2	0.9	1	1.1	3	1.0			9	0.8
Insulin	3	1.4			8	2.5	1	0.2	4	0.3
Oral antidiabetic drugs	5	2.3	2	2.2	18	5.7	10	2.0	19	1.6
Proton pump inhibitors	48	21.8	13	14.6	26	8.3	42	8.2	72	6.3
Bisphosphonates	1	0.5			1	0.3	2	0.4	8	0.7
Thyroid hormones	4	1.8	4	4.5	7	2.2	34	6.7	18	1.6
Opiate substitution	137	62.3	61	68.5	17	5.4	9	1.8	16	1.4
Psychotropic drugs	166	75.5	72	80.9	50	15.9	86	16.8	218	18.9
Anxiolytics, hypnotics, sedatives	68	30.9	32	36.0	8	2.5	14	2.7	45	3.9
Antidepressants	47	21.4	17	19.1	21	6.7	55	10.8	136	11.8
Antipsychotics	40	18.2	18	20.2	14	4.5	25	4.9	58	5.0

≥ 50 years										
	Male IDU		Female IDU		Male hetero		Female hetero		MSM	
Current therapies	183	%	99	%	600	%	460	%	987	%
Acetylsalicylic acid	45	24.6	17	17.2	108	18	49	10.7	171	17.3
ACE inhibitors/angiotensin antagonists	58	31.7	19	19.2	247	41.2	130	28.3	338	34.2
Beta blocker	31	16.9	14	14.1	105	17.5	56	12.2	180	18.2
Statin	59	32.2	30	30.3	229	38.2	151	32.8	342	34.7
Fibrate	3	1.6	1	1.0	22	3.7	9	2	22	2.2
Insulin	6	3.3	1	1.0	20	3.3	10	2.2	22	2.2
Oral antidiabetic drugs	8	4.4	3	3.0	81	13.5	37	8	79	8
Proton pump inhibitors	49	26.8	29	29.3	104	17.3	68	14.8	180	18.2
Bisphosphonates	1	0.5	5	5.1	15	2.5	25	5.4	24	2.4
Thyroid hormones	23	12.6	21	21.2	32	5.3	66	14.3	72	7.3
Opiate substitution	104	56.8	53	53.5	21	3.5	14	3	35	3.5
Psychotropic drugs	124	67.8	69	69.7	135	22.5	130	28.3	287	29.1
Anxiolytics, hypnotics, sedatives	48	26.2	28	28.3	30	5.0	30	6.5	58	5.9
Antidepressants	42	23.0	28	28.3	62	10.3	80	17.4	175	17.7
Antipsychotics	25	13.7	13	13.1	30	5.0	29	6.3	58	5.9

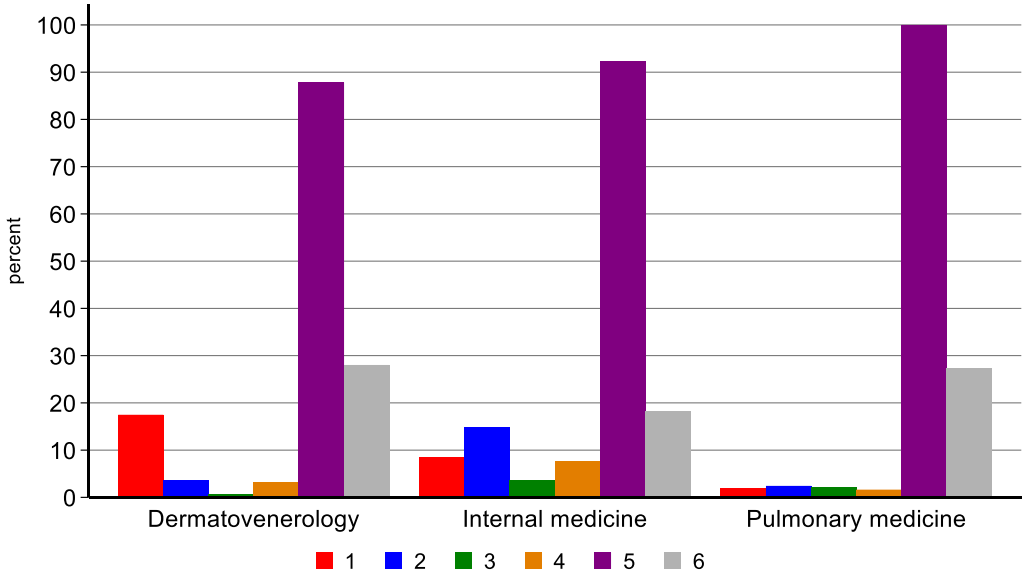
12.4 Co-medication

Comparison of “co-medications” used by the different medical subspecialities



12.5 Examples of quality assurance

"Quality assurance"			
LDL cholesterol not documented within the last 12 months (1)	604	4901	12.3
LDL cholesterol documented	4297	4901	87.7
LDL > 160 mg/dl	366	4297	8.5
Smoking never documented (2)	381	4901	7.8
Smoking documented	4520	4901	92.2
Smoking	2181	4520	48.3
LDL > 160 mg/dl and smoking (> 50 years)	87	987	8.8
LDL > 160 mg/dl and smoking and no statin (> 50 years)	55	87	63.2
Blood pressure not documented within the last 12 months (3)	165	4901	3.4
Blood pressure documented	4736	4901	96.6
Arterial hypertension	1042	4736	22.0
Arterial hypertension and smoking	370	1042	35.5
Blood pressure documented (> 50 years)	2408	2457	98.0
Arterial hypertension (> 50 years)	792	2408	32.9
Arterial hypertension and smoking (> 50 years)	263	792	33.2
Arterial hypertension and smoking and no statin (> 50 years)	130	263	49.4
Coronary heart disease (CHD)	286	4901	5.8
CHD and no statin	85	286	29.7
CHD and LDL cholesterol documented	268	286	93.7
CHD and LDL > 130 mg/dl	27	268	10.1
Diabetes	333	4901	6.8
Diabetes and HbA1c > 8	42	333	12.6
Diabetes and no HbA1c within the last 12 months (4)	12	333	3.6
Hepatitis C and visit within the last 12 months	95	4901	1.9
Hepatitis C and elastography never documented (5)	88	95	92.6
No syphilis screening in the last 6 months within MSM (6)	532	2139	24.9



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 (27.2%), followed. by the OWS Vienna (16.8%), Innsbruck (15.4%), Linz (13.7%), Graz (10.1%), Salzburg (6.3%), Klagenfurt (4.4%), KFJ Vienna (3.9%) and Feldkirch (2.3%). However, a considerable proportion (33.7%) 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 (35.9%), Upper Austria (30.5%), Vorarlberg (26.9%), Lower Austria (26.8%) and Tyrol (26.3%).
In the subgroup of heterosexually acquired infections, the rate of the women is 51.5%. It is highest in Upper Austria (55.0%), Burgenland (54.3%), Styria (53.7%), Carinthia (53.8%) and Tyrol (53.4%). Among patients newly diagnosed in 2022, 24.3% have been infected through heterosexual contacts. Since 2000, 35.1% of all newly diagnosed HIV infections were transmitted through heterosexual contacts.

Most of the cohort participants are Austrian nationals (70.1%). 83% come from high prevalence countries and 18.8% from low prevalence countries outside Austria. Information on the nationality of the remaining patients is missing.

According to Dachverband der Sozialversicherungsträger, 7396 persons received ART in 2021. Within AHIVCOS 4881 persons received ART in 2021, representing 67%. According to the ECDC tool about 85% of PLHIV are receiving ART. Thus, based on the number given by the Dachverband, the estimate for PLHIV add up to 8 700 for end of 2021.

As of January 1st 2021, the modelling tool of ECDC reveals 7358 PLHIV. Assuming that AHIVCOS is representative for Austria, the overall estimate for PLHIV sums up to 10 900. 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 2022 were analysed. During this period, 6797 HIV infections were newly diagnosed. The infections occurred in 34.9% through heterosexual transmission, in 44.6% 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.

17.0% of the examined patients had an “early“ diagnosis and 42.6% 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, 268 (7.2%) of 3741 patients were identified who had at least one resistance mutation before their first antiretroviral therapy. One patient had a 3-class resistance to NRTI, NNRTI and PI before starting ART. Nine patients had a resistance to NRTI and PI, five patients had a resistance to NRTI and NNRTI, and four 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 240/µl. The current CD4 cell count is 687/µl (median at the last measurement). As of September 1st, 2022, about 3.6% of the patients with a visit in the last 12 months had a current CD4 cell count below 200/µl and 18 (0.4%) of them had a CD4 cell count <50/µl. The mean CD4 cell count is currently 718/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 2018 (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 45%, for NRTI-associated resistance about 25% 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 40% 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, 47 patients of 8464 (0.6%) 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 heterosexually infected women.

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
BMG	Federal Ministry of Health
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 2022

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